

## Rack and pinion drives with synchronous servo motors

In cooperation with





**Rack and pinion drives with synchronous servo motors**

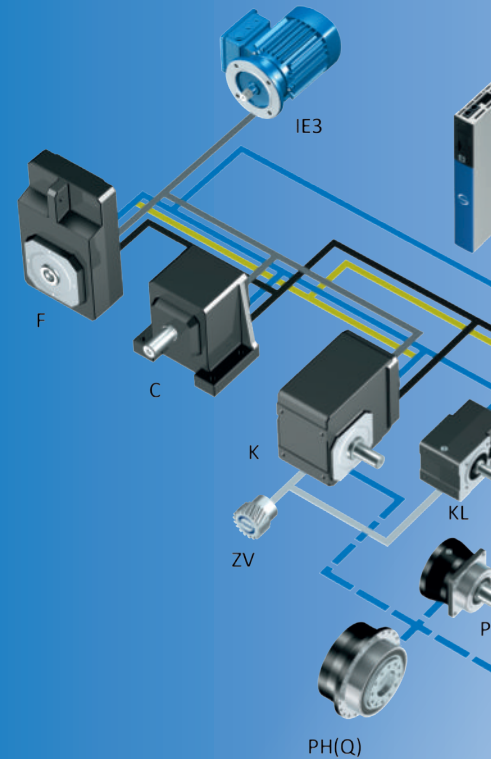
## One partner. All the possibilities.

STOBER has developed and produced excellent drive technology since 1934 and is active internationally with around 1000 employees at 12 locations. STOBER impresses machine manufacturers in wide-ranging industries and markets around the world with tailor-made, highly efficient drive systems for demanding movements.



"Our vision is to be the preferred partner for perfect movement."

- Rainer Wegener, CEO of STOBER.



### Rack and pinion drives with synchronous servo motors – what you can expect!

From full rotation into linear power: With the innovative system concept for rack and pinion drives, STOBER has developed a compact, easy-to-use system with process reliability that is precisely tailored to the application areas of machine tools, automation and robotics. By combining it with our planetary or helical bevel gear units and STOBER synchronous servo motors, you get the benefit of extremely compact, highly dynamic drive solutions. It's impossible to be more flexible!

## At home in the world of demanding motion

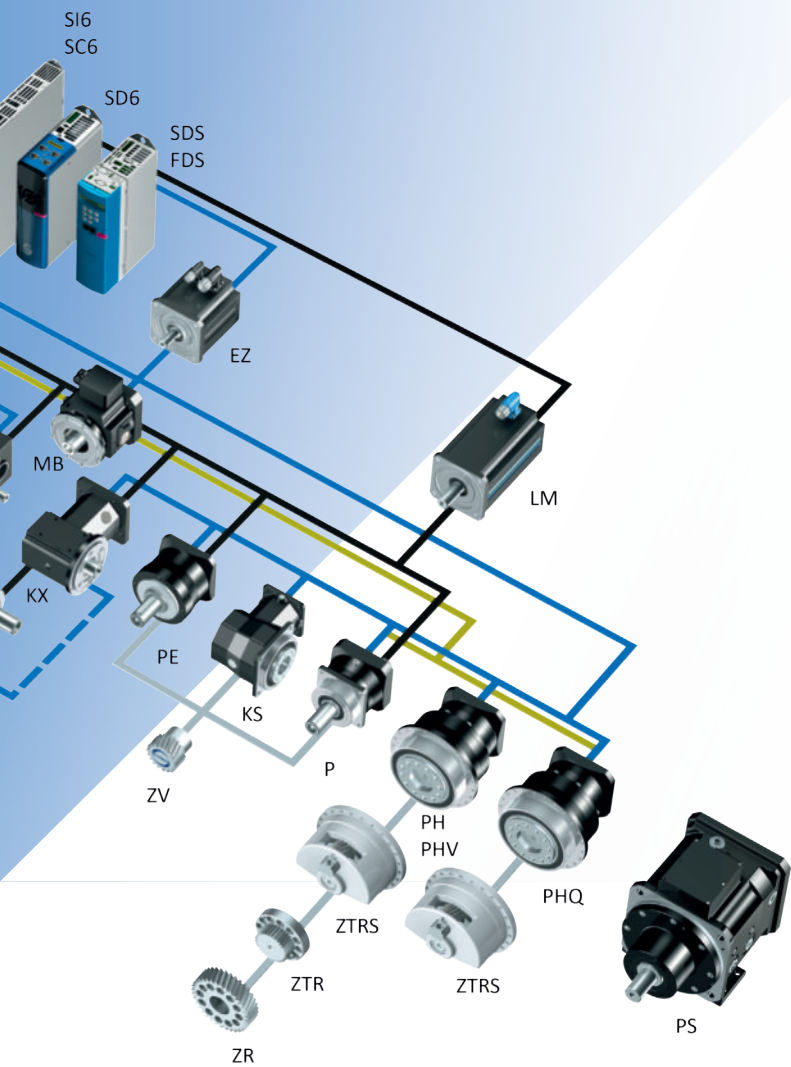
Gear units

Geared motors

Motors

Cables and drive controllers





## Everything from a single source.

The STOBER drive system consisting of gear units, motors, cables and drive controllers has a modular design and is freely scalable—for tailor-made, compact and powerful machine concepts. It can be adapted to your individual requirements and combined as needed in nearly all industries and applications areas.

We check every single component and how it works together with others, taking on the responsibility for the complete drive train. For you, this means that one contact partner, certified operating safety and maximum availability are guaranteed.

### Need special solutions?

Numerous one-of-a-kind product highlights and project-related adjustments make it possible. With a holistic approach to your specific task, we work together on individualized solutions that are optimally coordinated to your requirements. Dedicated and solution-oriented in the support of your visions and projects.

### STOBER moves integrally and precisely.

We put ideas in motion with passion and a great deal of dedication. In the process, we rely on our decades of experience and an exceptionally broad range of products. Our customers benefit from precise, practical system solutions with uncompromising quality and expert individual consultation.



## STOBER moves as a team and with personality.

As a family-owned company, it is very important to us to maintain close relationships and treat each other with trust. We put people first.

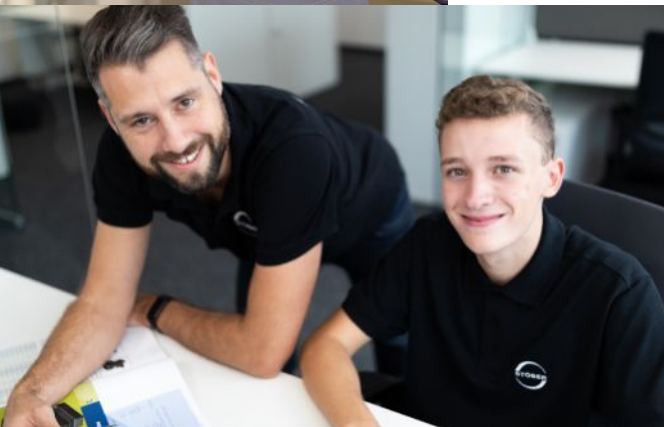
We are committed to the well-being of our employees, identify with the expectations of our customers, and show personal commitment to mutual success.



"We have installed gear units, motors and drive controllers from STOBER in nearly all our systems. STOBER supports us in new projects from the first stroke of a pencil in the design phase until commissioning. Our years of cooperation are shaped by openness and honesty and emanate a rather special spirit. The technical consulting, the support—that is real, experienced partnership"

- Jürgen Leicht, Managing Partner of Leicht Stanzautomation.





### **Working together. Worldwide. Successfully.**

With an eye to the future, STOBER is facing the challenges of digitalization and investing in integrated solutions and a strong global presence in production, sales and service. STOBER China was founded at the end of 2019. As a result, we are present in more than 40 countries around in the world at 12 locations and with 80 service partners.



**STOBER drives  
Systems technology  
Taicang, China.**



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# 1 Selection tool

## 1.1 Rack and pinion drives with synchronous servo motors



|                 |        |         |         |       |        |       |
|-----------------|--------|---------|---------|-------|--------|-------|
| Product chapter | ZTRSPH | ZTRSPHQ | ZTRSPHV | ZTRPH | ZTRPHV | ZRPH  |
| Chapter number  | [ 2 ]  | [ 3 ]   | [ 4 ]   | [ 5 ] | [ 6 ]  | [ 7 ] |

### Technical data

|             |                |                 |                 |                |                 |                 |
|-------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| $m_n$       | 3 – 8 mm       | 8 mm            | 5 – 8 mm        | 2 – 6 mm       | 5 – 6 mm        | 2 – 4 mm        |
| $z$         | 15 – 32        | 19              | 15 – 20         | 12 – 32        | 16 – 19         | 30 – 40         |
| $F_{f2acc}$ | 2.8 – 79 kN    | 107 – 124 kN    | 17 – 77 kN      | 1.9 – 67 kN    | 22 – 67 kN      | 0.93 – 16 kN    |
| $v_{f2N}$   | 0.12 – 4 m/s   | 0.09 – 0.26 m/s | 0.14 – 0.49 m/s | 0.11 – 4 m/s   | 0.13 – 0.39 m/s | 0.16 – 6 m/s    |
| $\Delta s$  | 8 – 56 $\mu$ m | 70 $\mu$ m      | 15 – 56 $\mu$ m | 4 – 44 $\mu$ m | 15 – 44 $\mu$ m | 10 – 56 $\mu$ m |

An explanation of the formula symbols can be found in the chapter [ 15.1 ].

### Features

|                        |   |       |       |       |       |       |
|------------------------|---|-------|-------|-------|-------|-------|
| Power density          | ★★★★★   | ★★★★★ | ★★★★★ | ★★★★☆ | ★★★★☆ | ★★★☆☆ |
| Linear backlash        | ★★★★★   | ★★★★☆ | ★★★★☆ | ★★★★★ | ★★★★☆ | ★★★★★ |
| Price category         | €€€€€   | €€€€€ | €€€€€ | €€€€  | €€€€  | €€€   |
| Smooth operation       | ★★★★☆   | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★★★☆ |
| Linear rigidity        | ★★★★★   | ★★★★★ | ★★★★★ | ★★★★☆ | ★★★★☆ | ★★★☆☆ |
| Mass moment of inertia | ★★★★☆   | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★★★☆ |
| Key                    | ★☆☆☆☆ good   ★★★★★ excellent<br>€ Economy   €€€€€ Premium |       |       |       |       |       |

|                       |   |   |   |               |   |               |
|-----------------------|---|---|---|---------------|---|---------------|
| <b>Pinion gearing</b> |   |   |   |               |   |               |
| Helical gearing       | ✓ | ✓ | ✓ | ✓             | ✓ | ✓             |
| Gearing quality       | 5 | 5 | 5 | 5             | 5 | 5             |
| <b>Bearing design</b> |   |   |   |               |   |               |
| Standard              | ✓ | ✓ | ✓ | ✓             | ✓ | ✓             |
| Reinforced            |   |   |   | ✓ (PH3 – PH5) |   | ✓ (PH3 – PH5) |
| <b>Accessories</b>    |   |   |   |               |   |               |
| Felt gear             | ✓ | ✓ | ✓ |               |   |               |

### ATLANTA gear racks

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

<http://atlantagmbh.de/>

# 1 Selection tool

## 1.1 Rack and pinion drives with synchronous servo motors



|                 |       |       |
|-----------------|-------|-------|
| Product chapter | ZVP   | ZVPE  |
| Chapter number  | [ 8 ] | [ 9 ] |

### Technical data

|             |                |                 |
|-------------|----------------|-----------------|
| $m_n$       | 2 – 4 mm       | 2 – 3 mm        |
| $z$         | 16 – 25        | 16 – 25         |
| $F_{f2acc}$ | 0.8 – 11 kN    | 0.48 – 6.1 kN   |
| $v_{f2N}$   | 0.08 – 4.5 m/s | 0.13 – 4.5 m/s  |
| $\Delta s$  | 8 – 44 $\mu$ m | 40 – 83 $\mu$ m |

An explanation of the formula symbols can be found in the chapter [\[ 15.1 \]](#).

### Features

|                        |   |       |
|------------------------|---|-------|
| Power density          | ★★★★☆   | ★★★★☆ |
| Linear backlash        | ★★★★★   | ★★★★☆ |
| Price category         | €€  | €     |
| Smooth operation       | ★★★★☆   | ★★★★☆ |
| Linear rigidity        | ★★★★☆   | ★★★★☆ |
| Mass moment of inertia | ★★★★☆   | ★★★★☆ |
| Key                    | ★☆☆☆☆ good   ★★★★★ excellent<br>€ Economy   €€€€€ Premium |       |

|                       |   |   |
|-----------------------|---|---|
| <b>Pinion gearing</b> |   |   |
| Helical gearing       | ✓ | ✓ |
| Gearing quality       | 6 | 6 |

|                       |   |   |
|-----------------------|---|---|
| <b>Bearing design</b> |   |   |
| Standard              | ✓ | ✓ |
| Axially reinforced    | ✓ |   |

### ATLANTA gear racks

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

<http://atlantagmbh.de/>

# 1 Selection tool

## 1.1 Rack and pinion drives with synchronous servo motors



Product chapter

ZVKS

ZVKL

ZVK

Chapter number

[ 10]

[ 11]

[ 12]

### Technical data

|             |                       |                        |                        |
|-------------|-----------------------|------------------------|------------------------|
| $m_n$       | 2 – 4 mm              | 2 mm                   | 2 – 4 mm               |
| $z$         | 18 – 25               | 16 – 20                | 18 – 25                |
| $F_{fzacc}$ | 1.3 – 11 kN           | 0.34 – 2.7 kN          | 0.91 – 15 kN           |
| $v_{fzN}$   | 0.08 – 3 m/s          | 0.21 – 3.3 m/s         | 0.04 – 3.4 m/s         |
| $\Delta s$  | 37 – 44 $\mu\text{m}$ | 99 – 123 $\mu\text{m}$ | 12 – 111 $\mu\text{m}$ |

An explanation of the formula symbols can be found in the chapter [\[ 15.1\]](#).

### Features

|                        |   |       |       |
|------------------------|---|-------|-------|
| Power density          | ★★★☆☆   | ★★☆☆☆ | ★☆☆☆☆ |
| Linear backlash        | ★★★☆☆   | ★☆☆☆☆ | ★★★★☆ |
| Price category         | €€€   | €     | €     |
| Smooth operation       | ★★★★☆   | ★★☆☆☆ | ★★★★☆ |
| Linear rigidity        | ★★★☆☆   | ★☆☆☆☆ | ★☆☆☆☆ |
| Mass moment of inertia | ★★★★☆   | ★★★★☆ | ★★★★☆ |
| Key                    | ★☆☆☆☆ good   ★★★★★ excellent<br>€ Economy   €€€€€ Premium |       |       |
| <b>Pinion gearing</b>  |   |       |       |
| Helical gearing        | ✓   | ✓     | ✓     |
| Gearing quality        | 6   | 6     | 6     |

### ATLANTA gear racks

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

<http://atlantagmbh.de/>

# 1 Selection tool

## 1.2 Synchronous servo motors



Product chapter

EZ

Chapter number

[▶ 13](#)

### Technical data

|       |                |
|-------|----------------|
| $M_N$ | 0.89 – 77.2 Nm |
| $M_0$ | 0.95 – 94 Nm   |

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

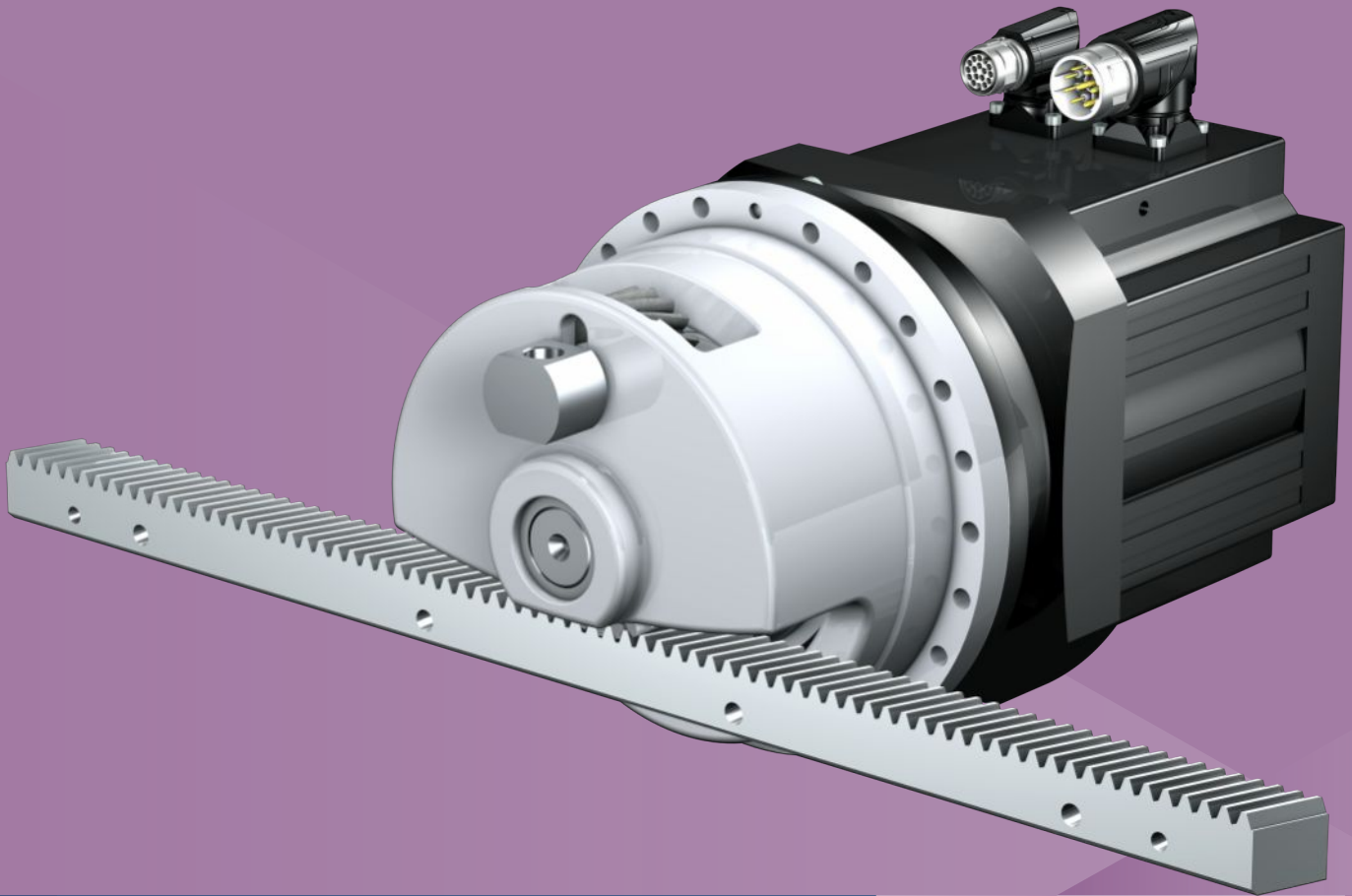
|                                  |   |
|----------------------------------|---|
| <b>Shaft design</b>              |   |
| Solid shaft without feather key  | ✓ |
| Flange hollow shaft              |   |
| <b>Encoder</b>                   |   |
| EnDat 3 One Cable Solution (OCS) | ✓ |
| EnDat 2.2                        | ✓ |
| EnDat 2.1                        | ✓ |
| Resolver                         | ✓ |
| <b>Cooling</b>                   |   |
| Convection cooling               | ✓ |
| Forced ventilation               | ✓ |
| <b>Brake</b>                     |   |
| Permanent magnet holding brake   | ✓ |
| <b>Marks and test symbols</b>    |   |
| CE                               | ✓ |
| cURus                            | ✓ |
| UKCA                             | ✓ |



## 2 ZTRSPH rack and pinion drives

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## 2 Rack and pinion drives

# ZTRSPH

### 2.1 Overview

High-performance precision planetary geared motors with supporting bearing holder

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★★ |
| Linear clearance  | ★★★★★ |
| Price category  | €€€€€ |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★★ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 5 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Radial runout $\leq 10 \mu\text{m}$ (optional)            | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                      |
|-------------|----------------------|
| $m_n$       | 3 – 8 mm             |
| $z$         | 15 – 32              |
| $F_{f2acc}$ | 2.8 – 79 kN          |
| $v_{f2N}$   | 0.12 – 4 m/s         |
| $\Delta s$  | 8 – 56 $\mu\text{m}$ |

## 2.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 2.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For rack and pinion drives with reduced backlash, higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTRS3PH7 (<math>n_{fN} = 2000</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.42   | 6.2               | 9.4                | 21       | 1.2 | ZTRS317SPH731_0040 EZ805U | 20                  | 41                  | 553                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                 | 3             | 17 | 54.1          |
| <b>ZTRS3PH7 (<math>n_{fN} = 3000</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.12   | 10                | 11                 | 0.7      | 1.6 | ZTRS317SPH732_0700 EZ501U | 20                  | 41                  | 553                | 70.00 | 0.15                   | 0.28                   | 24                 | 8                        | 173                 | 3             | 17 | 54.1          |
| 0.17   | 7.4               | 8.1                | 0.9      | 2.0 | ZTRS317SPH732_0500 EZ501U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                 | 3             | 17 | 54.1          |
| 0.17   | 13                | 14                 | 1.5      | 1.1 | ZTRS317SPH732_0500 EZ502U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                 | 3             | 17 | 54.1          |
| 0.17   | 13                | 14                 | 1.5      | 1.1 | ZTRS317SPH732_0500 EZ701U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                 | 3             | 17 | 54.1          |
| 0.21   | 5.9               | 6.5                | 1.1      | 2.3 | ZTRS317SPH732_0400 EZ501U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.21   | 10                | 11                 | 1.9      | 1.3 | ZTRS317SPH732_0400 EZ502U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.21   | 10                | 11                 | 1.9      | 1.3 | ZTRS317SPH732_0400 EZ701U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.21   | 13                | 15                 | 2.5      | 1.0 | ZTRS317SPH732_0400 EZ503U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.24   | 5.2               | 5.7                | 1.1      | 2.5 | ZTRS317SPH732_0350 EZ501U | 19                  | 41                  | 521                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.24   | 8.9               | 9.6                | 1.8      | 1.4 | ZTRS317SPH732_0350 EZ502U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.24   | 8.9               | 10                 | 1.8      | 1.4 | ZTRS317SPH732_0350 EZ701U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.24   | 12                | 13                 | 2.4      | 1.1 | ZTRS317SPH732_0350 EZ503U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                 | 3             | 17 | 54.1          |
| 0.30   | 4.1               | 4.5                | 1.2      | 2.9 | ZTRS317SPH732_0280 EZ501U | 15                  | 41                  | 417                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                 | 3             | 17 | 54.1          |
| 0.30   | 7.1               | 7.7                | 2.0      | 1.7 | ZTRS317SPH732_0280 EZ502U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                 | 3             | 17 | 54.1          |
| 0.30   | 7.1               | 8.0                | 2.0      | 1.7 | ZTRS317SPH732_0280 EZ701U | 19                  | 41                  | 521                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                 | 3             | 17 | 54.1          |
| 0.30   | 9.3               | 11                 | 2.7      | 1.3 | ZTRS317SPH732_0280 EZ503U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                 | 3             | 17 | 54.1          |
| 0.30   | 12                | 14                 | 3.3      | 1.0 | ZTRS317SPH732_0280 EZ702U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                 | 3             | 17 | 54.1          |
| 0.34   | 3.7               | 4.0                | 1.3      | 3.1 | ZTRS317SPH732_0250 EZ501U | 14                  | 41                  | 372                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.34   | 6.4               | 6.9                | 2.3      | 1.8 | ZTRS317SPH732_0250 EZ502U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.34   | 6.4               | 7.1                | 2.3      | 1.8 | ZTRS317SPH732_0250 EZ701U | 17                  | 41                  | 465                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.34   | 8.3               | 9.5                | 3.0      | 1.4 | ZTRS317SPH732_0250 EZ503U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.34   | 10                | 12                 | 3.8      | 1.1 | ZTRS317SPH732_0250 EZ702U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 3.0               | 3.2                | 1.6      | 3.6 | ZTRS317SPH732_0200 EZ501U | 11                  | 41                  | 298                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 5.1               | 5.5                | 2.8      | 2.1 | ZTRS317SPH732_0200 EZ502U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 5.1               | 5.7                | 2.8      | 2.1 | ZTRS317SPH732_0200 EZ701U | 14                  | 41                  | 372                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 6.7               | 7.6                | 3.7      | 1.6 | ZTRS317SPH732_0200 EZ503U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 8.2               | 9.9                | 4.6      | 1.3 | ZTRS317SPH732_0200 EZ702U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.43   | 9.3               | 11                 | 5.1      | 1.1 | ZTRS317SPH732_0200 EZ505U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                 | 3             | 17 | 54.1          |
| 0.53   | 2.4               | 2.6                | 1.9      | 4.2 | ZTRS317SPH732_0160 EZ501U | 8.8                 | 41                  | 238                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 4.1               | 4.4                | 3.2      | 2.4 | ZTRS317SPH732_0160 EZ502U | 17                  | 41                  | 461                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 4.1               | 4.6                | 3.2      | 2.4 | ZTRS317SPH732_0160 EZ701U | 11                  | 41                  | 298                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 5.3               | 6.1                | 4.2      | 1.9 | ZTRS317SPH732_0160 EZ503U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 6.6               | 7.9                | 5.2      | 1.5 | ZTRS317SPH732_0160 EZ702U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 7.4               | 8.8                | 5.9      | 1.3 | ZTRS317SPH732_0160 EZ505U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.53   | 9.1               | 11                 | 7.2      | 1.1 | ZTRS317SPH732_0160 EZ703U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                 | 3             | 17 | 54.1          |
| 0.85   | 2.6               | 2.9                | 1.8      | 3.2 | ZTRS317SPH731_0100 EZ701U | 7.1                 | 41                  | 192                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                 | 3             | 17 | 54.1          |
| 0.85   | 4.3               | 5.1                | 3.0      | 2.0 | ZTRS317SPH731_0100 EZ702U | 15                  | 41                  | 394                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                 | 3             | 17 | 54.1          |
| 0.85   | 5.9               | 7.4                | 4.1      | 1.4 | ZTRS317SPH731_0100 EZ703U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                 | 3             | 17 | 54.1          |
| 0.85   | 7.6               | 11                 | 5.3      | 1.1 | ZTRS317SPH731_0100 EZ705U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                 | 3             | 17 | 54.1          |
| 0.85   | 7.9               | 13                 | 5.5      | 1.1 | ZTRS317SPH731_0100 EZ802U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                 | 3             | 17 | 54.1          |
| 1.21   | 1.8               | 2.1                | 2.0      | 4.1 | ZTRS317SPH731_0070 EZ701U | 5.0                 | 41                  | 134                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                 | 3             | 17 | 54.1          |
| 1.21   | 3.0               | 3.6                | 3.3      | 2.5 | ZTRS317SPH731_0070 EZ702U | 10                  | 41                  | 276                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                 | 3             | 17 | 54.1          |
| 1.21   | 4.1               | 5.2                | 4.5      | 1.8 | ZTRS317SPH731_0070 EZ703U | 16                  | 41                  | 437                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                 | 3             | 17 | 54.1          |

2.2 Selection tables 2 ZTRSPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS3PH7 (<math>n_{fN} = 3000</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 1.21   | 5.3               | 7.5                | 5.9      | 1.4 | ZTRS317SPH731_0070 EZ705U | 20                  | 41                  | 553                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 1.21   | 5.5               | 9.2                | 6.1      | 1.4 | ZTRS317SPH731_0070 EZ802U | 20                  | 41                  | 553                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 1.21   | 6.6               | 12                 | 7.3      | 1.1 | ZTRS317SPH731_0070 EZ803U | 20                  | 41                  | 553                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 1.70   | 2.1               | 2.6                | 5.0      | 3.2 | ZTRS317SPH731_0050 EZ702U | 7.3                 | 41                  | 197                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 1.70   | 2.9               | 3.7                | 6.8      | 2.3 | ZTRS317SPH731_0050 EZ703U | 12                  | 41                  | 312                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 1.70   | 3.8               | 5.4                | 8.8      | 1.8 | ZTRS317SPH731_0050 EZ705U | 18                  | 41                  | 499                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 1.70   | 4.0               | 6.6                | 9.2      | 1.7 | ZTRS317SPH731_0050 EZ802U | 18                  | 41                  | 480                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 1.70   | 4.7               | 8.6                | 11       | 1.4 | ZTRS317SPH731_0050 EZ803U | 20                  | 41                  | 553                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 2.13   | 1.7               | 2.0                | 6.5      | 3.7 | ZTRS317SPH731_0040 EZ702U | 5.8                 | 33                  | 157                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                | 3             | 17 | 54.1          |
| 2.13   | 2.3               | 3.0                | 8.9      | 2.7 | ZTRS317SPH731_0040 EZ703U | 9.2                 | 33                  | 250                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                | 3             | 17 | 54.1          |
| 2.13   | 3.0               | 4.3                | 11       | 2.1 | ZTRS317SPH731_0040 EZ705U | 15                  | 33                  | 399                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                | 3             | 17 | 54.1          |
| 2.13   | 3.2               | 5.3                | 12       | 2.0 | ZTRS317SPH731_0040 EZ802U | 14                  | 41                  | 384                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                | 3             | 17 | 54.1          |
| 2.13   | 3.8               | 6.8                | 14       | 1.7 | ZTRS317SPH731_0040 EZ803U | 20                  | 41                  | 553                | 4.000 | 1.35                   | 2.83                   | 24                 | 8                        | 189                | 3             | 17 | 54.1          |
| <b>ZTRS3PH7 (<math>n_{fN} = 4500</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.46   | 9.1               | 15                 | 2.9      | 1.1 | ZTRS317SPH732_0280 EZ505U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.51   | 8.2               | 13                 | 3.2      | 1.2 | ZTRS317SPH732_0250 EZ505U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.64   | 6.5               | 11                 | 3.7      | 1.4 | ZTRS317SPH732_0200 EZ505U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.64   | 8.3               | 14                 | 4.7      | 1.1 | ZTRS317SPH732_0200 EZ703U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.80   | 5.2               | 8.4                | 4.1      | 1.7 | ZTRS317SPH732_0160 EZ505U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| 0.80   | 6.7               | 11                 | 5.3      | 1.3 | ZTRS317SPH732_0160 EZ703U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| 1.28   | 3.7               | 12                 | 3.0      | 2.0 | ZTRS317SPH731_0100 EZ802U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                | 3             | 17 | 54.1          |
| 1.28   | 4.3               | 7.1                | 3.4      | 1.7 | ZTRS317SPH731_0100 EZ703U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                | 3             | 17 | 54.1          |
| 1.28   | 5.8               | 11                 | 4.7      | 1.3 | ZTRS317SPH731_0100 EZ705U | 20                  | 41                  | 553                | 10.00 | 0.71                   | 1.42                   | 24                 | 8                        | 163                | 3             | 17 | 54.1          |
| 1.82   | 2.6               | 8.6                | 3.3      | 2.5 | ZTRS317SPH731_0070 EZ802U | 20                  | 41                  | 553                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 1.82   | 3.0               | 5.0                | 3.8      | 2.2 | ZTRS317SPH731_0070 EZ703U | 16                  | 41                  | 437                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 1.82   | 4.1               | 7.5                | 5.2      | 1.6 | ZTRS317SPH731_0070 EZ705U | 20                  | 41                  | 553                | 7.000 | 1.01                   | 2.02                   | 24                 | 8                        | 176                | 3             | 17 | 54.1          |
| 2.55   | 1.9               | 6.1                | 5.0      | 3.1 | ZTRS317SPH731_0050 EZ802U | 18                  | 41                  | 480                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 2.55   | 2.1               | 3.5                | 5.7      | 2.7 | ZTRS317SPH731_0050 EZ703U | 12                  | 41                  | 312                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| 2.55   | 2.9               | 5.3                | 7.7      | 2.0 | ZTRS317SPH731_0050 EZ705U | 18                  | 41                  | 499                | 5.000 | 1.25                   | 2.83                   | 24                 | 8                        | 184                | 3             | 17 | 54.1          |
| <b>ZTRS3PH7 (<math>n_{fN} = 6000</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.24   | 8.2               | 11                 | 0.7      | 1.6 | ZTRS317SPH732_0700 EZ501U | 20                  | 41                  | 553                | 70.00 | 0.15                   | 0.28                   | 24                 | 8                        | 173                | 3             | 17 | 54.1          |
| 0.24   | 13                | 19                 | 1.1      | 1.0 | ZTRS317SPH732_0700 EZ502U | 20                  | 41                  | 553                | 70.00 | 0.15                   | 0.28                   | 24                 | 8                        | 173                | 3             | 17 | 54.1          |
| 0.24   | 13                | 19                 | 1.1      | 1.0 | ZTRS317SPH732_0700 EZ701U | 20                  | 41                  | 553                | 70.00 | 0.15                   | 0.28                   | 24                 | 8                        | 173                | 3             | 17 | 54.1          |
| 0.34   | 5.8               | 7.6                | 0.9      | 2.0 | ZTRS317SPH732_0500 EZ501U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                | 3             | 17 | 54.1          |
| 0.34   | 8.9               | 13                 | 1.3      | 1.3 | ZTRS317SPH732_0500 EZ502U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                | 3             | 17 | 54.1          |
| 0.34   | 8.9               | 14                 | 1.3      | 1.3 | ZTRS317SPH732_0500 EZ701U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                | 3             | 17 | 54.1          |
| 0.34   | 11                | 18                 | 1.6      | 1.1 | ZTRS317SPH732_0500 EZ503U | 20                  | 41                  | 553                | 50.00 | 0.21                   | 0.40                   | 24                 | 8                        | 178                | 3             | 17 | 54.1          |
| 0.43   | 4.7               | 6.0                | 1.1      | 2.3 | ZTRS317SPH732_0400 EZ501U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.43   | 7.1               | 11                 | 1.7      | 1.5 | ZTRS317SPH732_0400 EZ502U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.43   | 7.1               | 11                 | 1.7      | 1.5 | ZTRS317SPH732_0400 EZ701U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.43   | 8.5               | 15                 | 2.0      | 1.2 | ZTRS317SPH732_0400 EZ503U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.43   | 9.9               | 20                 | 2.4      | 1.1 | ZTRS317SPH732_0400 EZ702U | 20                  | 41                  | 553                | 40.00 | 0.26                   | 0.50                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.49   | 4.1               | 5.3                | 1.0      | 2.5 | ZTRS317SPH732_0350 EZ501U | 19                  | 41                  | 521                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.49   | 6.3               | 9.4                | 1.6      | 1.6 | ZTRS317SPH732_0350 EZ502U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.49   | 6.3               | 9.5                | 1.6      | 1.6 | ZTRS317SPH732_0350 EZ701U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.49   | 7.5               | 13                 | 1.9      | 1.4 | ZTRS317SPH732_0350 EZ503U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.49   | 8.7               | 17                 | 2.2      | 1.2 | ZTRS317SPH732_0350 EZ702U | 20                  | 41                  | 553                | 35.00 | 0.30                   | 0.57                   | 24                 | 8                        | 179                | 3             | 17 | 54.1          |
| 0.61   | 3.3               | 4.2                | 1.1      | 2.9 | ZTRS317SPH732_0280 EZ501U | 15                  | 41                  | 417                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.61   | 5.0               | 7.5                | 1.7      | 1.9 | ZTRS317SPH732_0280 EZ502U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.61   | 5.0               | 7.6                | 1.7      | 1.9 | ZTRS317SPH732_0280 EZ701U | 19                  | 41                  | 521                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.61   | 6.0               | 10                 | 2.1      | 1.6 | ZTRS317SPH732_0280 EZ503U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.61   | 6.9               | 14                 | 2.4      | 1.4 | ZTRS317SPH732_0280 EZ702U | 20                  | 41                  | 553                | 28.00 | 0.37                   | 0.71                   | 24                 | 8                        | 182                | 3             | 17 | 54.1          |
| 0.68   | 2.9               | 3.8                | 1.3      | 3.1 | ZTRS317SPH732_0250 EZ501U | 14                  | 41                  | 372                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.68   | 4.5               | 6.7                | 2.0      | 2.0 | ZTRS317SPH732_0250 EZ502U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.68   | 4.5               | 6.8                | 2.0      | 2.0 | ZTRS317SPH732_0250 EZ701U | 17                  | 41                  | 465                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.68   | 5.3               | 9.1                | 2.3      | 1.7 | ZTRS317SPH732_0250 EZ503U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.68   | 6.2               | 12                 | 2.7      | 1.5 | ZTRS317SPH732_0250 EZ702U | 20                  | 41                  | 553                | 25.00 | 0.40                   | 0.79                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.85   | 2.3               | 3.0                | 1.5      | 3.6 | ZTRS317SPH732_0200 EZ501U | 11                  | 41                  | 298                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.85   | 3.6               | 5.4                | 2.2      | 2.4 | ZTRS317SPH732_0200 EZ502U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.85   | 3.6               | 5.4                | 2.2      | 2.4 | ZTRS317SPH732_0200 EZ701U | 14                  | 41                  | 372                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.85   | 4.3               | 7.3                | 2.6      | 2.0 | ZTRS317SPH732_0200 EZ503U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 0.85   | 4.9               | 9.8                | 3.1      | 1.7 | ZTRS317SPH732_0200 EZ702U | 20                  | 41                  | 553                | 20.00 | 0.43                   | 0.85                   | 24                 | 8                        | 180                | 3             | 17 | 54.1          |
| 1.06   | 1.9               | 2.4                | 1.6      | 4.2 | ZTRS317SPH732_0160 EZ501U | 8.8                 | 41                  | 238                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| 1.06   | 2.9               | 4.3                | 2.5      | 2.7 | ZTRS317SPH732_0160 EZ502U | 17                  | 41                  | 461                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| 1.06   | 2.9               | 4.3                | 2.5      | 2.7 | ZTRS317SPH732_0160 EZ701U | 11                  | 41                  | 298                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS3PH7 (<math>n_{fN} = 6000</math> rpm, (<math>F_{f2acc,max} = 20</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 1.06   | 3.4               | 5.8                | 3.0      | 2.3 | ZTRS317SPH732_0160 EZ503U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| 1.06   | 4.0               | 7.9                | 3.4      | 2.0 | ZTRS317SPH732_0160 EZ702U | 20                  | 41                  | 553                | 16.00 | 0.53                   | 1.06                   | 24                 | 8                        | 183                | 3             | 17 | 54.1          |
| <b>ZTRS3PH8 (<math>n_{fN} = 2000</math> rpm, (<math>F_{f2acc,max} = 28</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.43   | 20                | 30                 | 5.7      | 1.3 | ZTRS332SPH832_0250 EZ805U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.53   | 16                | 24                 | 6.6      | 1.5 | ZTRS332SPH832_0200 EZ805U | 28                  | 55                  | 1412               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 0.67   | 13                | 19                 | 8.4      | 1.7 | ZTRS332SPH832_0160 EZ805U | 28                  | 55                  | 1412               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.07   | 8.2               | 12                 | 4.2      | 1.8 | ZTRS332SPH831_0100 EZ805U | 27                  | 55                  | 1392               | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 197                | 3             | 32 | 101.9         |
| 1.52   | 5.8               | 8.7                | 5.0      | 3.4 | ZTRS332SPH831_0070 EZ805U | 27                  | 55                  | 1378               | 7.000 | 1.52                   | 3.05                   | 44                 | 15                       | 221                | 3             | 32 | 101.9         |
| 2.13   | 4.1               | 6.2                | 7.5      | 4.4 | ZTRS332SPH831_0050 EZ805U | 19                  | 49                  | 984                | 5.000 | 1.71                   | 4.27                   | 44                 | 15                       | 241                | 3             | 32 | 101.9         |
| 2.67   | 3.3               | 5.0                | 12       | 4.8 | ZTRS332SPH831_0040 EZ805U | 15                  | 39                  | 787                | 4.000 | 1.87                   | 4.67                   | 44                 | 15                       | 243                | 3             | 32 | 101.9         |
| <b>ZTRS3PH8 (<math>n_{fN} = 3000</math> rpm, (<math>F_{f2acc,max} = 28</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.16   | 14                | 15                 | 0.7      | 1.3 | ZTRS332SPH832_1000 EZ701U | 27                  | 54                  | 1380               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 194                | 3             | 32 | 101.9         |
| 0.23   | 9.5               | 11                 | 0.6      | 2.6 | ZTRS332SPH832_0700 EZ701U | 26                  | 55                  | 1302               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.23   | 15                | 18                 | 1.0      | 1.6 | ZTRS332SPH832_0700 EZ702U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.23   | 21                | 27                 | 1.3      | 1.2 | ZTRS332SPH832_0700 EZ703U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.32   | 6.8               | 7.6                | 0.7      | 3.7 | ZTRS332SPH832_0500 EZ701U | 18                  | 55                  | 930                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.32   | 11                | 13                 | 1.1      | 2.3 | ZTRS332SPH832_0500 EZ702U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.32   | 15                | 19                 | 1.6      | 1.7 | ZTRS332SPH832_0500 EZ703U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.32   | 19                | 28                 | 2.0      | 1.3 | ZTRS332SPH832_0500 EZ705U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.32   | 20                | 34                 | 2.1      | 1.2 | ZTRS332SPH832_0500 EZ802U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.32   | 24                | 44                 | 2.5      | 1.0 | ZTRS332SPH832_0500 EZ803U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.40   | 5.4               | 6.1                | 1.0      | 3.7 | ZTRS332SPH832_0400 EZ701U | 15                  | 55                  | 744                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.40   | 8.8               | 11                 | 1.6      | 2.3 | ZTRS332SPH832_0400 EZ702U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.40   | 12                | 15                 | 2.2      | 1.7 | ZTRS332SPH832_0400 EZ703U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.40   | 16                | 22                 | 2.8      | 1.3 | ZTRS332SPH832_0400 EZ705U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.40   | 16                | 27                 | 2.9      | 1.2 | ZTRS332SPH832_0400 EZ802U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.40   | 19                | 35                 | 3.5      | 1.0 | ZTRS332SPH832_0400 EZ803U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.46   | 7.7               | 9.2                | 1.4      | 3.2 | ZTRS332SPH832_0350 EZ702U | 26                  | 55                  | 1335               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.46   | 11                | 13                 | 1.9      | 2.3 | ZTRS332SPH832_0350 EZ703U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.46   | 14                | 19                 | 2.4      | 1.8 | ZTRS332SPH832_0350 EZ705U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.46   | 14                | 24                 | 2.5      | 1.7 | ZTRS332SPH832_0350 EZ802U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.46   | 17                | 31                 | 3.0      | 1.5 | ZTRS332SPH832_0350 EZ803U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.57   | 6.1               | 7.4                | 1.9      | 3.2 | ZTRS332SPH832_0280 EZ702U | 21                  | 55                  | 1068               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.57   | 8.4               | 11                 | 2.6      | 2.3 | ZTRS332SPH832_0280 EZ703U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.57   | 11                | 15                 | 3.4      | 1.8 | ZTRS332SPH832_0280 EZ705U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.57   | 11                | 19                 | 3.5      | 1.7 | ZTRS332SPH832_0280 EZ802U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.57   | 14                | 25                 | 4.2      | 1.5 | ZTRS332SPH832_0280 EZ803U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.64   | 5.5               | 6.6                | 1.6      | 4.5 | ZTRS332SPH832_0250 EZ702U | 19                  | 55                  | 953                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.64   | 7.5               | 9.5                | 2.2      | 3.3 | ZTRS332SPH832_0250 EZ703U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.64   | 9.7               | 14                 | 2.9      | 2.5 | ZTRS332SPH832_0250 EZ705U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.64   | 10                | 17                 | 3.0      | 2.4 | ZTRS332SPH832_0250 EZ802U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.64   | 12                | 22                 | 3.6      | 2.0 | ZTRS332SPH832_0250 EZ803U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.80   | 6.0               | 7.6                | 2.5      | 4.1 | ZTRS332SPH832_0200 EZ703U | 24                  | 55                  | 1209               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 0.80   | 7.8               | 11                 | 3.2      | 3.2 | ZTRS332SPH832_0200 EZ705U | 28                  | 55                  | 1412               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 0.80   | 8.1               | 14                 | 3.4      | 3.0 | ZTRS332SPH832_0200 EZ802U | 28                  | 55                  | 1412               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 0.80   | 9.7               | 18                 | 4.0      | 2.5 | ZTRS332SPH832_0200 EZ803U | 28                  | 55                  | 1412               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 1.00   | 4.8               | 6.1                | 3.5      | 4.1 | ZTRS332SPH832_0160 EZ703U | 19                  | 55                  | 967                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.00   | 6.2               | 8.8                | 4.5      | 3.2 | ZTRS332SPH832_0160 EZ705U | 28                  | 55                  | 1412               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.00   | 6.5               | 11                 | 4.7      | 3.0 | ZTRS332SPH832_0160 EZ802U | 28                  | 55                  | 1412               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.00   | 7.8               | 14                 | 5.6      | 2.5 | ZTRS332SPH832_0160 EZ803U | 28                  | 55                  | 1412               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.60   | 4.2               | 7.0                | 2.5      | 3.2 | ZTRS332SPH831_0100 EZ802U | 19                  | 55                  | 960                | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 197                | 3             | 32 | 101.9         |
| 1.60   | 5.0               | 9.1                | 2.9      | 2.6 | ZTRS332SPH831_0100 EZ803U | 27                  | 55                  | 1392               | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 197                | 3             | 32 | 101.9         |
| 2.29   | 3.5               | 6.4                | 3.5      | 4.9 | ZTRS332SPH831_0070 EZ803U | 19                  | 55                  | 974                | 7.000 | 1.52                   | 3.05                   | 44                 | 15                       | 221                | 3             | 32 | 101.9         |
| <b>ZTRS3PH8 (<math>n_{fN} = 4500</math> rpm, (<math>F_{f2acc,max} = 28</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.34   | 13                | 44                 | 1.0      | 1.6 | ZTRS332SPH832_0700 EZ802U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.34   | 15                | 26                 | 1.1      | 1.4 | ZTRS332SPH832_0700 EZ703U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.34   | 21                | 38                 | 1.5      | 1.0 | ZTRS332SPH832_0700 EZ705U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.48   | 9.6               | 31                 | 1.1      | 2.3 | ZTRS332SPH832_0500 EZ802U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.48   | 11                | 18                 | 1.3      | 2.0 | ZTRS332SPH832_0500 EZ703U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.48   | 15                | 27                 | 1.8      | 1.5 | ZTRS332SPH832_0500 EZ705U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.60   | 7.7               | 25                 | 1.6      | 2.3 | ZTRS332SPH832_0400 EZ802U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.60   | 8.8               | 15                 | 1.8      | 2.0 | ZTRS332SPH832_0400 EZ703U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.60   | 12                | 22                 | 2.5      | 1.5 | ZTRS332SPH832_0400 EZ705U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.69   | 6.7               | 22                 | 1.4      | 3.2 | ZTRS332SPH832_0350 EZ802U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.69   | 7.7               | 13                 | 1.6      | 2.8 | ZTRS332SPH832_0350 EZ703U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 0.69   | 10                | 19                 | 2.1      | 2.1 | ZTRS332SPH832_0350 EZ705U | 28                  | 55                  | 1412               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |



2.2 Selection tables 2 ZTRSPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS3PH8 (<math>n_{fN} = 4500</math> rpm, (<math>F_{f2acc,max} = 28</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.86   | 5.4               | 18                 | 1.9      | 3.2 | ZTRS332SPH832_0280 EZ802U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.86   | 6.2               | 10                 | 2.2      | 2.8 | ZTRS332SPH832_0280 EZ703U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.86   | 8.4               | 15                 | 3.0      | 2.1 | ZTRS332SPH832_0280 EZ705U | 28                  | 55                  | 1412               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| 0.96   | 4.8               | 16                 | 1.6      | 4.5 | ZTRS332SPH832_0250 EZ802U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.96   | 5.5               | 9.1                | 1.9      | 3.9 | ZTRS332SPH832_0250 EZ703U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 0.96   | 7.5               | 14                 | 2.5      | 2.9 | ZTRS332SPH832_0250 EZ705U | 28                  | 55                  | 1412               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 230                | 3             | 32 | 101.9         |
| 1.20   | 4.4               | 7.3                | 2.1      | 4.9 | ZTRS332SPH832_0200 EZ703U | 24                  | 55                  | 1209               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 1.20   | 6.0               | 11                 | 2.8      | 3.6 | ZTRS332SPH832_0200 EZ705U | 28                  | 55                  | 1412               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 231                | 3             | 32 | 101.9         |
| 1.50   | 3.5               | 5.8                | 2.9      | 4.9 | ZTRS332SPH832_0160 EZ703U | 19                  | 55                  | 967                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| 1.50   | 4.8               | 8.8                | 3.9      | 3.6 | ZTRS332SPH832_0160 EZ705U | 28                  | 55                  | 1412               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 227                | 3             | 32 | 101.9         |
| <b>ZTRS3PH8 (<math>n_{fN} = 6000</math> rpm, (<math>F_{f2acc,max} = 28</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.32   | 9.5               | 14                 | 0.6      | 1.4 | ZTRS332SPH832_1000 EZ701U | 27                  | 54                  | 1380               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 194                | 3             | 32 | 101.9         |
| 0.32   | 13                | 26                 | 0.9      | 1.0 | ZTRS332SPH832_1000 EZ702U | 27                  | 54                  | 1380               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 194                | 3             | 32 | 101.9         |
| 0.46   | 6.6               | 10                 | 0.5      | 3.0 | ZTRS332SPH832_0700 EZ701U | 26                  | 55                  | 1302               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.46   | 9.2               | 18                 | 0.7      | 2.1 | ZTRS332SPH832_0700 EZ702U | 28                  | 55                  | 1412               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 214                | 3             | 32 | 101.9         |
| 0.64   | 4.7               | 7.2                | 0.6      | 4.2 | ZTRS332SPH832_0500 EZ701U | 18                  | 55                  | 930                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.64   | 6.6               | 13                 | 0.9      | 3.0 | ZTRS332SPH832_0500 EZ702U | 28                  | 55                  | 1412               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 226                | 3             | 32 | 101.9         |
| 0.80   | 3.8               | 5.8                | 0.9      | 4.2 | ZTRS332SPH832_0400 EZ701U | 15                  | 55                  | 744                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.80   | 5.3               | 10                 | 1.2      | 3.0 | ZTRS332SPH832_0400 EZ702U | 28                  | 55                  | 1412               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 219                | 3             | 32 | 101.9         |
| 0.91   | 4.6               | 9.1                | 1.0      | 4.3 | ZTRS332SPH832_0350 EZ702U | 26                  | 55                  | 1335               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 229                | 3             | 32 | 101.9         |
| 1.14   | 3.7               | 7.3                | 1.4      | 4.3 | ZTRS332SPH832_0280 EZ702U | 21                  | 55                  | 1068               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 224                | 3             | 32 | 101.9         |
| <b>ZTRS4PH8 (<math>n_{fN} = 2000</math> rpm, (<math>F_{f2acc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.25   | 34                | 51                 | 4.3      | 1.0 | ZTRS420SPH832_0350 EZ805U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.36   | 24                | 36                 | 5.7      | 1.3 | ZTRS420SPH832_0250 EZ805U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.44   | 19                | 29                 | 6.6      | 1.5 | ZTRS420SPH832_0200 EZ805U | 45                  | 70                  | 1929               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 0.56   | 15                | 23                 | 8.4      | 1.7 | ZTRS420SPH832_0160 EZ805U | 45                  | 70                  | 1929               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 0.89   | 9.9               | 15                 | 4.2      | 1.8 | ZTRS420SPH831_0100 EZ805U | 33                  | 66                  | 1392               | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 247                | 4             | 20 | 84.9          |
| 1.27   | 6.9               | 10                 | 5.0      | 2.9 | ZTRS420SPH831_0070 EZ805U | 32                  | 70                  | 1378               | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 273                | 4             | 20 | 84.9          |
| 1.78   | 4.9               | 7.5                | 7.5      | 3.6 | ZTRS420SPH831_0050 EZ805U | 23                  | 59                  | 984                | 5.000 | 1.42                   | 3.56                   | 37                 | 12                       | 294                | 4             | 20 | 84.9          |
| 2.22   | 4.0               | 6.0                | 12       | 4.2 | ZTRS420SPH831_0040 EZ805U | 19                  | 47                  | 787                | 4.000 | 1.56                   | 3.89                   | 37                 | 12                       | 296                | 4             | 20 | 84.9          |
| <b>ZTRS4PH8 (<math>n_{fN} = 3000</math> rpm, (<math>F_{f2acc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.13   | 16                | 18                 | 0.7      | 1.3 | ZTRS420SPH832_1000 EZ701U | 33                  | 65                  | 1380               | 100.0 | 0.13                   | 0.27                   | 37                 | 12                       | 244                | 4             | 20 | 84.9          |
| 0.19   | 11                | 13                 | 0.6      | 2.6 | ZTRS420SPH832_0700 EZ701U | 31                  | 70                  | 1302               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.19   | 18                | 22                 | 1.0      | 1.6 | ZTRS420SPH832_0700 EZ702U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.19   | 25                | 32                 | 1.3      | 1.2 | ZTRS420SPH832_0700 EZ703U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.27   | 8.1               | 9.1                | 0.7      | 3.7 | ZTRS420SPH832_0500 EZ701U | 22                  | 70                  | 930                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.27   | 13                | 16                 | 1.1      | 2.3 | ZTRS420SPH832_0500 EZ702U | 45                  | 70                  | 1907               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.27   | 18                | 23                 | 1.6      | 1.7 | ZTRS420SPH832_0500 EZ703U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.27   | 23                | 33                 | 2.0      | 1.3 | ZTRS420SPH832_0500 EZ705U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.27   | 24                | 41                 | 2.1      | 1.2 | ZTRS420SPH832_0500 EZ802U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.27   | 29                | 53                 | 2.5      | 1.0 | ZTRS420SPH832_0500 EZ803U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.33   | 6.5               | 7.3                | 1.0      | 3.7 | ZTRS420SPH832_0400 EZ701U | 18                  | 70                  | 744                | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.33   | 11                | 13                 | 1.6      | 2.3 | ZTRS420SPH832_0400 EZ702U | 36                  | 70                  | 1525               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.33   | 14                | 18                 | 2.2      | 1.7 | ZTRS420SPH832_0400 EZ703U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.33   | 19                | 26                 | 2.8      | 1.3 | ZTRS420SPH832_0400 EZ705U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.33   | 20                | 33                 | 2.9      | 1.2 | ZTRS420SPH832_0400 EZ802U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.33   | 23                | 42                 | 3.5      | 1.0 | ZTRS420SPH832_0400 EZ803U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.38   | 9.2               | 11                 | 1.4      | 3.2 | ZTRS420SPH832_0350 EZ702U | 31                  | 70                  | 1335               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.38   | 13                | 16                 | 1.9      | 2.3 | ZTRS420SPH832_0350 EZ703U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.38   | 16                | 23                 | 2.4      | 1.8 | ZTRS420SPH832_0350 EZ705U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.38   | 17                | 28                 | 2.5      | 1.7 | ZTRS420SPH832_0350 EZ802U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.38   | 20                | 37                 | 3.0      | 1.5 | ZTRS420SPH832_0350 EZ803U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.48   | 7.4               | 8.8                | 1.9      | 3.2 | ZTRS420SPH832_0280 EZ702U | 25                  | 70                  | 1068               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.48   | 10                | 13                 | 2.6      | 2.3 | ZTRS420SPH832_0280 EZ703U | 40                  | 70                  | 1693               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.48   | 13                | 19                 | 3.4      | 1.8 | ZTRS420SPH832_0280 EZ705U | 45                  | 70                  | 1929               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.48   | 14                | 23                 | 3.5      | 1.7 | ZTRS420SPH832_0280 EZ802U | 45                  | 70                  | 1929               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.48   | 16                | 30                 | 4.2      | 1.5 | ZTRS420SPH832_0280 EZ803U | 45                  | 70                  | 1929               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.53   | 6.6               | 7.9                | 1.6      | 4.1 | ZTRS420SPH832_0250 EZ702U | 22                  | 70                  | 953                | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.53   | 9.0               | 11                 | 2.2      | 3.0 | ZTRS420SPH832_0250 EZ703U | 36                  | 70                  | 1511               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.53   | 12                | 17                 | 2.9      | 2.3 | ZTRS420SPH832_0250 EZ705U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.53   | 12                | 20                 | 3.0      | 2.2 | ZTRS420SPH832_0250 EZ802U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.53   | 15                | 26                 | 3.6      | 1.8 | ZTRS420SPH832_0250 EZ803U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.67   | 5.3               | 6.3                | 1.8      | 4.7 | ZTRS420SPH832_0200 EZ702U | 18                  | 70                  | 763                | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 0.67   | 7.2               | 9.1                | 2.5      | 3.4 | ZTRS420SPH832_0200 EZ703U | 28                  | 70                  | 1209               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 0.67   | 9.3               | 13                 | 3.2      | 2.7 | ZTRS420SPH832_0200 EZ705U | 45                  | 70                  | 1929               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 0.67   | 9.8               | 16                 | 3.4      | 2.5 | ZTRS420SPH832_0200 EZ802U | 44                  | 70                  | 1860               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{fzacc}$<br>[kN] | $F_{fzNOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS4PH8 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.67   | 12                | 21                 | 4.0      | 2.1 | ZTRS420SPH832_0200 EZ803U | 45                  | 70                  | 1929               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 0.83   | 5.8               | 7.3                | 3.5      | 4.0 | ZTRS420SPH832_0160 EZ703U | 23                  | 70                  | 967                | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 0.83   | 7.5               | 11                 | 4.5      | 3.1 | ZTRS420SPH832_0160 EZ705U | 36                  | 70                  | 1548               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 0.83   | 7.8               | 13                 | 4.7      | 3.0 | ZTRS420SPH832_0160 EZ802U | 35                  | 70                  | 1488               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 0.83   | 9.3               | 17                 | 5.6      | 2.5 | ZTRS420SPH832_0160 EZ803U | 45                  | 70                  | 1929               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 1.33   | 5.0               | 8.4                | 2.5      | 3.2 | ZTRS420SPH831_0100 EZ802U | 23                  | 66                  | 960                | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 247                | 4             | 20 | 84.9          |
| 1.33   | 6.0               | 11                 | 2.9      | 2.6 | ZTRS420SPH831_0100 EZ803U | 33                  | 66                  | 1392               | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 247                | 4             | 20 | 84.9          |
| 1.91   | 3.5               | 5.9                | 2.9      | 5.0 | ZTRS420SPH831_0070 EZ802U | 16                  | 70                  | 672                | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 273                | 4             | 20 | 84.9          |
| 1.91   | 4.2               | 7.6                | 3.5      | 4.2 | ZTRS420SPH831_0070 EZ803U | 23                  | 70                  | 974                | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 273                | 4             | 20 | 84.9          |
| <b>ZTRS4PH8 (<math>n_{fN} = 4500</math> rpm, (<math>F_{fzacc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.29   | 16                | 53                 | 1.0      | 1.6 | ZTRS420SPH832_0700 EZ802U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.29   | 19                | 31                 | 1.1      | 1.4 | ZTRS420SPH832_0700 EZ703U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.29   | 25                | 46                 | 1.5      | 1.0 | ZTRS420SPH832_0700 EZ705U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.40   | 12                | 38                 | 1.1      | 2.3 | ZTRS420SPH832_0500 EZ802U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.40   | 13                | 22                 | 1.3      | 2.0 | ZTRS420SPH832_0500 EZ703U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.40   | 18                | 33                 | 1.8      | 1.5 | ZTRS420SPH832_0500 EZ705U | 45                  | 70                  | 1929               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.50   | 9.2               | 30                 | 1.6      | 2.3 | ZTRS420SPH832_0400 EZ802U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.50   | 11                | 18                 | 1.8      | 2.0 | ZTRS420SPH832_0400 EZ703U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.50   | 14                | 26                 | 2.5      | 1.5 | ZTRS420SPH832_0400 EZ705U | 45                  | 70                  | 1920               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.57   | 8.1               | 26                 | 1.4      | 3.2 | ZTRS420SPH832_0350 EZ802U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.57   | 9.3               | 15                 | 1.6      | 2.8 | ZTRS420SPH832_0350 EZ703U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.57   | 13                | 23                 | 2.1      | 2.1 | ZTRS420SPH832_0350 EZ705U | 45                  | 70                  | 1929               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.71   | 6.4               | 21                 | 1.9      | 3.2 | ZTRS420SPH832_0280 EZ802U | 45                  | 70                  | 1929               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.71   | 7.4               | 12                 | 2.2      | 2.8 | ZTRS420SPH832_0280 EZ703U | 40                  | 70                  | 1693               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.71   | 10                | 18                 | 3.0      | 2.1 | ZTRS420SPH832_0280 EZ705U | 45                  | 70                  | 1929               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| 0.80   | 5.8               | 19                 | 1.6      | 4.1 | ZTRS420SPH832_0250 EZ802U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.80   | 6.6               | 11                 | 1.9      | 3.5 | ZTRS420SPH832_0250 EZ703U | 36                  | 70                  | 1511               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 0.80   | 9.0               | 16                 | 2.5      | 2.6 | ZTRS420SPH832_0250 EZ705U | 45                  | 70                  | 1929               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 283                | 4             | 20 | 84.9          |
| 1.00   | 4.6               | 15                 | 1.8      | 4.7 | ZTRS420SPH832_0200 EZ802U | 44                  | 70                  | 1860               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 1.00   | 5.3               | 8.8                | 2.1      | 4.1 | ZTRS420SPH832_0200 EZ703U | 28                  | 70                  | 1209               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 1.00   | 7.2               | 13                 | 2.8      | 3.0 | ZTRS420SPH832_0200 EZ705U | 45                  | 70                  | 1929               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 284                | 4             | 20 | 84.9          |
| 1.25   | 4.2               | 7.0                | 2.9      | 4.7 | ZTRS420SPH832_0160 EZ703U | 23                  | 70                  | 967                | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| 1.25   | 5.7               | 11                 | 3.9      | 3.5 | ZTRS420SPH832_0160 EZ705U | 36                  | 70                  | 1548               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 280                | 4             | 20 | 84.9          |
| <b>ZTRS4PH8 (<math>n_{fN} = 6000</math> rpm, (<math>F_{fzacc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.27   | 11                | 17                 | 0.6      | 1.4 | ZTRS420SPH832_1000 EZ701U | 33                  | 65                  | 1380               | 100.0 | 0.13                   | 0.27                   | 37                 | 12                       | 244                | 4             | 20 | 84.9          |
| 0.27   | 16                | 31                 | 0.9      | 1.0 | ZTRS420SPH832_1000 EZ702U | 33                  | 65                  | 1380               | 100.0 | 0.13                   | 0.27                   | 37                 | 12                       | 244                | 4             | 20 | 84.9          |
| 0.38   | 8.0               | 12                 | 0.5      | 3.0 | ZTRS420SPH832_0700 EZ701U | 31                  | 70                  | 1302               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.38   | 11                | 22                 | 0.7      | 2.1 | ZTRS420SPH832_0700 EZ702U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 266                | 4             | 20 | 84.9          |
| 0.53   | 5.7               | 8.7                | 0.6      | 4.2 | ZTRS420SPH832_0500 EZ701U | 22                  | 70                  | 930                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.53   | 7.9               | 16                 | 0.9      | 3.0 | ZTRS420SPH832_0500 EZ702U | 45                  | 70                  | 1907               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 278                | 4             | 20 | 84.9          |
| 0.67   | 4.6               | 6.9                | 0.9      | 4.2 | ZTRS420SPH832_0400 EZ701U | 18                  | 70                  | 744                | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.67   | 6.3               | 13                 | 1.2      | 3.0 | ZTRS420SPH832_0400 EZ702U | 36                  | 70                  | 1525               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 271                | 4             | 20 | 84.9          |
| 0.76   | 5.5               | 11                 | 1.0      | 4.3 | ZTRS420SPH832_0350 EZ702U | 31                  | 70                  | 1335               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 281                | 4             | 20 | 84.9          |
| 0.95   | 4.4               | 8.8                | 1.4      | 4.3 | ZTRS420SPH832_0280 EZ702U | 25                  | 70                  | 1068               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 276                | 4             | 20 | 84.9          |
| <b>ZTRS5PH8 (<math>n_{fN} = 2000</math> rpm, (<math>F_{fzacc,max} = 49</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.25   | 34                | 51                 | 4.3      | 1.0 | ZTRS516SPH832_0350 EZ805U | 49                  | 70                  | 2100               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.36   | 24                | 36                 | 5.7      | 1.3 | ZTRS516SPH832_0250 EZ805U | 49                  | 70                  | 2100               | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.44   | 19                | 29                 | 6.6      | 1.5 | ZTRS516SPH832_0200 EZ805U | 49                  | 70                  | 2100               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.56   | 15                | 23                 | 8.4      | 1.7 | ZTRS516SPH832_0160 EZ805U | 47                  | 70                  | 2000               | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 0.89   | 9.9               | 15                 | 4.2      | 1.8 | ZTRS516SPH831_0100 EZ805U | 33                  | 66                  | 1392               | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 255                | 5             | 16 | 84.9          |
| 1.27   | 6.9               | 10                 | 5.0      | 2.9 | ZTRS516SPH831_0070 EZ805U | 32                  | 70                  | 1378               | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 283                | 5             | 16 | 84.9          |
| 1.78   | 4.9               | 7.5                | 7.5      | 3.6 | ZTRS516SPH831_0050 EZ805U | 23                  | 59                  | 984                | 5.000 | 1.42                   | 3.56                   | 37                 | 12                       | 306                | 5             | 16 | 84.9          |
| 2.22   | 4.0               | 6.0                | 12       | 4.1 | ZTRS516SPH831_0040 EZ805U | 19                  | 47                  | 787                | 4.000 | 1.56                   | 3.89                   | 37                 | 12                       | 308                | 5             | 16 | 84.9          |
| <b>ZTRS5PH8 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 49</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.13   | 16                | 18                 | 0.7      | 1.3 | ZTRS516SPH832_1000 EZ701U | 33                  | 65                  | 1380               | 100.0 | 0.13                   | 0.27                   | 37                 | 12                       | 252                | 5             | 16 | 84.9          |
| 0.19   | 11                | 13                 | 0.6      | 2.6 | ZTRS516SPH832_0700 EZ701U | 31                  | 70                  | 1302               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.19   | 18                | 22                 | 1.0      | 1.6 | ZTRS516SPH832_0700 EZ702U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.19   | 25                | 32                 | 1.3      | 1.2 | ZTRS516SPH832_0700 EZ703U | 44                  | 70                  | 1848               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.27   | 8.1               | 9.1                | 0.7      | 3.7 | ZTRS516SPH832_0500 EZ701U | 22                  | 70                  | 930                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.27   | 13                | 16                 | 1.1      | 2.3 | ZTRS516SPH832_0500 EZ702U | 45                  | 70                  | 1907               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.27   | 18                | 23                 | 1.6      | 1.7 | ZTRS516SPH832_0500 EZ703U | 49                  | 70                  | 2100               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.27   | 23                | 33                 | 2.0      | 1.3 | ZTRS516SPH832_0500 EZ705U | 49                  | 70                  | 2100               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.27   | 24                | 41                 | 2.1      | 1.2 | ZTRS516SPH832_0500 EZ802U | 49                  | 70                  | 2100               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.27   | 29                | 53                 | 2.5      | 1.0 | ZTRS516SPH832_0500 EZ803U | 49                  | 70                  | 2100               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.33   | 6.5               | 7.3                | 1.0      | 3.7 | ZTRS516SPH832_0400 EZ701U | 18                  | 70                  | 744                | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.33   | 11                | 13                 | 1.6      | 2.3 | ZTRS516SPH832_0400 EZ702U | 36                  | 70                  | 1525               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |

2.2 Selection tables 2 ZTRSPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i      | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|--------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRSPH8 (<math>n_{fN} = 3000</math> rpm, (<math>F_{f2acc,max} = 49</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |        |                        |                        |                    |                          |                    |               |    |               |
| 0.33  | 14                | 18                 | 2.2      | 1.7 | ZTRS516SPH832_0400 EZ703U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.33  | 19                | 26                 | 2.8      | 1.3 | ZTRS516SPH832_0400 EZ705U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.33  | 20                | 33                 | 2.9      | 1.2 | ZTRS516SPH832_0400 EZ802U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.33  | 23                | 42                 | 3.5      | 1.0 | ZTRS516SPH832_0400 EZ803U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.38  | 9.2               | 11                 | 1.4      | 3.2 | ZTRS516SPH832_0350 EZ702U | 31                  | 70                  | 1335               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.38  | 13                | 16                 | 1.9      | 2.3 | ZTRS516SPH832_0350 EZ703U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.38  | 16                | 23                 | 2.4      | 1.8 | ZTRS516SPH832_0350 EZ705U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.38  | 17                | 28                 | 2.5      | 1.7 | ZTRS516SPH832_0350 EZ802U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.38  | 20                | 37                 | 3.0      | 1.4 | ZTRS516SPH832_0350 EZ803U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.48  | 7.4               | 8.8                | 1.9      | 3.2 | ZTRS516SPH832_0280 EZ702U | 25                  | 70                  | 1068               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.48  | 10                | 13                 | 2.6      | 2.3 | ZTRS516SPH832_0280 EZ703U | 40                  | 70                  | 1693               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.48  | 13                | 19                 | 3.4      | 1.8 | ZTRS516SPH832_0280 EZ705U | 47                  | 70                  | 2000               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.48  | 14                | 23                 | 3.5      | 1.7 | ZTRS516SPH832_0280 EZ802U | 47                  | 70                  | 2000               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.48  | 16                | 30                 | 4.2      | 1.5 | ZTRS516SPH832_0280 EZ803U | 47                  | 70                  | 2000               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.53  | 6.6               | 7.9                | 1.6      | 4.0 | ZTRS516SPH832_0250 EZ702U | 22                  | 70                  | 953                | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.53  | 9.0               | 11                 | 2.2      | 2.9 | ZTRS516SPH832_0250 EZ703U | 36                  | 70                  | 1511               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.53  | 12                | 17                 | 2.9      | 2.3 | ZTRS516SPH832_0250 EZ705U | 49                  | 70                  | 2100               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.53  | 12                | 20                 | 3.0      | 2.2 | ZTRS516SPH832_0250 EZ802U | 49                  | 70                  | 2100               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.53  | 15                | 26                 | 3.6      | 1.8 | ZTRS516SPH832_0250 EZ803U | 49                  | 70                  | 2100               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.67  | 5.3               | 6.3                | 1.8      | 4.7 | ZTRS516SPH832_0200 EZ702U | 18                  | 70                  | 763                | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.67  | 7.2               | 9.1                | 2.5      | 3.4 | ZTRS516SPH832_0200 EZ703U | 28                  | 70                  | 1209               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.67  | 9.3               | 13                 | 3.2      | 2.6 | ZTRS516SPH832_0200 EZ705U | 46                  | 70                  | 1934               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.67  | 9.8               | 16                 | 3.4      | 2.5 | ZTRS516SPH832_0200 EZ802U | 44                  | 70                  | 1860               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.67  | 12                | 21                 | 4.0      | 2.1 | ZTRS516SPH832_0200 EZ803U | 49                  | 70                  | 2100               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 0.83  | 5.8               | 7.3                | 3.5      | 3.9 | ZTRS516SPH832_0160 EZ703U | 23                  | 70                  | 967                | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 0.83  | 7.5               | 11                 | 4.5      | 3.0 | ZTRS516SPH832_0160 EZ705U | 36                  | 70                  | 1548               | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 0.83  | 7.8               | 13                 | 4.7      | 2.9 | ZTRS516SPH832_0160 EZ802U | 35                  | 70                  | 1488               | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 0.83  | 9.3               | 17                 | 5.6      | 2.4 | ZTRS516SPH832_0160 EZ803U | 47                  | 70                  | 2000               | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 1.33  | 5.0               | 8.4                | 2.5      | 3.2 | ZTRS516SPH831_0100 EZ802U | 23                  | 66                  | 960                | 10.00  | 0.98                   | 1.78                   | 37                 | 12                       | 255                | 5             | 16 | 84.9          |
| 1.33  | 6.0               | 11                 | 2.9      | 2.6 | ZTRS516SPH831_0100 EZ803U | 33                  | 66                  | 1392               | 10.00  | 0.98                   | 1.78                   | 37                 | 12                       | 255                | 5             | 16 | 84.9          |
| 1.91  | 3.5               | 5.9                | 2.9      | 4.9 | ZTRS516SPH831_0070 EZ802U | 16                  | 70                  | 672                | 7.000  | 1.27                   | 2.54                   | 37                 | 12                       | 283                | 5             | 16 | 84.9          |
| 1.91  | 4.2               | 7.6                | 3.5      | 4.1 | ZTRS516SPH831_0070 EZ803U | 23                  | 70                  | 974                | 7.000  | 1.27                   | 2.54                   | 37                 | 12                       | 283                | 5             | 16 | 84.9          |
| <b>ZTRSPH8 (<math>n_{fN} = 4500</math> rpm, (<math>F_{f2acc,max} = 49</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |        |                        |                        |                    |                          |                    |               |    |               |
| 0.29  | 16                | 53                 | 1.0      | 1.6 | ZTRS516SPH832_0700 EZ802U | 44                  | 70                  | 1848               | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.29  | 19                | 31                 | 1.1      | 1.4 | ZTRS516SPH832_0700 EZ703U | 44                  | 70                  | 1848               | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.29  | 25                | 46                 | 1.5      | 1.0 | ZTRS516SPH832_0700 EZ705U | 44                  | 70                  | 1848               | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.40  | 12                | 38                 | 1.1      | 2.3 | ZTRS516SPH832_0500 EZ802U | 49                  | 70                  | 2100               | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.40  | 13                | 22                 | 1.3      | 2.0 | ZTRS516SPH832_0500 EZ703U | 49                  | 70                  | 2100               | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.40  | 18                | 33                 | 1.8      | 1.5 | ZTRS516SPH832_0500 EZ705U | 49                  | 70                  | 2100               | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.50  | 9.2               | 30                 | 1.6      | 2.3 | ZTRS516SPH832_0400 EZ802U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.50  | 11                | 18                 | 1.8      | 2.0 | ZTRS516SPH832_0400 EZ703U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.50  | 14                | 26                 | 2.5      | 1.5 | ZTRS516SPH832_0400 EZ705U | 45                  | 70                  | 1920               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.57  | 8.1               | 26                 | 1.4      | 3.2 | ZTRS516SPH832_0350 EZ802U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.57  | 9.3               | 15                 | 1.6      | 2.8 | ZTRS516SPH832_0350 EZ703U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.57  | 13                | 23                 | 2.1      | 2.1 | ZTRS516SPH832_0350 EZ705U | 49                  | 70                  | 2100               | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.71  | 6.4               | 21                 | 1.9      | 3.2 | ZTRS516SPH832_0280 EZ802U | 47                  | 70                  | 2000               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.71  | 7.4               | 12                 | 2.2      | 2.8 | ZTRS516SPH832_0280 EZ703U | 40                  | 70                  | 1693               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.71  | 10                | 18                 | 3.0      | 2.1 | ZTRS516SPH832_0280 EZ705U | 47                  | 70                  | 2000               | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| 0.80  | 5.8               | 19                 | 1.6      | 4.0 | ZTRS516SPH832_0250 EZ802U | 49                  | 70                  | 2100               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.80  | 6.6               | 11                 | 1.9      | 3.5 | ZTRS516SPH832_0250 EZ703U | 36                  | 70                  | 1511               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 0.80  | 9.0               | 16                 | 2.5      | 2.6 | ZTRS516SPH832_0250 EZ705U | 49                  | 70                  | 2100               | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 294                | 5             | 16 | 84.9          |
| 1.00  | 4.6               | 15                 | 1.8      | 4.7 | ZTRS516SPH832_0200 EZ802U | 44                  | 70                  | 1860               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 1.00  | 5.3               | 8.8                | 2.1      | 4.0 | ZTRS516SPH832_0200 EZ703U | 28                  | 70                  | 1209               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 1.00  | 7.2               | 13                 | 2.8      | 3.0 | ZTRS516SPH832_0200 EZ705U | 46                  | 70                  | 1934               | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 295                | 5             | 16 | 84.9          |
| 1.25  | 4.2               | 7.0                | 2.9      | 4.7 | ZTRS516SPH832_0160 EZ703U | 23                  | 70                  | 967                | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| 1.25  | 5.7               | 11                 | 3.9      | 3.5 | ZTRS516SPH832_0160 EZ705U | 36                  | 70                  | 1548               | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 290                | 5             | 16 | 84.9          |
| <b>ZTRSPH8 (<math>n_{fN} = 6000</math> rpm, (<math>F_{f2acc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |        |                        |                        |                    |                          |                    |               |    |               |
| 0.27  | 11                | 17                 | 0.6      | 1.4 | ZTRS516SPH832_1000 EZ701U | 33                  | 65                  | 1380               | 100.00 | 0.13                   | 0.27                   | 37                 | 12                       | 252                | 5             | 16 | 84.9          |
| 0.27  | 16                | 31                 | 0.9      | 1.0 | ZTRS516SPH832_1000 EZ702U | 33                  | 65                  | 1380               | 100.00 | 0.13                   | 0.27                   | 37                 | 12                       | 252                | 5             | 16 | 84.9          |
| 0.38  | 8.0               | 12                 | 0.5      | 3.0 | ZTRS516SPH832_0700 EZ701U | 31                  | 70                  | 1302               | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.38  | 11                | 22                 | 0.7      | 2.1 | ZTRS516SPH832_0700 EZ702U | 44                  | 70                  | 1848               | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 276                | 5             | 16 | 84.9          |
| 0.53  | 5.7               | 8.7                | 0.6      | 4.2 | ZTRS516SPH832_0500 EZ701U | 22                  | 70                  | 930                | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.53  | 7.9               | 16                 | 0.9      | 3.0 | ZTRS516SPH832_0500 EZ702U | 45                  | 70                  | 1907               | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 289                | 5             | 16 | 84.9          |
| 0.67  | 4.6               | 6.9                | 0.9      | 4.2 | ZTRS516SPH832_0400 EZ701U | 18                  | 70                  | 744                | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |
| 0.67  | 6.3               | 13                 | 1.2      | 3.0 | ZTRS516SPH832_0400 EZ702U | 36                  | 70                  | 1525               | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 281                | 5             | 16 | 84.9          |



| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS5PH8 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 45</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.76   | 5.5               | 11                 | 1.0      | 4.2 | ZTRS516SPH832_0350 EZ702U | 31                  | 70                  | 1335               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 292                | 5             | 16 | 84.9          |
| 0.95   | 4.4               | 8.8                | 1.4      | 4.3 | ZTRS516SPH832_0280 EZ702U | 25                  | 70                  | 1068               | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 287                | 5             | 16 | 84.9          |
| <b>ZTRS5PH9 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.19   | 46                | 70                 | 1.5      | 1.3 | ZTRS520SPH942_0600 EZ805U | 77                  | 154                 | 4075               | 60.00 | 0.26                   | 0.42                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.23   | 37                | 56                 | 1.6      | 1.5 | ZTRS520SPH942_0480 EZ805U | 77                  | 154                 | 4075               | 48.00 | 0.32                   | 0.52                   | 46                 | 15                       | 385                | 5             | 20 | 106.1         |
| 0.27   | 32                | 49                 | 1.8      | 1.7 | ZTRS520SPH942_0420 EZ805U | 77                  | 154                 | 4075               | 42.00 | 0.37                   | 0.60                   | 46                 | 15                       | 387                | 5             | 20 | 106.1         |
| 0.28   | 31                | 46                 | 2.2      | 1.7 | ZTRS520SPH942_0400 EZ805U | 77                  | 154                 | 4075               | 40.00 | 0.39                   | 0.63                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.35   | 25                | 37                 | 2.3      | 2.0 | ZTRS520SPH942_0320 EZ805U | 77                  | 154                 | 4075               | 32.00 | 0.49                   | 0.78                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.37   | 23                | 35                 | 2.2      | 2.1 | ZTRS520SPH942_0300 EZ805U | 77                  | 154                 | 4075               | 30.00 | 0.46                   | 0.74                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.40   | 21                | 32                 | 2.2      | 2.2 | ZTRS520SPH942_0280 EZ805U | 77                  | 154                 | 4075               | 28.00 | 0.56                   | 0.89                   | 46                 | 15                       | 392                | 5             | 20 | 106.1         |
| 0.46   | 18                | 28                 | 2.7      | 2.4 | ZTRS520SPH942_0240 EZ805U | 77                  | 154                 | 4075               | 24.00 | 0.46                   | 0.81                   | 46                 | 15                       | 389                | 5             | 20 | 106.1         |
| 0.56   | 15                | 23                 | 3.0      | 2.7 | ZTRS520SPH942_0200 EZ805U | 72                  | 154                 | 3813               | 20.00 | 0.69                   | 1.11                   | 46                 | 15                       | 396                | 5             | 20 | 106.1         |
| 0.62   | 14                | 21                 | 3.1      | 2.9 | ZTRS520SPH942_0180 EZ805U | 65                  | 154                 | 3432               | 18.00 | 0.56                   | 0.93                   | 46                 | 15                       | 391                | 5             | 20 | 106.1         |
| 0.69   | 12                | 19                 | 3.3      | 3.2 | ZTRS520SPH942_0160 EZ805U | 57                  | 145                 | 3050               | 16.00 | 0.69                   | 1.22                   | 46                 | 15                       | 397                | 5             | 20 | 106.1         |
| 0.93   | 9.2               | 14                 | 3.8      | 3.8 | ZTRS520SPH942_0120 EZ805U | 43                  | 109                 | 2288               | 12.00 | 0.83                   | 1.39                   | 46                 | 15                       | 401                | 5             | 20 | 106.1         |
| <b>ZTRS5PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.28   | 23                | 39                 | 0.8      | 2.2 | ZTRS520SPH942_0600 EZ802U | 77                  | 154                 | 4075               | 60.00 | 0.26                   | 0.42                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.28   | 28                | 51                 | 0.9      | 1.9 | ZTRS520SPH942_0600 EZ803U | 77                  | 154                 | 4075               | 60.00 | 0.26                   | 0.42                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.35   | 19                | 31                 | 0.8      | 2.6 | ZTRS520SPH942_0480 EZ802U | 77                  | 154                 | 4075               | 48.00 | 0.32                   | 0.52                   | 46                 | 15                       | 385                | 5             | 20 | 106.1         |
| 0.35   | 22                | 41                 | 1.0      | 2.2 | ZTRS520SPH942_0480 EZ803U | 77                  | 154                 | 4075               | 48.00 | 0.32                   | 0.52                   | 46                 | 15                       | 385                | 5             | 20 | 106.1         |
| 0.40   | 16                | 27                 | 0.9      | 2.9 | ZTRS520SPH942_0420 EZ802U | 74                  | 154                 | 3906               | 42.00 | 0.37                   | 0.60                   | 46                 | 15                       | 387                | 5             | 20 | 106.1         |
| 0.40   | 20                | 35                 | 1.1      | 2.4 | ZTRS520SPH942_0420 EZ803U | 77                  | 154                 | 4075               | 42.00 | 0.37                   | 0.60                   | 46                 | 15                       | 387                | 5             | 20 | 106.1         |
| 0.42   | 16                | 26                 | 1.3      | 2.9 | ZTRS520SPH942_0400 EZ802U | 70                  | 154                 | 3720               | 40.00 | 0.39                   | 0.63                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.42   | 19                | 34                 | 1.5      | 2.5 | ZTRS520SPH942_0400 EZ803U | 77                  | 154                 | 4075               | 40.00 | 0.39                   | 0.63                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.52   | 13                | 21                 | 1.3      | 3.4 | ZTRS520SPH942_0320 EZ802U | 56                  | 154                 | 2976               | 32.00 | 0.49                   | 0.78                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.52   | 15                | 27                 | 1.6      | 2.9 | ZTRS520SPH942_0320 EZ803U | 77                  | 154                 | 4075               | 32.00 | 0.49                   | 0.78                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.56   | 12                | 20                 | 1.1      | 3.6 | ZTRS520SPH942_0300 EZ802U | 53                  | 154                 | 2790               | 30.00 | 0.46                   | 0.74                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.56   | 14                | 25                 | 1.3      | 3.0 | ZTRS520SPH942_0300 EZ803U | 76                  | 154                 | 4046               | 30.00 | 0.46                   | 0.74                   | 46                 | 15                       | 388                | 5             | 20 | 106.1         |
| 0.60   | 11                | 18                 | 1.1      | 3.7 | ZTRS520SPH942_0280 EZ802U | 49                  | 154                 | 2604               | 28.00 | 0.56                   | 0.89                   | 46                 | 15                       | 392                | 5             | 20 | 106.1         |
| 0.60   | 13                | 24                 | 1.4      | 3.1 | ZTRS520SPH942_0280 EZ803U | 71                  | 154                 | 3776               | 28.00 | 0.56                   | 0.89                   | 46                 | 15                       | 392                | 5             | 20 | 106.1         |
| 0.69   | 9.4               | 16                 | 1.4      | 4.1 | ZTRS520SPH942_0240 EZ802U | 42                  | 154                 | 2232               | 24.00 | 0.46                   | 0.81                   | 46                 | 15                       | 389                | 5             | 20 | 106.1         |
| 0.69   | 11                | 20                 | 1.7      | 3.5 | ZTRS520SPH942_0240 EZ803U | 61                  | 154                 | 3236               | 24.00 | 0.46                   | 0.81                   | 46                 | 15                       | 389                | 5             | 20 | 106.1         |
| 0.83   | 7.8               | 13                 | 1.5      | 4.7 | ZTRS520SPH942_0200 EZ802U | 35                  | 154                 | 1860               | 20.00 | 0.69                   | 1.11                   | 46                 | 15                       | 396                | 5             | 20 | 106.1         |
| 0.83   | 9.3               | 17                 | 1.8      | 3.9 | ZTRS520SPH942_0200 EZ803U | 51                  | 154                 | 2697               | 20.00 | 0.69                   | 1.11                   | 46                 | 15                       | 396                | 5             | 20 | 106.1         |
| 0.93   | 8.4               | 15                 | 1.9      | 4.2 | ZTRS520SPH942_0180 EZ803U | 46                  | 154                 | 2427               | 18.00 | 0.56                   | 0.93                   | 46                 | 15                       | 391                | 5             | 20 | 106.1         |
| 1.04   | 7.5               | 14                 | 2.3      | 4.6 | ZTRS520SPH942_0160 EZ803U | 41                  | 145                 | 2158               | 16.00 | 0.69                   | 1.22                   | 46                 | 15                       | 397                | 5             | 20 | 106.1         |
| <b>ZTRS5PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.42   | 11                | 36                 | 0.4      | 4.2 | ZTRS520SPH942_0600 EZ802U | 77                  | 154                 | 4075               | 60.00 | 0.26                   | 0.42                   | 46                 | 15                       | 383                | 5             | 20 | 106.1         |
| 0.52   | 8.8               | 29                 | 0.4      | 4.8 | ZTRS520SPH942_0480 EZ802U | 77                  | 154                 | 4075               | 48.00 | 0.32                   | 0.52                   | 46                 | 15                       | 385                | 5             | 20 | 106.1         |
| <b>ZTRS6PH9 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.22   | 38                | 58                 | 1.5      | 1.4 | ZTRS620SPH942_0600 EZ805U | 77                  | 150                 | 4919               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 354                | 6             | 20 | 127.3         |
| 0.28   | 31                | 46                 | 1.6      | 1.8 | ZTRS620SPH942_0480 EZ805U | 77                  | 150                 | 4919               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 357                | 6             | 20 | 127.3         |
| 0.32   | 27                | 41                 | 1.8      | 2.0 | ZTRS620SPH942_0420 EZ805U | 77                  | 150                 | 4919               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 359                | 6             | 20 | 127.3         |
| 0.33   | 26                | 39                 | 2.2      | 1.8 | ZTRS620SPH942_0400 EZ805U | 72                  | 145                 | 4600               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 355                | 6             | 20 | 127.3         |
| 0.42   | 20                | 31                 | 2.3      | 2.4 | ZTRS620SPH942_0320 EZ805U | 72                  | 145                 | 4600               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 360                | 6             | 20 | 127.3         |
| 0.44   | 19                | 29                 | 2.2      | 2.5 | ZTRS620SPH942_0300 EZ805U | 77                  | 150                 | 4919               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 361                | 6             | 20 | 127.3         |
| 0.48   | 18                | 27                 | 2.2      | 2.6 | ZTRS620SPH942_0280 EZ805U | 77                  | 150                 | 4919               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 366                | 6             | 20 | 127.3         |
| 0.56   | 15                | 23                 | 2.7      | 2.9 | ZTRS620SPH942_0240 EZ805U | 72                  | 150                 | 4576               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 362                | 6             | 20 | 127.3         |
| 0.67   | 13                | 19                 | 3.0      | 3.3 | ZTRS620SPH942_0200 EZ805U | 60                  | 150                 | 3813               | 20.00 | 0.83                   | 1.33                   | 56                 | 19                       | 370                | 6             | 20 | 127.3         |
| 0.74   | 11                | 17                 | 3.1      | 3.5 | ZTRS620SPH942_0180 EZ805U | 54                  | 136                 | 3432               | 18.00 | 0.67                   | 1.11                   | 56                 | 19                       | 364                | 6             | 20 | 127.3         |
| 0.83   | 10                | 15                 | 3.3      | 3.8 | ZTRS620SPH942_0160 EZ805U | 48                  | 120                 | 3050               | 16.00 | 0.83                   | 1.46                   | 56                 | 19                       | 372                | 6             | 20 | 127.3         |
| 1.11   | 7.7               | 12                 | 3.8      | 4.6 | ZTRS620SPH942_0120 EZ805U | 36                  | 91                  | 2288               | 12.00 | 1.00                   | 1.67                   | 56                 | 19                       | 377                | 6             | 20 | 127.3         |
| <b>ZTRS6PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.33   | 20                | 33                 | 0.8      | 2.7 | ZTRS620SPH942_0600 EZ802U | 77                  | 150                 | 4919               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 354                | 6             | 20 | 127.3         |
| 0.33   | 23                | 42                 | 0.9      | 2.2 | ZTRS620SPH942_0600 EZ803U | 77                  | 150                 | 4919               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 354                | 6             | 20 | 127.3         |
| 0.42   | 16                | 26                 | 0.8      | 3.1 | ZTRS620SPH942_0480 EZ802U | 70                  | 150                 | 4464               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 357                | 6             | 20 | 127.3         |
| 0.42   | 19                | 34                 | 1.0      | 2.6 | ZTRS620SPH942_0480 EZ803U | 77                  | 150                 | 4919               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 357                | 6             | 20 | 127.3         |
| 0.48   | 14                | 23                 | 0.9      | 3.4 | ZTRS620SPH942_0420 EZ802U | 61                  | 150                 | 3906               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 359                | 6             | 20 | 127.3         |
| 0.48   | 16                | 30                 | 1.1      | 2.8 | ZTRS620SPH942_0420 EZ803U | 77                  | 150                 | 4919               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 359                | 6             | 20 | 127.3         |
| 0.50   | 13                | 22                 | 1.3      | 3.1 | ZTRS620SPH942_0400 EZ802U | 58                  | 145                 | 3720               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 355                | 6             | 20 | 127.3         |
| 0.50   | 16                | 28                 | 1.5      | 2.6 | ZTRS620SPH942_0400 EZ803U | 72                  | 145                 | 4600               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 355                | 6             | 20 | 127.3         |
| 0.63   | 10                | 17                 | 1.3      | 4.0 | ZTRS620SPH942_0320 EZ802U | 47                  | 145                 | 2976               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 360                | 6             | 20 | 127.3         |
| 0.63   | 12                | 23                 | 1.6      | 3.4 | ZTRS620SPH942_0320 EZ803U | 68                  | 145                 | 4315               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 360                | 6             | 20 | 127.3         |
| 0.67   | 9.8               | 16                 | 1.1      | 4.3 | ZTRS620SPH942_0300 EZ802U | 44                  | 150                 | 2790               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 361                | 6             | 20 | 127.3         |
| 0.67   | 12                | 21                 | 1.3      | 3.6 | ZTRS620SPH942_0300 EZ803U | 64                  | 150                 | 4046               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 361                | 6             | 20 | 127.3         |

2.2 Selection tables 2 ZTRSPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZTRS6PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.71   | 9.1               | 15                 | 1.1      | 4.5 | ZTRS620SPH942_0280 EZ802U | 41                  | 150                 | 2604               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 366                | 6             | 20 | 127.3         |
| 0.71   | 11                | 20                 | 1.4      | 3.7 | ZTRS620SPH942_0280 EZ803U | 59                  | 150                 | 3776               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 366                | 6             | 20 | 127.3         |
| 0.83   | 7.8               | 13                 | 1.4      | 4.9 | ZTRS620SPH942_0240 EZ802U | 35                  | 150                 | 2232               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 362                | 6             | 20 | 127.3         |
| 0.83   | 9.3               | 17                 | 1.7      | 4.1 | ZTRS620SPH942_0240 EZ803U | 51                  | 150                 | 3236               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 362                | 6             | 20 | 127.3         |
| 1.00   | 7.8               | 14                 | 1.8      | 4.7 | ZTRS620SPH942_0200 EZ803U | 42                  | 150                 | 2697               | 20.00 | 0.83                   | 1.33                   | 56                 | 19                       | 370                | 6             | 20 | 127.3         |
| <b>ZTRS6PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 77</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.50   | 9.2               | 30                 | 0.4      | 5.0 | ZTRS620SPH942_0600 EZ802U | 77                  | 150                 | 4919               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 354                | 6             | 20 | 127.3         |
| <b>ZTRS8PH9 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 79</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.22   | 38                | 58                 | 1.5      | 1.4 | ZTRS815SPH942_0600 EZ805U | 79                  | 150                 | 5000               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.28   | 31                | 46                 | 1.6      | 1.8 | ZTRS815SPH942_0480 EZ805U | 79                  | 150                 | 5000               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 373                | 8             | 15 | 127.3         |
| 0.32   | 27                | 41                 | 1.8      | 2.0 | ZTRS815SPH942_0420 EZ805U | 79                  | 150                 | 5000               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 376                | 8             | 15 | 127.3         |
| 0.33   | 26                | 39                 | 2.2      | 1.8 | ZTRS815SPH942_0400 EZ805U | 72                  | 145                 | 4600               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.42   | 20                | 31                 | 2.3      | 2.4 | ZTRS815SPH942_0320 EZ805U | 72                  | 145                 | 4600               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 377                | 8             | 15 | 127.3         |
| 0.44   | 19                | 29                 | 2.2      | 2.5 | ZTRS815SPH942_0300 EZ805U | 79                  | 150                 | 5000               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 378                | 8             | 15 | 127.3         |
| 0.48   | 18                | 27                 | 2.2      | 2.6 | ZTRS815SPH942_0280 EZ805U | 79                  | 150                 | 5000               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 383                | 8             | 15 | 127.3         |
| 0.56   | 15                | 23                 | 2.7      | 2.9 | ZTRS815SPH942_0240 EZ805U | 72                  | 150                 | 4576               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 379                | 8             | 15 | 127.3         |
| 0.67   | 13                | 19                 | 3.0      | 3.3 | ZTRS815SPH942_0200 EZ805U | 60                  | 150                 | 3813               | 20.00 | 0.83                   | 1.33                   | 56                 | 19                       | 388                | 8             | 15 | 127.3         |
| 0.74   | 11                | 17                 | 3.1      | 3.5 | ZTRS815SPH942_0180 EZ805U | 54                  | 136                 | 3432               | 18.00 | 0.67                   | 1.11                   | 56                 | 19                       | 381                | 8             | 15 | 127.3         |
| 0.83   | 10                | 15                 | 3.3      | 3.8 | ZTRS815SPH942_0160 EZ805U | 48                  | 120                 | 3050               | 16.00 | 0.83                   | 1.46                   | 56                 | 19                       | 390                | 8             | 15 | 127.3         |
| 1.11   | 7.7               | 12                 | 3.8      | 4.6 | ZTRS815SPH942_0120 EZ805U | 36                  | 91                  | 2288               | 12.00 | 1.00                   | 1.67                   | 56                 | 19                       | 395                | 8             | 15 | 127.3         |
| <b>ZTRS8PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 79</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.33   | 20                | 33                 | 0.8      | 2.7 | ZTRS815SPH942_0600 EZ802U | 79                  | 150                 | 5000               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.33   | 23                | 42                 | 0.9      | 2.2 | ZTRS815SPH942_0600 EZ803U | 79                  | 150                 | 5000               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.42   | 16                | 26                 | 0.8      | 3.1 | ZTRS815SPH942_0480 EZ802U | 70                  | 150                 | 4464               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 373                | 8             | 15 | 127.3         |
| 0.42   | 19                | 34                 | 1.0      | 2.6 | ZTRS815SPH942_0480 EZ803U | 79                  | 150                 | 5000               | 48.00 | 0.39                   | 0.63                   | 56                 | 19                       | 373                | 8             | 15 | 127.3         |
| 0.48   | 14                | 23                 | 0.9      | 3.4 | ZTRS815SPH942_0420 EZ802U | 61                  | 150                 | 3906               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 376                | 8             | 15 | 127.3         |
| 0.48   | 16                | 30                 | 1.1      | 2.8 | ZTRS815SPH942_0420 EZ803U | 79                  | 150                 | 5000               | 42.00 | 0.44                   | 0.71                   | 56                 | 19                       | 376                | 8             | 15 | 127.3         |
| 0.50   | 13                | 22                 | 1.3      | 3.1 | ZTRS815SPH942_0400 EZ802U | 58                  | 145                 | 3720               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.50   | 16                | 28                 | 1.5      | 2.6 | ZTRS815SPH942_0400 EZ803U | 72                  | 145                 | 4600               | 40.00 | 0.47                   | 0.75                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |
| 0.63   | 10                | 17                 | 1.3      | 4.0 | ZTRS815SPH942_0320 EZ802U | 47                  | 145                 | 2976               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 377                | 8             | 15 | 127.3         |
| 0.63   | 12                | 23                 | 1.6      | 3.4 | ZTRS815SPH942_0320 EZ803U | 68                  | 145                 | 4315               | 32.00 | 0.58                   | 0.94                   | 56                 | 19                       | 377                | 8             | 15 | 127.3         |
| 0.67   | 9.8               | 16                 | 1.1      | 4.3 | ZTRS815SPH942_0300 EZ802U | 44                  | 150                 | 2790               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 378                | 8             | 15 | 127.3         |
| 0.67   | 12                | 21                 | 1.3      | 3.6 | ZTRS815SPH942_0300 EZ803U | 64                  | 150                 | 4046               | 30.00 | 0.56                   | 0.89                   | 56                 | 19                       | 378                | 8             | 15 | 127.3         |
| 0.71   | 9.1               | 15                 | 1.1      | 4.5 | ZTRS815SPH942_0280 EZ802U | 41                  | 150                 | 2604               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 383                | 8             | 15 | 127.3         |
| 0.71   | 11                | 20                 | 1.4      | 3.7 | ZTRS815SPH942_0280 EZ803U | 59                  | 150                 | 3776               | 28.00 | 0.67                   | 1.07                   | 56                 | 19                       | 383                | 8             | 15 | 127.3         |
| 0.83   | 7.8               | 13                 | 1.4      | 4.9 | ZTRS815SPH942_0240 EZ802U | 35                  | 150                 | 2232               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 379                | 8             | 15 | 127.3         |
| 0.83   | 9.3               | 17                 | 1.7      | 4.1 | ZTRS815SPH942_0240 EZ803U | 51                  | 150                 | 3236               | 24.00 | 0.56                   | 0.97                   | 56                 | 19                       | 379                | 8             | 15 | 127.3         |
| 1.00   | 7.8               | 14                 | 1.8      | 4.7 | ZTRS815SPH942_0200 EZ803U | 42                  | 150                 | 2697               | 20.00 | 0.83                   | 1.33                   | 56                 | 19                       | 388                | 8             | 15 | 127.3         |
| <b>ZTRS8PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 79</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                    |               |    |               |
| 0.50   | 9.2               | 30                 | 0.4      | 5.0 | ZTRS815SPH942_0600 EZ802U | 79                  | 150                 | 5000               | 60.00 | 0.31                   | 0.50                   | 56                 | 19                       | 371                | 8             | 15 | 127.3         |

## 2.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

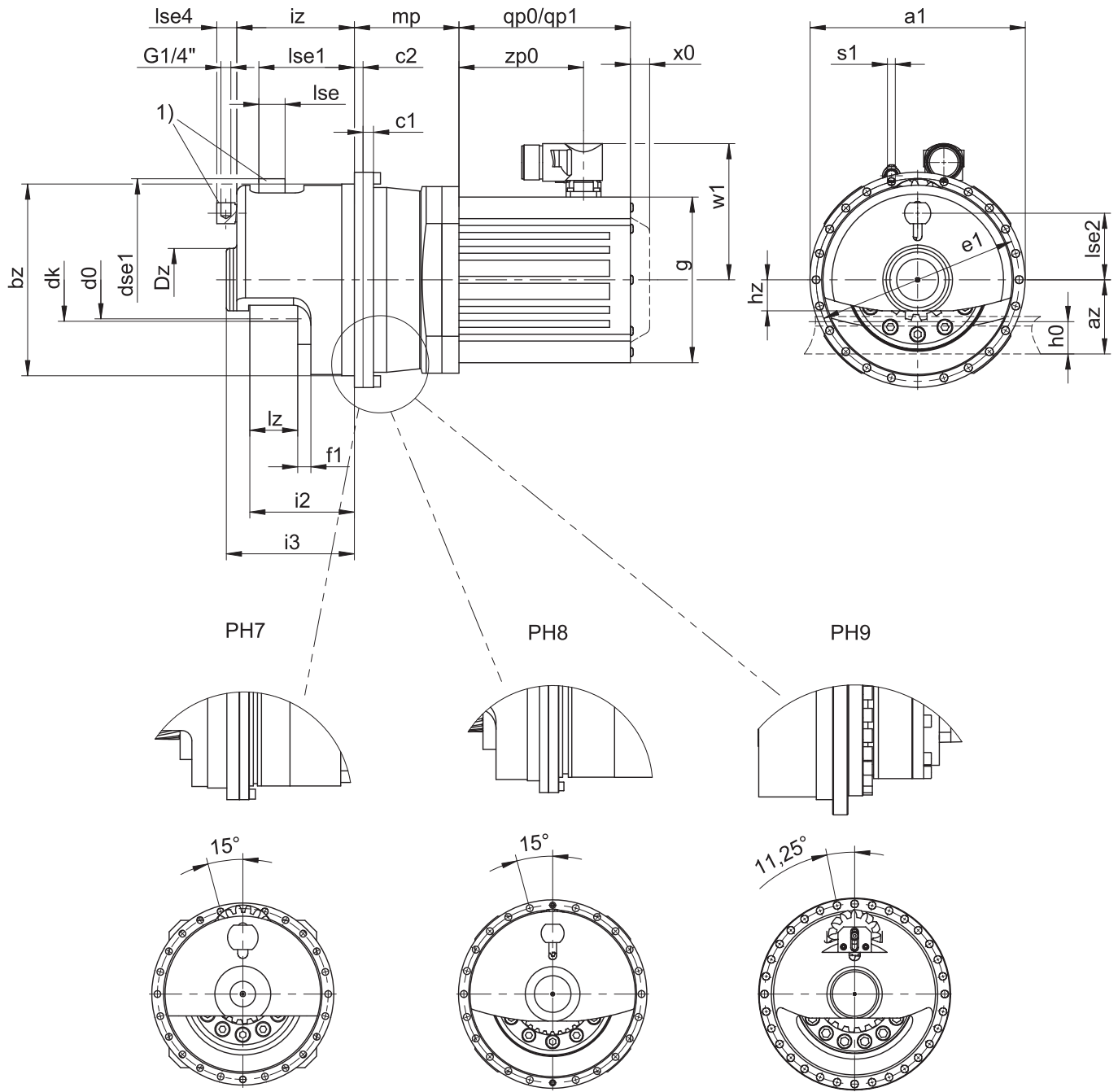
The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

x0 Applies to encoders using an optical measuring method.

1) Felt gear for lubrication (option)

qp1 Applies to motors with brake.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

## Dimensions of gear units

| Type         | mn | Øa1 | az     | Øbz               | c1 | c2 | Ød0    | Ødk   | Ødse1 | ØDz | Øe1 | f1   | i2    | i3    | iz    | h0 | hz   | lz   | lse | lse1  | lse2  | lse4 | Øs1  | x   |
|--------------|----|-----|--------|-------------------|----|----|--------|-------|-------|-----|-----|------|-------|-------|-------|----|------|------|-----|-------|-------|------|------|-----|
| ZTRS317SPH7_ | 3  | 179 | 53.06  | 156 <sub>n7</sub> | 10 | 12 | 54.11  | 60.1  | 63.6  | 55  | 168 | 19.0 | 78.5  | 99.5  | 89.5  | 26 | 21.5 | 32.5 | 25  | 75.2  | 55.7  | 23.0 | 6.6  | 0.0 |
| ZTRS332SPH8_ | 3  | 247 | 76.93  | 220 <sub>n7</sub> | 12 | 10 | 101.86 | 107.9 | 63.6  | 72  | 233 | 14.0 | 107.0 | 137.0 | 125.0 | 26 | 35.5 | 42.0 | 30  | 102.6 | 79.5  | 23.0 | 9.0  | 0.0 |
| ZTRS420SPH8_ | 4  | 247 | 77.44  | 220 <sub>n7</sub> | 12 | 10 | 84.88  | 92.8  | 62.8  | 72  | 233 | 14.0 | 110.0 | 137.0 | 125.0 | 35 | 35.5 | 45.0 | 30  | 98.6  | 68.9  | 23.0 | 9.0  | 0.0 |
| ZTRS516SPH8_ | 5  | 247 | 76.44  | 220 <sub>n7</sub> | 12 | 10 | 84.88  | 94.8  | 78.6  | 72  | 233 | 14.5 | 120.0 | 147.0 | 135.0 | 34 | 35.5 | 55.0 | 30  | 109.6 | 76.5  | 23.0 | 9.0  | 0.0 |
| ZTRS520SPH9_ | 5  | 346 | 87.05  | 300 <sub>n7</sub> | 18 | 18 | 106.10 | 116.1 | 78.6  | 100 | 325 | 21.5 | 137.0 | 179.0 | 171.0 | 34 | 45.0 | 55.0 | 30  | 131.1 | 87.1  | –    | 13.5 | 0.0 |
| ZTRS620SPH9_ | 6  | 346 | 106.66 | 300 <sub>n7</sub> | 18 | 18 | 127.32 | 139.3 | 94.2  | 100 | 325 | 21.5 | 147.0 | 189.0 | 181.0 | 43 | 43.5 | 65.0 | 30  | 131.1 | 104.8 | –    | 13.5 | 0.0 |
| ZTRS815SPH9_ | 8  | 346 | 136.66 | 300 <sub>n7</sub> | 18 | 18 | 127.32 | 147.3 | 160.0 | 110 | 325 | 21.5 | 162.0 | 204.7 | 196.5 | 71 | 55.0 | 80.0 | 65  | 162.0 | 137.7 | 5.5  | 13.5 | 0.3 |

## Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |
| EZ803U | 190 | 238 | 315.0 | 156.5 | 22 | 184.0 |
| EZ805U | 190 | 320 | 397.0 | 156.5 | 22 | 266.0 |

## Dimensions of geared motors

| Type        | EZ5<br>mp | EZ7<br>mp | EZ8<br>mp |
|-------------|-----------|-----------|-----------|
| ZTRS_PH731_ | –         | 83.0      | 93.0      |
| ZTRS_PH732_ | 131.0     | 134.0     | –         |
| ZTRS_PH831_ | –         | –         | 120.0     |
| ZTRS_PH832_ | –         | 171.0     | 181.0     |
| ZTRS_PH942_ | –         | –         | 228.5     |

## 2.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |     |   |    |   |    |   |   |   |   |   |   |   |      |        |
|---|-----|---|----|---|----|---|---|---|---|---|---|---|------|--------|
| Z | TRS | 3 | 17 | S | PH | 7 | 3 | 1 | S | F | S | S | 0050 | EZ703U |
|---|-----|---|----|---|----|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design   |
|--------|--------------------------------------|--|
| Z      | Type                                 | Rack and pinion drive  |
| TRS    | Design                               | Screwed flange pinion with supporting bearing holder           |
| 3      | Module                               | $m_n = 3$ (example)  |
| 17     | Number of teeth                      | $z = 17$ (example)   |
| S      | Toothing                             | Helical (left-hand 19° 31' 42")                                |
| SF     |                                      | Helical (left-hand 19° 31' 42") with felt gear for lubrication |
| PH     | Type                                 | Planetary gear unit  |
| 7      | Size                                 | 7 (example)  |
| 3      | Generation                           | Generation 3   |
| 4      |                                      | Generation 4   |
| 1      | Stages                               | Single-stage   |
| 2      |                                      | Two-stage  |
| S      | Housing                              | Standard   |
| F      | Shaft                                | Flange shaft   |
| S      | Bearing                              | Standard bearing   |
| V      |                                      | Reinforced bearing (PH3 – PH5)                                 |
| S      | Backlash                             | Standard   |
| R      |                                      | Reduced (PH3 – PH9)  |
| 0050   | Transmission ratio ( $i \times 10$ ) | $i = 5$ (example)  |
| EZ703U | Motor                                | EZ synchronous servo motor                                     |

### To complete the type designation, also specify the following in your order:

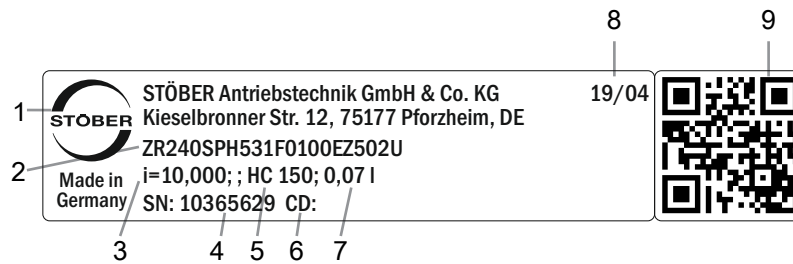
- A detailed type designation of the motor, see chapter [\[ 13\]](#)
- Position of the plug connectors, see chapter [\[ 2.5.5\]](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [\[ 2.6.2\]](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 2.5.1\]](#).

## 2.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 2.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

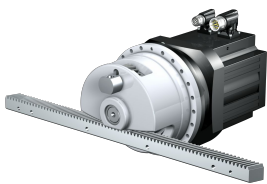
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 2.5 Product description

### 2.5.1 Input options

This chapter shows you all available input options:

Synchronous servo motors



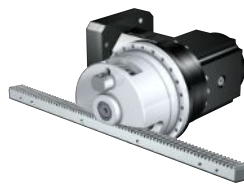
Catalog ID 443286\_en

Motor adapter



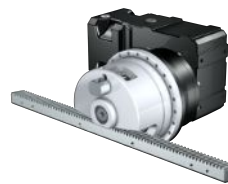
Catalog ID 443137\_en

KX right-angle input with MF motor adapter



On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 2.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 2.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

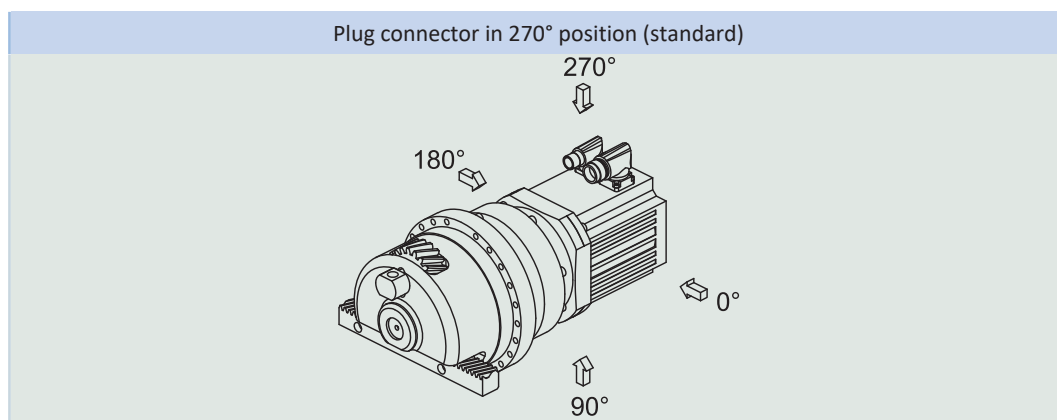
- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 2.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

## 2.5.5 Position of the plug connectors



The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

Note that the plug connectors also rotate when the gear rack is rotated to a different position.

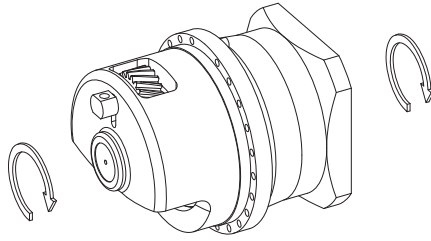
## 2.5.6 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | $\leq 90$ °C          |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |



## 2.5.7 Direction of rotation

The input and output rotate in the same direction.



## 2.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

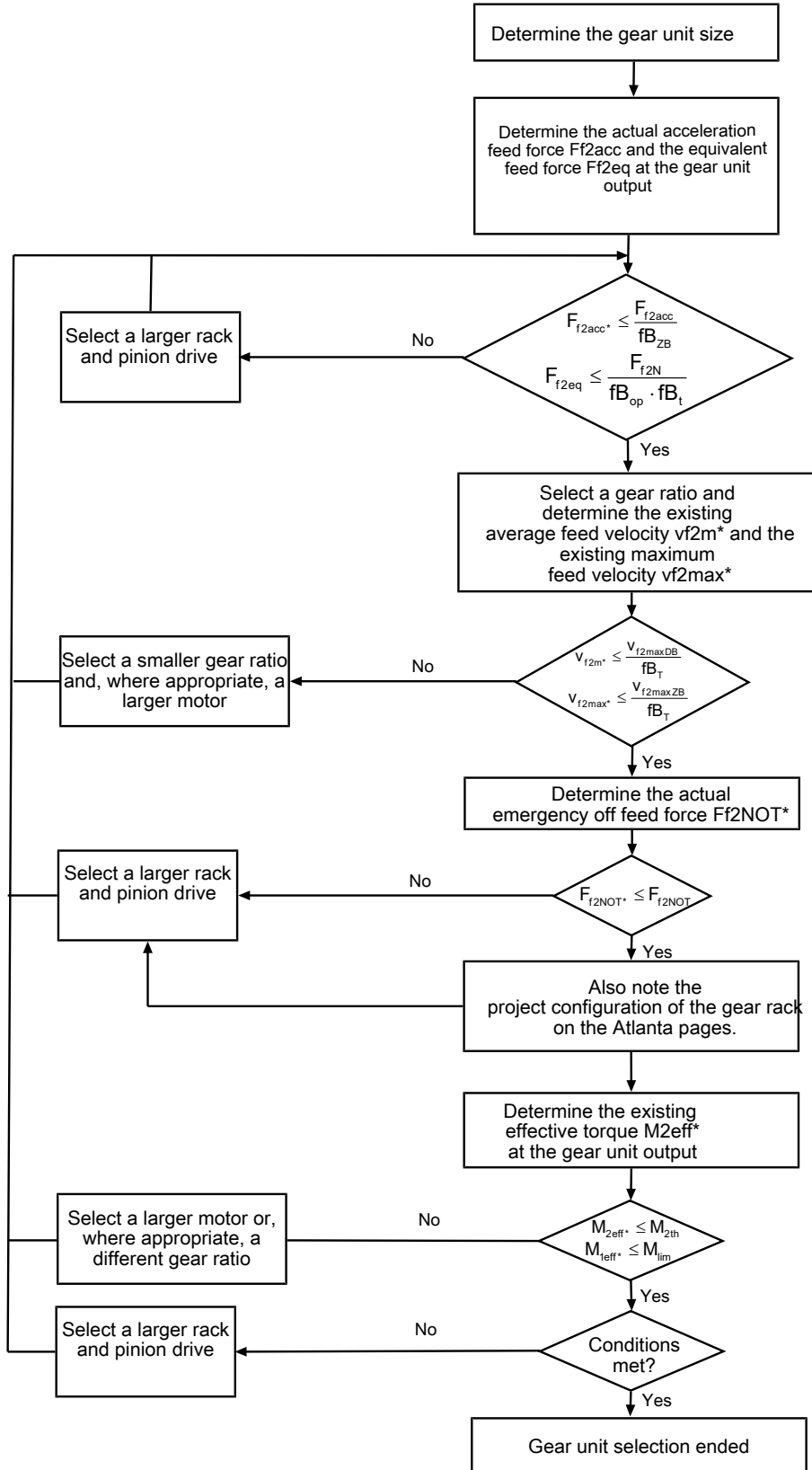
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 2.6.1 Drive selection

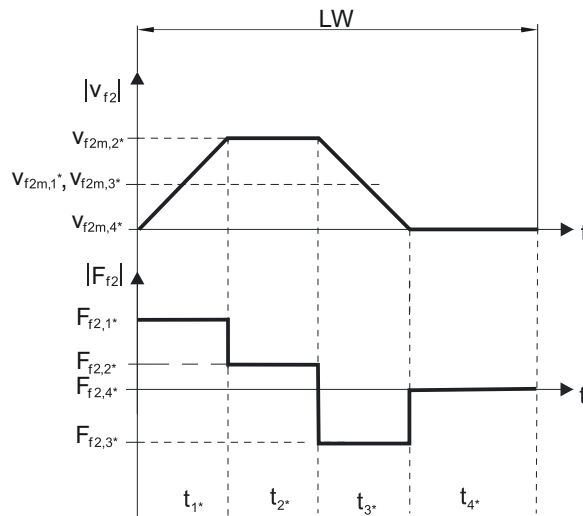


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

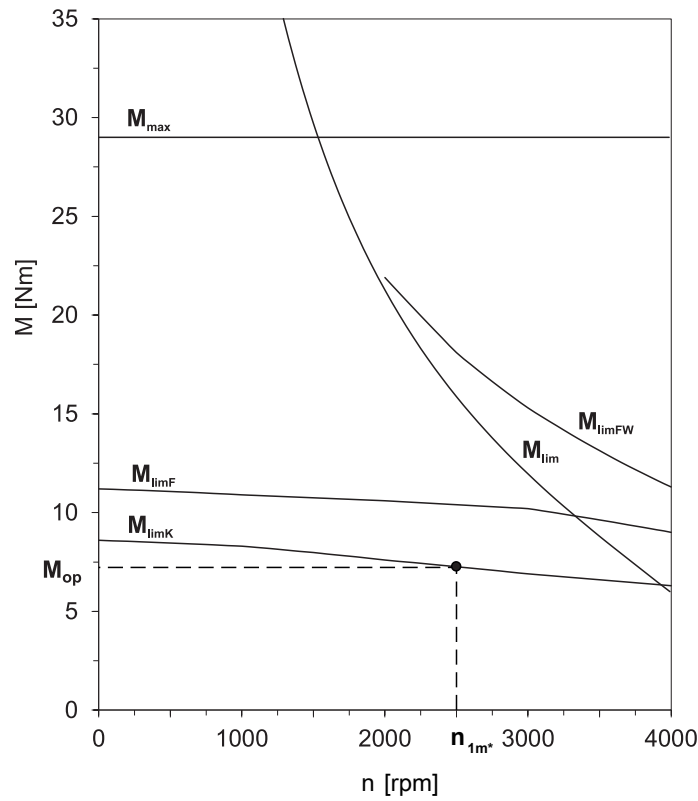
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [► 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

**2.6.2 Recommendation for radial shaft seal rings**

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

**2.7 Additional documentation**

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

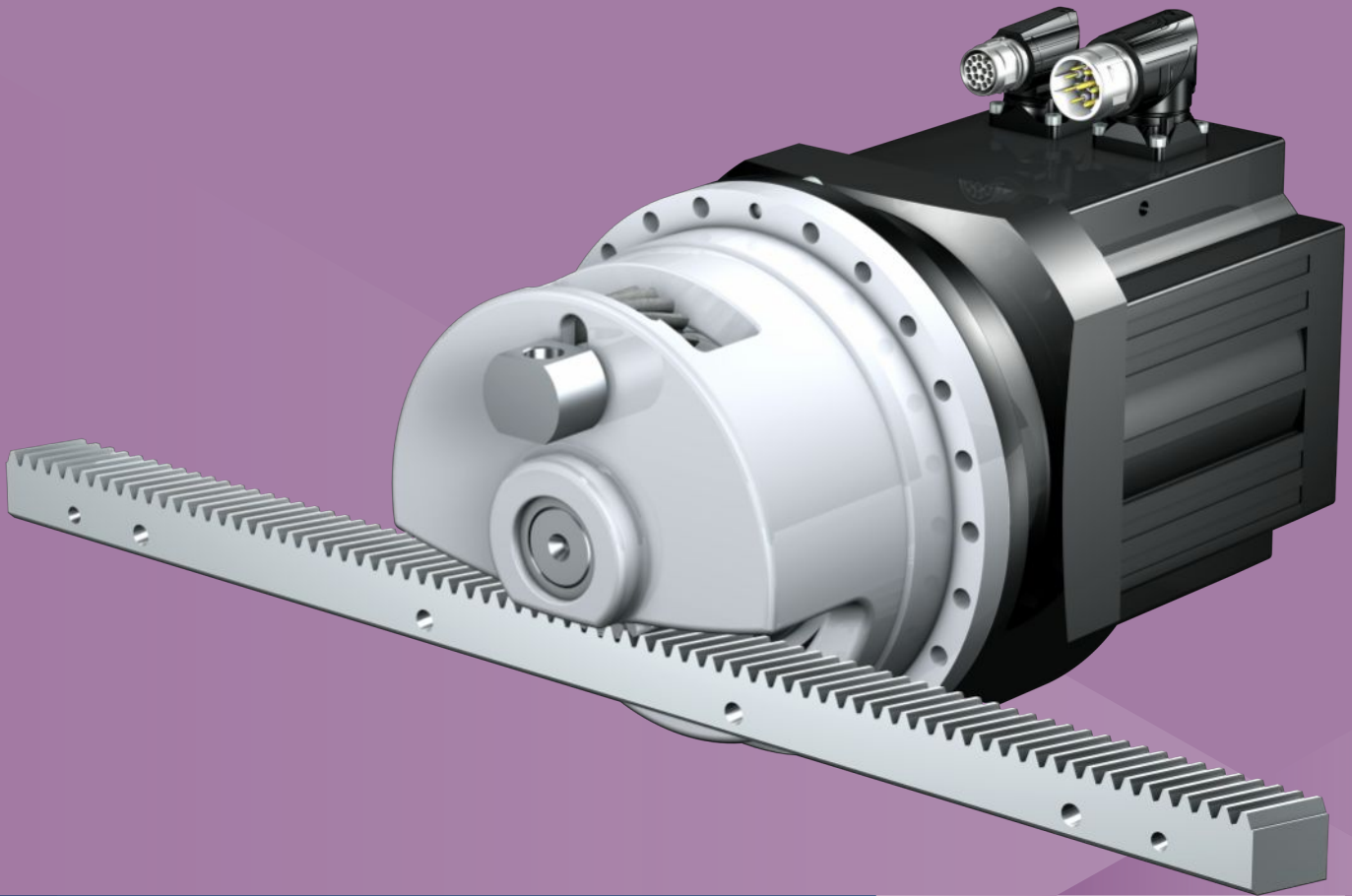
| Documentation  | ID        |
|--|-----------|
| Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104 | 443354_de |
| Operating manual for EZ synchronous servo motors                     | 443032_en |
| Operating manual for gear racks (Atlanta)                            | 442455    |



## 3 ZTRSPHQ rack and pinion drives

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## 3 Rack and pinion drives

# ZTRSPHQ

### 3.1 Overview

Quattro-Power precision planetary geared motors with supporting bearing holder

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★★ |
| Linear clearance  | ★★★★☆ |
| Price category  | €€€€€ |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★★ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 5 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Radial runout ≤ 10 µm (optional)                          | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                 |
|-------------|-----------------|
| $m_n$       | 8 mm            |
| $z$         | 19              |
| $F_{f2acc}$ | 107 – 124 kN    |
| $v_{f2N}$   | 0.09 – 0.26 m/s |
| $\Delta s$  | 70 µm           |



## 3.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 3.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                        | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{flin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-----------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|----------------------|---------------|----|---------------|
| <b>ZTRSPHQ10 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 124</math> kN)</b> |                   |                    |          |     |                             |                     |                     |                    |       |                        |                        |                    |                          |                      |               |    |               |
| 0.14  | 59                | 89                 | 0.6      | 1.1 | ZTRS819SPHQ1043_1200 EZ805U | 124                 | 240                 | 10000              | 120.0 | 0.14                   | 0.25                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.18  | 47                | 71                 | 0.6      | 1.4 | ZTRS819SPHQ1043_0960 EZ805U | 124                 | 240                 | 10000              | 96.00 | 0.18                   | 0.31                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| <b>ZTRSPHQ10 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 124</math> kN)</b> |                   |                    |          |     |                             |                     |                     |                    |       |                        |                        |                    |                          |                      |               |    |               |
| 0.11  | 60                | 99                 | 0.2      | 1.1 | ZTRS819SPHQ1043_2400 EZ802U | 124                 | 240                 | 10000              | 240.0 | 0.10                   | 0.16                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.12  | 52                | 87                 | 0.2      | 1.3 | ZTRS819SPHQ1043_2100 EZ802U | 124                 | 240                 | 10000              | 210.0 | 0.11                   | 0.18                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.12  | 62                | 113                | 0.3      | 1.1 | ZTRS819SPHQ1043_2100 EZ803U | 124                 | 240                 | 10000              | 210.0 | 0.11                   | 0.18                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.15  | 42                | 70                 | 0.3      | 1.6 | ZTRS819SPHQ1043_1680 EZ802U | 124                 | 240                 | 10000              | 168.0 | 0.14                   | 0.23                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.15  | 50                | 90                 | 0.3      | 1.3 | ZTRS819SPHQ1043_1680 EZ803U | 124                 | 240                 | 10000              | 168.0 | 0.14                   | 0.23                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.17  | 37                | 62                 | 0.3      | 1.8 | ZTRS819SPHQ1043_1500 EZ802U | 124                 | 240                 | 10000              | 150.0 | 0.14                   | 0.23                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.17  | 45                | 81                 | 0.3      | 1.5 | ZTRS819SPHQ1043_1500 EZ803U | 124                 | 240                 | 10000              | 150.0 | 0.14                   | 0.23                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.21  | 30                | 50                 | 0.3      | 2.0 | ZTRS819SPHQ1043_1200 EZ802U | 124                 | 240                 | 10000              | 120.0 | 0.14                   | 0.25                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.21  | 36                | 65                 | 0.4      | 1.7 | ZTRS819SPHQ1043_1200 EZ803U | 124                 | 240                 | 10000              | 120.0 | 0.14                   | 0.25                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.26  | 24                | 40                 | 0.3      | 2.4 | ZTRS819SPHQ1043_0960 EZ802U | 107                 | 240                 | 8640               | 96.00 | 0.18                   | 0.31                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.26  | 29                | 52                 | 0.4      | 2.0 | ZTRS819SPHQ1043_0960 EZ803U | 124                 | 240                 | 10000              | 96.00 | 0.18                   | 0.31                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| <b>ZTRSPHQ10 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 124</math> kN)</b> |                   |                    |          |     |                             |                     |                     |                    |       |                        |                        |                    |                          |                      |               |    |               |
| 0.09  | 49                | 162                | 0.1      | 1.3 | ZTRS819SPHQ1043_4200 EZ802U | 124                 | 240                 | 10000              | 420.0 | 0.06                   | 0.09                   | 70                 | –                        | 339                  | 8             | 19 | 161.3         |
| 0.13  | 35                | 116                | 0.1      | 1.9 | ZTRS819SPHQ1043_3000 EZ802U | 124                 | 240                 | 10000              | 300.0 | 0.08                   | 0.13                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.16  | 28                | 92                 | 0.1      | 2.3 | ZTRS819SPHQ1043_2400 EZ802U | 124                 | 240                 | 10000              | 240.0 | 0.10                   | 0.16                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.18  | 25                | 81                 | 0.1      | 2.6 | ZTRS819SPHQ1043_2100 EZ802U | 124                 | 240                 | 10000              | 210.0 | 0.11                   | 0.18                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |
| 0.23  | 20                | 65                 | 0.1      | 3.0 | ZTRS819SPHQ1043_1680 EZ802U | 124                 | 240                 | 10000              | 168.0 | 0.14                   | 0.23                   | 70                 | –                        | 340                  | 8             | 19 | 161.3         |

### 3.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

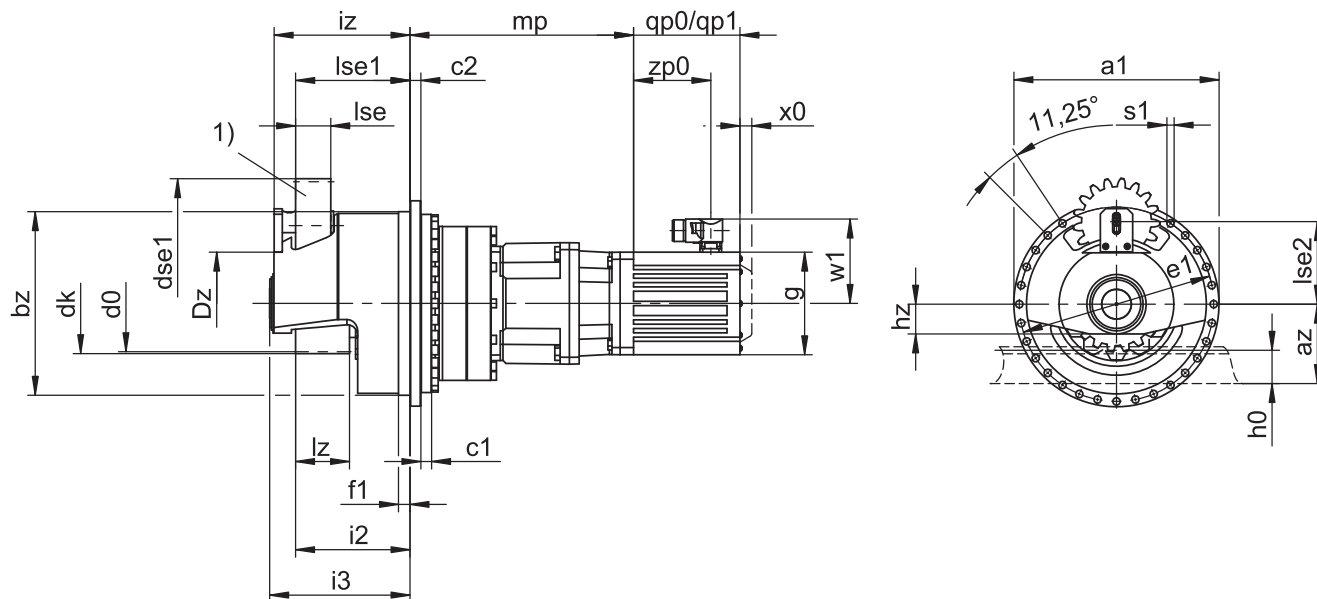
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4](#)

1) Felt gear for lubrication (option)

#### Dimensions of gear units

| Type           | mn | Øa1 | az     | Øbz               | c1 | c2 | Ød0    | Ødk   | Ødse1 | ØDz | Øe1 | f1   | i2  | i3  | iz    | h0 | hz | lz  | lse | lse1  | lse2  | Øs1  | x    |
|----------------|----|-----|--------|-------------------|----|----|--------|-------|-------|-----|-----|------|-----|-----|-------|----|----|-----|-----|-------|-------|------|------|
| ZTRS819SPHQ10_ | 8  | 380 | 151.64 | 340 <sub>h7</sub> | 20 | 20 | 161.28 | 177.3 | 160   | 110 | 360 | 21.5 | 212 | 260 | 251.9 | 71 | 55 | 100 | 65  | 211.7 | 152.8 | 13.5 | 0.00 |

#### Dimensions of motors

| Type   | □g  | qp0 | qp1 | w1    | x0 | zp0 |
|--------|-----|-----|-----|-------|----|-----|
| EZ802U | 190 | 197 | 274 | 156.5 | 22 | 143 |
| EZ803U | 190 | 238 | 315 | 156.5 | 22 | 184 |
| EZ805U | 190 | 320 | 397 | 156.5 | 22 | 266 |

#### Dimensions of geared motors

| Type          | EZ8         |
|---------------|-------------|
| ZTRS_PHQ1043_ | mp<br>344.5 |

## 3.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |     |   |    |   |     |    |   |   |   |      |        |
|---|-----|---|----|---|-----|----|---|---|---|------|--------|
| Z | TRS | 8 | 19 | S | PHQ | 10 | 4 | 3 | F | 1680 | EZ802U |
|---|-----|---|----|---|-----|----|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design   |
|--------|--------------------------------------|--|
| Z      | Type                                 | Rack and pinion drive  |
| TRS    | Design                               | Screwed flange pinion with supporting bearing holder           |
| 8      | Module                               | $m_n = 8$ (example)  |
| 19     | Number of teeth                      | $z = 19$ (example)   |
| S      | Toothing                             | Helical (left-hand 19° 31' 42")                                |
| SF     |                                      | Helical (left-hand 19° 31' 42") with felt gear for lubrication |
| PHQ    | Type                                 | Planetary gear unit  |
| 10     | Size                                 | 10 (example)   |
| 4      | Generation                           | Generation 4   |
| 3      | Stages                               | Three-stage  |
| F      | Shaft                                | Flange shaft   |
| 1680   | Transmission ratio ( $i \times 10$ ) | $i = 168$ (example)  |
| EZ802U | Motor                                | EZ synchronous servo motor                                     |

### To complete the type designation, also specify the following in your order:

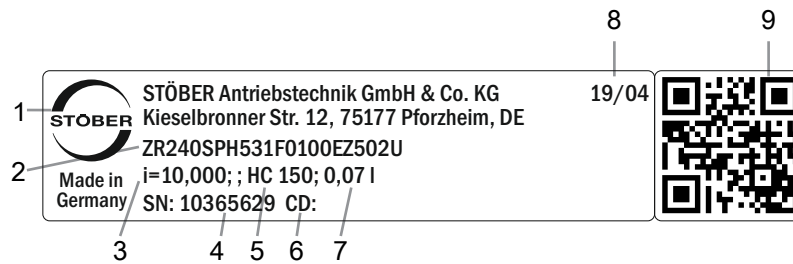
- A detailed type designation of the motor, see chapter [▶ 13](#)
- Mounting position (for three-stage gear units), see the chapter [▶ 3.5.5](#)
- Position of the plug connectors, see chapter [▶ 3.5.6](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [▶ 3.6.2](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [▶ 3.5.1](#).

### 3.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

#### 3.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

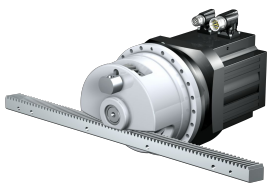
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 3.5 Product description

### 3.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

Motor adapter



Catalog ID 443137\_en

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 3.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 3.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 3.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate. The filling volume and the structure of the gear units depend on the mounting position.

Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

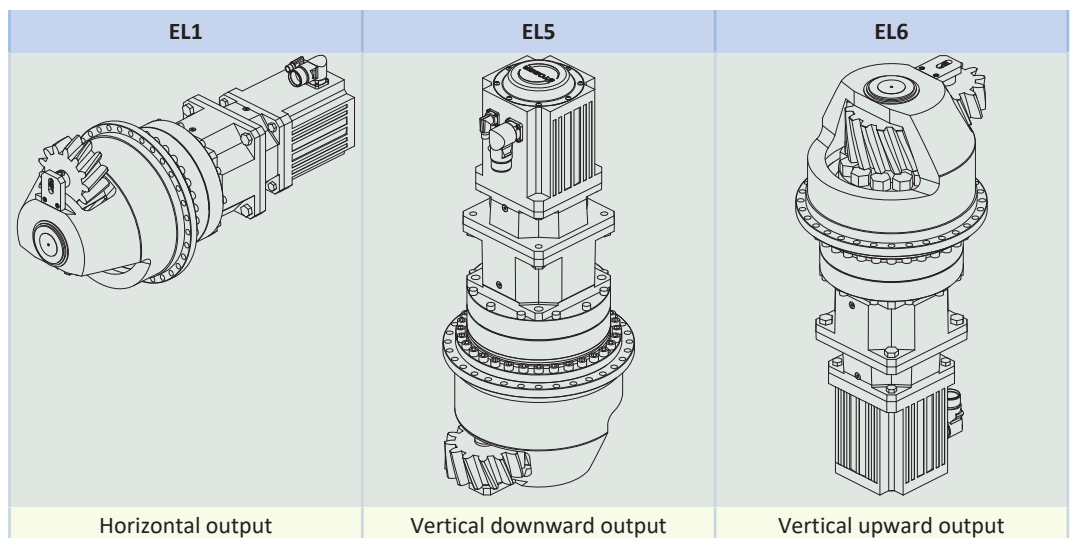
### 3.5.4.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

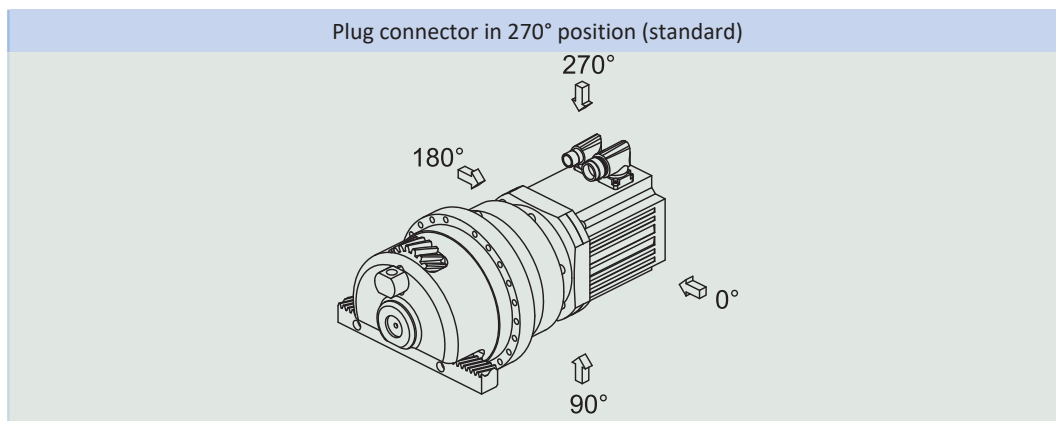
## 3.5.5 Mounting positions

The following table shows the standard mounting positions.

Please indicate the mounting position when ordering three-stage geared motors.



### 3.5.6 Position of the plug connectors



The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

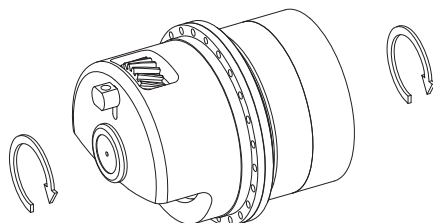
Note that the plug connectors also rotate when the gear rack is rotated to a different position.

### 3.5.7 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 90 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

### 3.5.8 Direction of rotation

The input and output rotate in the same direction.



## 3.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

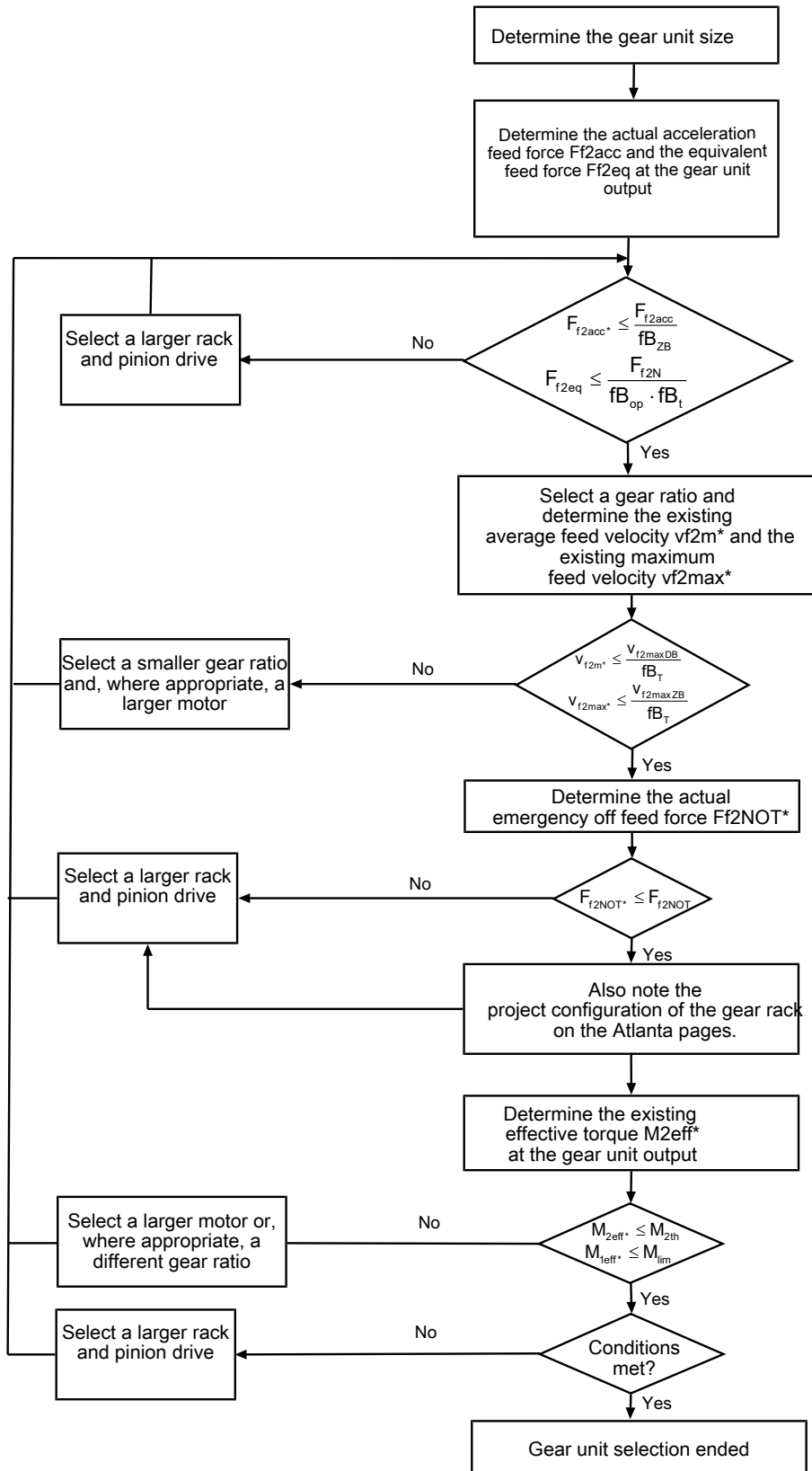
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 3.6.1 Drive selection

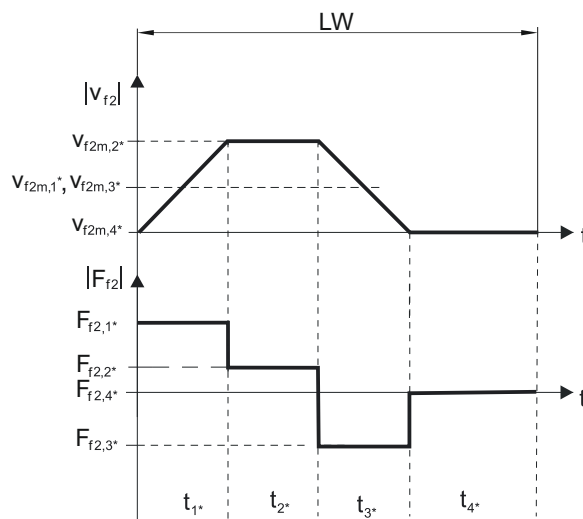


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

### Example of cyclic operation

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:



#### Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

#### Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

#### Calculation of the actual emergency off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

#### Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

#### Calculation of the thermal limit torque

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

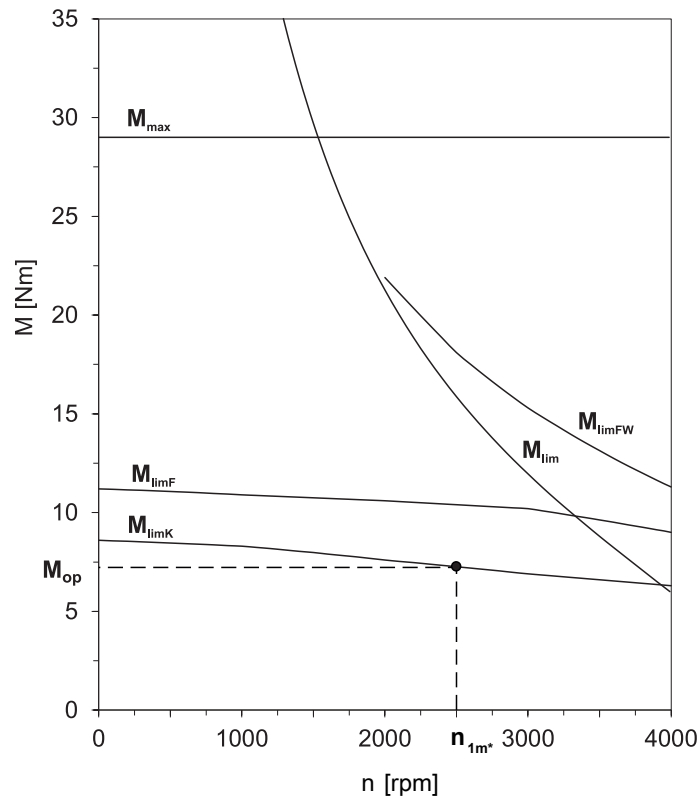
$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.





Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

### 3.6.2 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

## 3.7 Additional documentation

Additional documentation related to the product can be found at <http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

| Documentation  | ID        |
|--|-----------|
| Operating manual gear units, geared motors PHQ43 – PHQ83, PHQ94 – PHQ124 | 443353_de |
| Operating manual for EZ synchronous servo motors                         | 443032_en |
| Operating manual for gear racks (Atlanta)                                | 442455    |

## 4 ZTRSPHV rack and pinion drives

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## 4 Rack and pinion drives

# ZTRSPHV

### 4.1 Overview

High-performance precision planetary geared motors with supporting bearing holder

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★★ |
| Linear clearance  | ★★★★☆ |
| Price category  | €€€€€ |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★★ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 5 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Radial runout ≤ 10 μm (optional)                          | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                 |
|-------------|-----------------|
| $m_n$       | 5 – 8 mm        |
| $z$         | 15 – 20         |
| $F_{f2acc}$ | 17 – 77 kN      |
| $v_{f2N}$   | 0.14 – 0.49 m/s |
| $\Delta s$  | 15 – 56 μm      |

## 4.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 4.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{in}$ | S   | Type                       | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|----------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTRS5PHV9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 77</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.14   | 15                | 17                 | 0.2      | 3.1 | ZTRS520SPHV943_1210 EZ701U | 41                  | 154                 | 2178               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.14   | 25                | 30                 | 0.4      | 1.9 | ZTRS520SPHV943_1210 EZ702U | 77                  | 154                 | 4075               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.14   | 34                | 43                 | 0.5      | 1.4 | ZTRS520SPHV943_1210 EZ703U | 77                  | 154                 | 4075               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.14   | 44                | 62                 | 0.7      | 1.1 | ZTRS520SPHV943_1210 EZ705U | 77                  | 154                 | 4075               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.18   | 11                | 13                 | 0.3      | 4.1 | ZTRS520SPHV943_0910 EZ701U | 31                  | 154                 | 1638               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.18   | 19                | 22                 | 0.4      | 2.5 | ZTRS520SPHV943_0910 EZ702U | 63                  | 154                 | 3358               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.18   | 25                | 32                 | 0.6      | 1.9 | ZTRS520SPHV943_0910 EZ703U | 77                  | 154                 | 4075               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.18   | 33                | 47                 | 0.8      | 1.4 | ZTRS520SPHV943_0910 EZ705U | 77                  | 154                 | 4075               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.27   | 12                | 15                 | 0.5      | 3.8 | ZTRS520SPHV943_0610 EZ702U | 42                  | 154                 | 2251               | 61.00 | 0.23                   | 0.41                   | 46                 | 15                       | 357                 | 5             | 20 | 106.1         |
| 0.27   | 17                | 22                 | 0.7      | 2.8 | ZTRS520SPHV943_0610 EZ703U | 67                  | 154                 | 3569               | 61.00 | 0.23                   | 0.41                   | 46                 | 15                       | 357                 | 5             | 20 | 106.1         |
| 0.27   | 22                | 31                 | 1.0      | 2.1 | ZTRS520SPHV943_0610 EZ705U | 77                  | 154                 | 4075               | 61.00 | 0.23                   | 0.41                   | 46                 | 15                       | 357                 | 5             | 20 | 106.1         |
| <b>ZTRS5PHV9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 77</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.21   | 25                | 41                 | 0.4      | 1.7 | ZTRS520SPHV943_1210 EZ703U | 77                  | 154                 | 4075               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.21   | 34                | 62                 | 0.6      | 1.3 | ZTRS520SPHV943_1210 EZ705U | 77                  | 154                 | 4075               | 121.0 | 0.12                   | 0.21                   | 46                 | 15                       | 350                 | 5             | 20 | 106.1         |
| 0.28   | 19                | 31                 | 0.5      | 2.3 | ZTRS520SPHV943_0910 EZ703U | 77                  | 154                 | 4075               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.28   | 25                | 46                 | 0.7      | 1.7 | ZTRS520SPHV943_0910 EZ705U | 77                  | 154                 | 4075               | 91.00 | 0.15                   | 0.28                   | 46                 | 15                       | 355                 | 5             | 20 | 106.1         |
| 0.41   | 13                | 21                 | 0.6      | 3.4 | ZTRS520SPHV943_0610 EZ703U | 67                  | 154                 | 3569               | 61.00 | 0.23                   | 0.41                   | 46                 | 15                       | 357                 | 5             | 20 | 106.1         |
| 0.41   | 17                | 31                 | 0.8      | 2.5 | ZTRS520SPHV943_0610 EZ705U | 77                  | 154                 | 4075               | 61.00 | 0.23                   | 0.41                   | 46                 | 15                       | 357                 | 5             | 20 | 106.1         |
| <b>ZTRS6PHV9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.17   | 13                | 14                 | 0.2      | 3.1 | ZTRS620SPHV943_1210 EZ701U | 34                  | 141                 | 2178               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.17   | 21                | 25                 | 0.4      | 1.9 | ZTRS620SPHV943_1210 EZ702U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.17   | 28                | 36                 | 0.5      | 1.4 | ZTRS620SPHV943_1210 EZ703U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.17   | 36                | 52                 | 0.7      | 1.1 | ZTRS620SPHV943_1210 EZ705U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.22   | 9.5               | 11                 | 0.3      | 4.1 | ZTRS620SPHV943_0910 EZ701U | 26                  | 141                 | 1638               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.22   | 15                | 19                 | 0.4      | 2.5 | ZTRS620SPHV943_0910 EZ702U | 53                  | 141                 | 3358               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.22   | 21                | 27                 | 0.6      | 1.9 | ZTRS620SPHV943_0910 EZ703U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.22   | 27                | 39                 | 0.8      | 1.4 | ZTRS620SPHV943_0910 EZ705U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.33   | 10                | 12                 | 0.5      | 3.8 | ZTRS620SPHV943_0610 EZ702U | 35                  | 141                 | 2251               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 322                 | 6             | 20 | 127.3         |
| 0.33   | 14                | 18                 | 0.7      | 2.8 | ZTRS620SPHV943_0610 EZ703U | 56                  | 141                 | 3569               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 322                 | 6             | 20 | 127.3         |
| 0.33   | 18                | 26                 | 1.0      | 2.1 | ZTRS620SPHV943_0610 EZ705U | 67                  | 141                 | 4250               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 322                 | 6             | 20 | 127.3         |
| <b>ZTRS6PHV9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 67</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.25   | 21                | 34                 | 0.4      | 1.7 | ZTRS620SPHV943_1210 EZ703U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.25   | 28                | 51                 | 0.6      | 1.3 | ZTRS620SPHV943_1210 EZ705U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 314                 | 6             | 20 | 127.3         |
| 0.33   | 16                | 26                 | 0.5      | 2.3 | ZTRS620SPHV943_0910 EZ703U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.33   | 21                | 39                 | 0.7      | 1.7 | ZTRS620SPHV943_0910 EZ705U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 320                 | 6             | 20 | 127.3         |
| 0.49   | 10                | 17                 | 0.6      | 3.4 | ZTRS620SPHV943_0610 EZ703U | 56                  | 141                 | 3569               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 322                 | 6             | 20 | 127.3         |
| 0.49   | 14                | 26                 | 0.8      | 2.5 | ZTRS620SPHV943_0610 EZ705U | 67                  | 141                 | 4250               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 322                 | 6             | 20 | 127.3         |
| <b>ZTRS8PHV9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.17   | 13                | 14                 | 0.2      | 3.1 | ZTRS815SPHV943_1210 EZ701U | 34                  | 141                 | 2178               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 327                 | 8             | 15 | 127.3         |
| 0.17   | 21                | 25                 | 0.4      | 1.9 | ZTRS815SPHV943_1210 EZ702U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 327                 | 8             | 15 | 127.3         |
| 0.17   | 28                | 36                 | 0.5      | 1.4 | ZTRS815SPHV943_1210 EZ703U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 327                 | 8             | 15 | 127.3         |
| 0.17   | 36                | 52                 | 0.7      | 1.1 | ZTRS815SPHV943_1210 EZ705U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                 | 19                       | 327                 | 8             | 15 | 127.3         |
| 0.22   | 9.5               | 11                 | 0.3      | 4.1 | ZTRS815SPHV943_0910 EZ701U | 26                  | 141                 | 1638               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 334                 | 8             | 15 | 127.3         |
| 0.22   | 15                | 19                 | 0.4      | 2.5 | ZTRS815SPHV943_0910 EZ702U | 53                  | 141                 | 3358               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 334                 | 8             | 15 | 127.3         |
| 0.22   | 21                | 27                 | 0.6      | 1.9 | ZTRS815SPHV943_0910 EZ703U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 334                 | 8             | 15 | 127.3         |
| 0.22   | 27                | 39                 | 0.8      | 1.4 | ZTRS815SPHV943_0910 EZ705U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                 | 19                       | 334                 | 8             | 15 | 127.3         |
| 0.33   | 10                | 12                 | 0.5      | 3.8 | ZTRS815SPHV943_0610 EZ702U | 35                  | 141                 | 2251               | 61.00 | 0.27                   | 0.49                   | 56                 | 19                       | 336                 | 8             | 15 | 127.3         |

4.2 Selection tables 4 ZTRSPHV rack and pinion drives

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                       | $F_{fzacc}$<br>[kN] | $F_{fzNOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[ $\mu$ m] | $\Delta s_{red}$<br>[ $\mu$ m] | $C_{lin}$<br>[N/ $\mu$ m] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|----------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------------|--------------------------------|---------------------------|---------------|----|---------------|
| <b>ZTRS8PHV9 (<math>n_{1,th} = 3000</math> rpm, (<math>F_{fzacc,max} = 67</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                          |                                |                           |               |    |               |
| 0.33   | 14                | 18                 | 0.7      | 2.8 | ZTRS815SPHV943_0610 EZ703U | 56                  | 141                 | 3569               | 61.00 | 0.27                   | 0.49                   | 56                       | 19                             | 336                       | 8             | 15 | 127.3         |
| 0.33   | 18                | 26                 | 1.0      | 2.1 | ZTRS815SPHV943_0610 EZ705U | 67                  | 141                 | 4250               | 61.00 | 0.27                   | 0.49                   | 56                       | 19                             | 336                       | 8             | 15 | 127.3         |
| <b>ZTRS8PHV9 (<math>n_{1,th} = 4500</math> rpm, (<math>F_{fzacc,max} = 67</math> kN)</b> |                   |                    |          |     |                            |                     |                     |                    |       |                        |                        |                          |                                |                           |               |    |               |
| 0.25   | 21                | 34                 | 0.4      | 1.7 | ZTRS815SPHV943_1210 EZ703U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                       | 19                             | 327                       | 8             | 15 | 127.3         |
| 0.25   | 28                | 51                 | 0.6      | 1.3 | ZTRS815SPHV943_1210 EZ705U | 67                  | 141                 | 4250               | 121.0 | 0.14                   | 0.25                   | 56                       | 19                             | 327                       | 8             | 15 | 127.3         |
| 0.33   | 16                | 26                 | 0.5      | 2.3 | ZTRS815SPHV943_0910 EZ703U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                       | 19                             | 334                       | 8             | 15 | 127.3         |
| 0.33   | 21                | 39                 | 0.7      | 1.7 | ZTRS815SPHV943_0910 EZ705U | 67                  | 141                 | 4250               | 91.00 | 0.18                   | 0.33                   | 56                       | 19                             | 334                       | 8             | 15 | 127.3         |
| 0.49   | 10                | 17                 | 0.6      | 3.4 | ZTRS815SPHV943_0610 EZ703U | 56                  | 141                 | 3569               | 61.00 | 0.27                   | 0.49                   | 56                       | 19                             | 336                       | 8             | 15 | 127.3         |
| 0.49   | 14                | 26                 | 0.8      | 2.5 | ZTRS815SPHV943_0610 EZ705U | 67                  | 141                 | 4250               | 61.00 | 0.27                   | 0.49                   | 56                       | 19                             | 336                       | 8             | 15 | 127.3         |



### 4.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

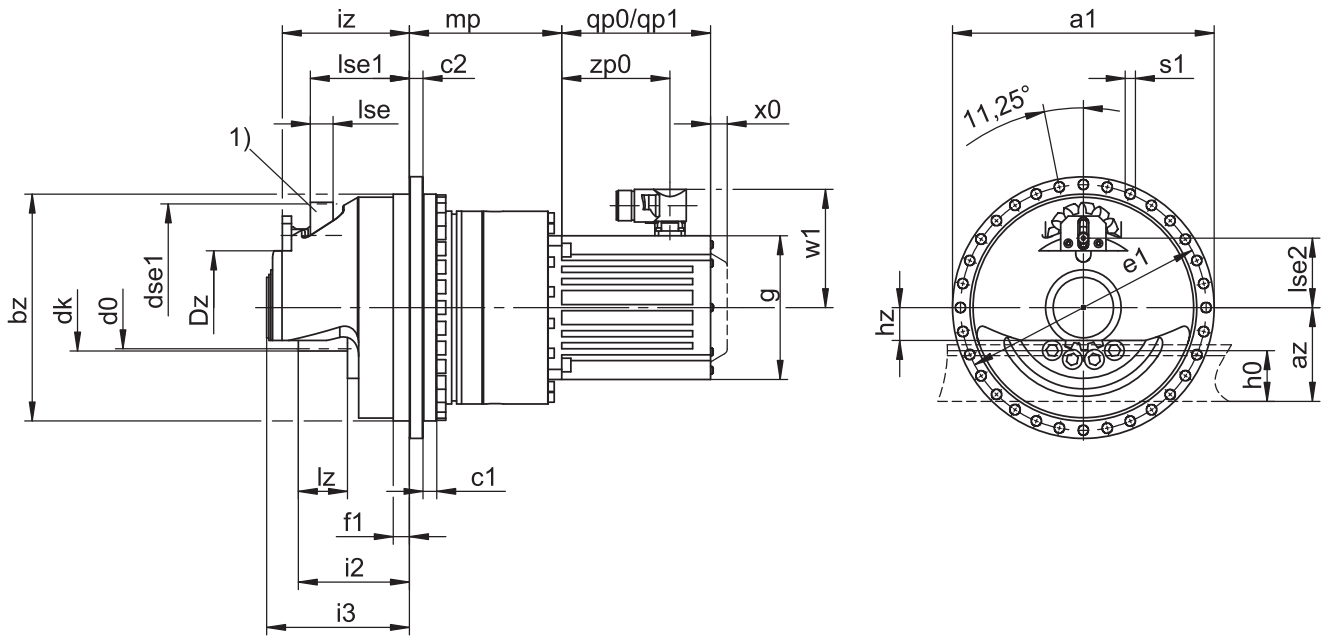
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4]

1) Felt gear for lubrication (option)

#### Dimensions of gear units

| Type          | mn | Øa1 | az     | Øbz               | c1 | c2 | Ød0    | Ødk   | Ødse1 | ØDz | Øe1 | f1   | i2  | i3    | iz    | h0 | hz   | lz | lse | lse1  | lse2  | Øs1  | x   |
|---------------|----|-----|--------|-------------------|----|----|--------|-------|-------|-----|-----|------|-----|-------|-------|----|------|----|-----|-------|-------|------|-----|
| ZTRS520SPHV9_ | 5  | 346 | 87.05  | 300 <sub>h7</sub> | 18 | 18 | 106.10 | 116.1 | 78.6  | 100 | 325 | 21.5 | 137 | 179.0 | 171.0 | 34 | 45.0 | 55 | 30  | 131.1 | 87.1  | 13.5 | 0.0 |
| ZTRS620SPHV9_ | 6  | 346 | 106.66 | 300 <sub>h7</sub> | 18 | 18 | 127.32 | 139.3 | 94.2  | 100 | 325 | 21.5 | 147 | 189.0 | 181.0 | 43 | 43.5 | 65 | 30  | 131.1 | 104.8 | 13.5 | 0.0 |
| ZTRS815SPHV9_ | 8  | 346 | 136.66 | 300 <sub>h7</sub> | 18 | 18 | 127.32 | 147.3 | 160.0 | 110 | 325 | 21.5 | 162 | 204.7 | 196.5 | 71 | 55.0 | 80 | 65  | 162.0 | 137.7 | 13.5 | 0.3 |

#### Dimensions of motors

| Type   | □g  | qp0 | qp1 | w1  | x0 | zp0 |
|--------|-----|-----|-----|-----|----|-----|
| EZ701U | 145 | 102 | 161 | 115 | 22 | 64  |
| EZ702U | 145 | 127 | 186 | 115 | 22 | 89  |
| EZ703U | 145 | 152 | 211 | 115 | 22 | 114 |
| EZ705U | 145 | 207 | 266 | 134 | 22 | 165 |

#### Dimensions of geared motors

| Type         | EZ7       |
|--------------|-----------|
| ZTRS_PHV943_ | mp<br>192 |



## 4.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |     |   |    |   |     |   |   |   |   |   |   |   |      |       |
|---|-----|---|----|---|-----|---|---|---|---|---|---|---|------|-------|
| Z | TRS | 6 | 20 | S | PHV | 9 | 4 | 3 | S | F | S | S | 0910 | EZ703 |
|   |     |   |    |   |     |   |   |   |   |   |   |   |      | U     |

### Explanation

| Code   | Designation                          | Design   |
|--------|--------------------------------------|--|
| Z      | Type                                 | Rack and pinion drive  |
| TRS    | Design                               | Screwed flange pinion with supporting bearing holder           |
| 6      | Module                               | $m_n = 6$ (example)  |
| 20     | Number of teeth                      | $z = 20$ (example)   |
| S      | Toothing                             | Helical (left-hand 19° 31' 42")                                |
| SF     |                                      | Helical (left-hand 19° 31' 42") with felt gear for lubrication |
| PHV    | Type                                 | Planetary gear unit  |
| 9      | Size                                 | 9 (example)  |
| 4      | Generation                           | Generation 4   |
| 3      | Stages                               | Three-stage  |
| S      | Housing                              | Standard   |
| F      | Shaft                                | Flange shaft   |
| S      | Bearing                              | Standard bearing   |
| V      |                                      | Reinforced bearing (PH3 – PH5)                                 |
| S      | Backlash                             | Standard   |
| R      |                                      | Reduced (PHV9)   |
| 0910   | Transmission ratio ( $i \times 10$ ) | $i = 91$ (example)   |
| EZ703U | Motor                                | EZ synchronous servo motor                                     |

### To complete the type designation, also specify the following in your order:

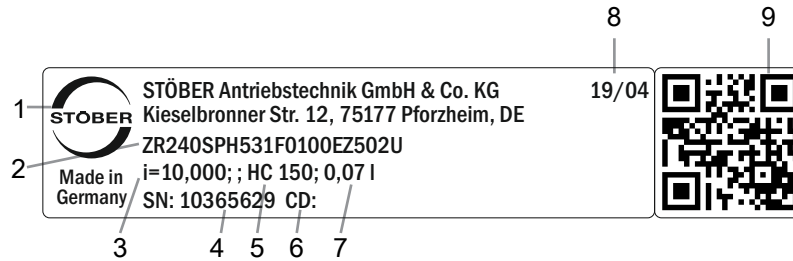
- A detailed type designation of the motor, see chapter [▶ 13](#)
- Position of the plug connectors, see chapter [▶ 4.5.5](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [▶ 4.6.2](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [▶ 4.5.1](#).

### 4.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

#### 4.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 4.5 Product description

### 4.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

Motor adapter



Catalog ID 443137\_en

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 4.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 4.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 4.5.4 Lubricants

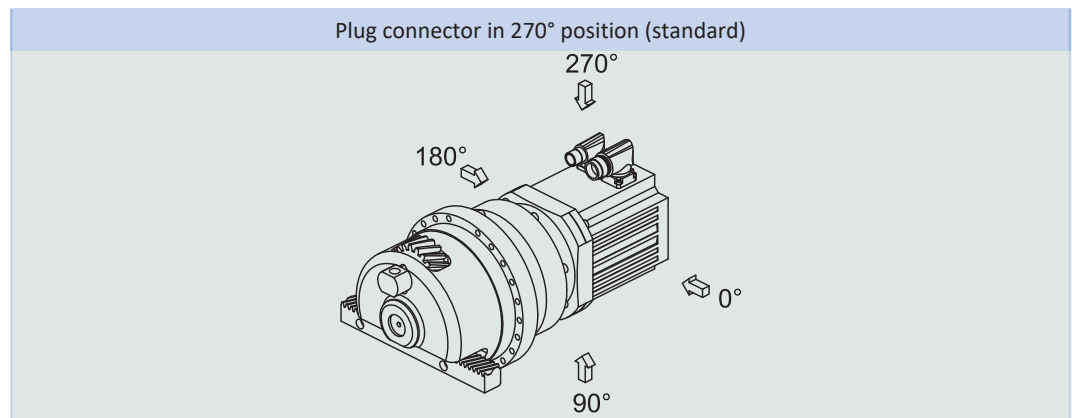
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 4.5.4.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 4.5.5 Position of the plug connectors



The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

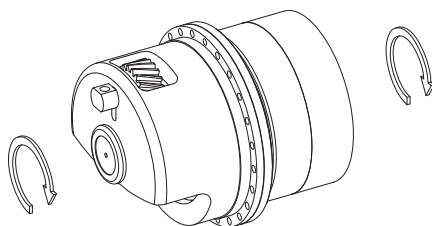
Note that the plug connectors also rotate when the gear rack is rotated to a different position.

## 4.5.6 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 90 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 4.5.7 Direction of rotation

The input and output rotate in the same direction.



## 4.6 Project configuration

Project your drives using our SERVSoft designing software. Download SERVSoft for free at <https://www.stoeber.de/en/ServoSoft>.

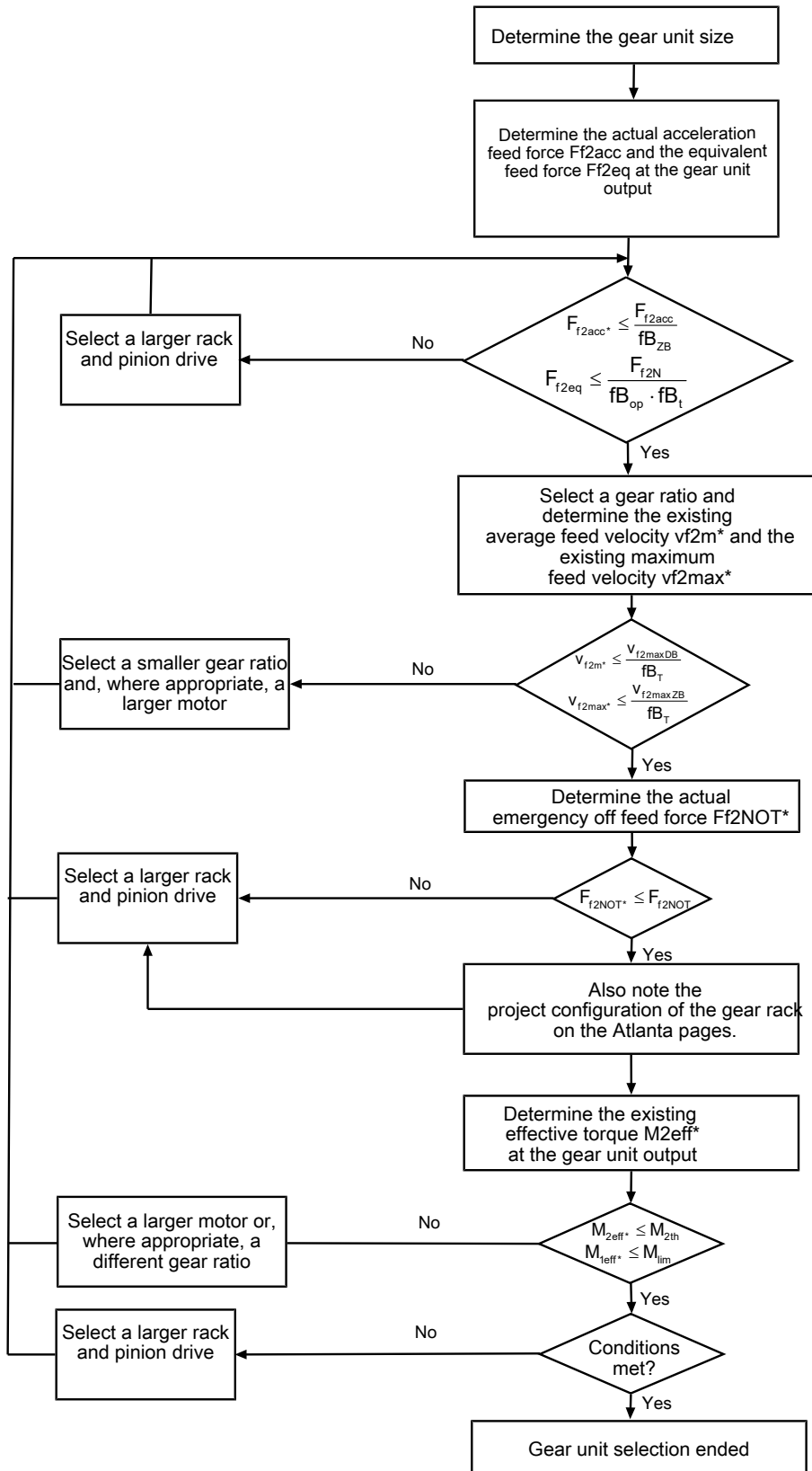
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 4.6.1 Drive selection

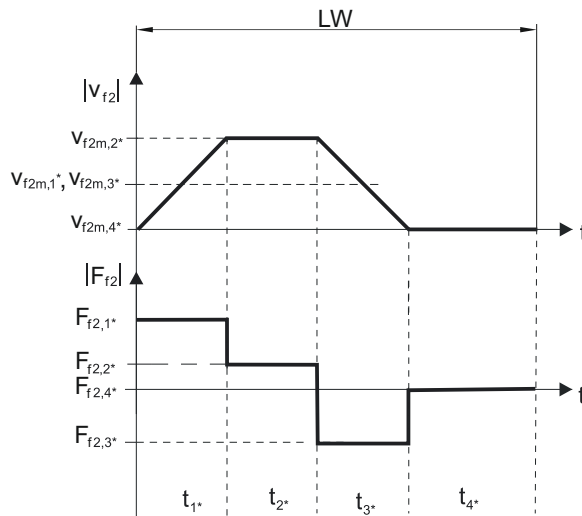


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:



**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

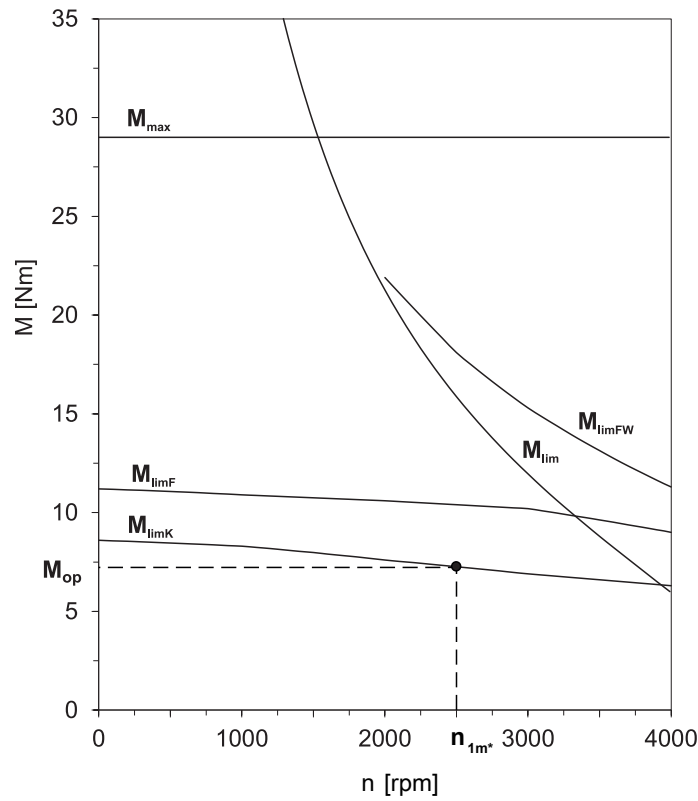
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



**Calculation of the actual effective torque**

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

**Operating factors**

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 4.6.2 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

## 4.7 Additional documentation

Additional documentation related to the product can be found at <http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

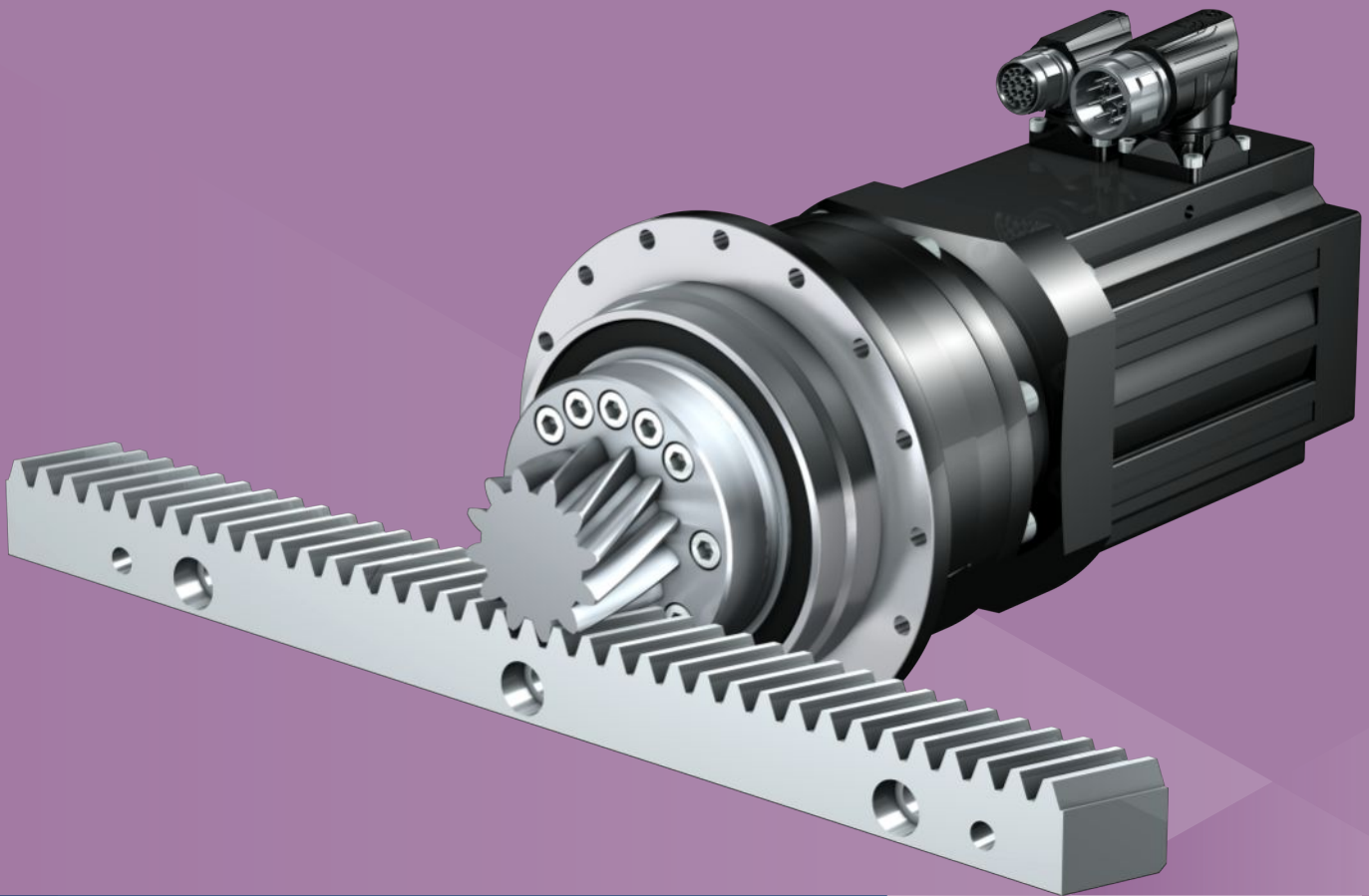
| Documentation   | ID        |
|---|-----------|
| Operating manual gear units, geared motors PHV94 – PHV104 | 443355_en |
| Operating manual for EZ synchronous servo motors          | 443032_en |
| Operating manual for gear racks (Atlanta)                 | 442455    |



# 5 ZTRPH rack and pinion drives

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## 5 Rack and pinion drives

# ZTRPH

### 5.1 Overview

High-performance precision planetary geared motors with screwed flange pinion

#### Features

|   |              |
|---|--------------|
| Power density   | ★★★★☆        |
| Linear clearance  | ★★★★★        |
| Price category  | €€€€         |
| Smooth operation  | ★★★★☆        |
| Linear rigidity   | ★★★★☆        |
| Mass moment of inertia                                    | ★★★★☆        |
| Ready-to-install drive solution                           | ✓            |
| Pinion gearing quality 5 (DIN 3962)                       | ✓            |
| Helical gearing   | ✓            |
| Case-hardened and smoothed                                | ✓            |
| Radial runout ≤ 10 µm (optional)                          | ✓            |
| Reinforced output bearing (PH3 – PH5)                     | ✓ (optional) |
| Compact and highly dynamic due to direct motor attachment | ✓            |

Key ★☆☆☆☆ good | ★★★★★ excellent  
 € Economy | €€€€€ Premium

#### Technical data

|             |              |
|-------------|--------------|
| $m_n$       | 2 – 6 mm     |
| $z$         | 12 – 32      |
| $F_{f2acc}$ | 1.9 – 67 kN  |
| $v_{f2N}$   | 0.11 – 4 m/s |
| $\Delta s$  | 4 – 44 µm    |

## 5.2 Selection table

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 5.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For rack and pinion drives with reduced backlash or reinforced bearings (PH3 – PH5), higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR2PH4 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.11   | 2.5               | 2.6                | 0.7      | 1.1 | ZTR216SPH432_0500 EZ301U | 6.7                 | 9.2                 | 114                | 50.00 | 0.16                   | 0.28                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.11   | 2.4               | 2.4                | 0.9      | 1.1 | ZTR212SPH432_0350 EZ301U | 6.7                 | 11                  | 85                 | 35.00 | 0.17                   | 0.31                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.13   | 2.0               | 2.1                | 0.8      | 1.3 | ZTR216SPH432_0400 EZ301U | 6.1                 | 9.2                 | 104                | 40.00 | 0.20                   | 0.36                   | 15                 | 5                        | 89                  | 2             | 16 | 34.0          |
| 0.14   | 1.9               | 1.9                | 1.1      | 1.3 | ZTR212SPH432_0280 EZ301U | 5.7                 | 11                  | 73                 | 28.00 | 0.21                   | 0.38                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.15   | 1.8               | 1.8                | 0.9      | 1.4 | ZTR216SPH432_0350 EZ301U | 5.4                 | 9.2                 | 91                 | 35.00 | 0.23                   | 0.41                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.16   | 1.7               | 1.7                | 1.1      | 1.4 | ZTR212SPH432_0250 EZ301U | 5.1                 | 11                  | 65                 | 25.00 | 0.24                   | 0.43                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.19   | 1.4               | 1.5                | 1.1      | 1.7 | ZTR216SPH432_0280 EZ301U | 4.3                 | 9.2                 | 73                 | 28.00 | 0.29                   | 0.51                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.20   | 1.4               | 1.4                | 1.3      | 1.6 | ZTR212SPH432_0200 EZ301U | 4.1                 | 11                  | 52                 | 20.00 | 0.27                   | 0.53                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.21   | 1.3               | 1.3                | 1.1      | 1.8 | ZTR216SPH432_0250 EZ301U | 3.8                 | 9.2                 | 65                 | 25.00 | 0.32                   | 0.57                   | 15                 | 5                        | 91                  | 2             | 16 | 34.0          |
| 0.21   | 2.2               | 2.3                | 1.9      | 1.1 | ZTR216SPH432_0250 EZ302U | 6.7                 | 9.2                 | 114                | 25.00 | 0.32                   | 0.57                   | 15                 | 5                        | 91                  | 2             | 16 | 34.0          |
| 0.25   | 1.1               | 1.1                | 1.5      | 1.8 | ZTR212SPH432_0160 EZ301U | 3.3                 | 11                  | 42                 | 16.00 | 0.33                   | 0.67                   | 11                 | 4                        | 96                  | 2             | 12 | 25.5          |
| 0.25   | 1.9               | 2.0                | 2.6      | 1.1 | ZTR212SPH432_0160 EZ302U | 5.8                 | 11                  | 74                 | 16.00 | 0.33                   | 0.67                   | 11                 | 4                        | 96                  | 2             | 12 | 25.5          |
| 0.27   | 1.0               | 1.0                | 1.3      | 2.1 | ZTR216SPH432_0200 EZ301U | 3.1                 | 9.2                 | 52                 | 20.00 | 0.36                   | 0.71                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.27   | 1.7               | 1.8                | 2.2      | 1.2 | ZTR216SPH432_0200 EZ302U | 5.5                 | 9.2                 | 93                 | 20.00 | 0.36                   | 0.71                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.33   | 0.8               | 0.8                | 1.5      | 2.4 | ZTR216SPH432_0160 EZ301U | 2.5                 | 9.2                 | 42                 | 16.00 | 0.44                   | 0.89                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.33   | 1.4               | 1.5                | 2.6      | 1.4 | ZTR216SPH432_0160 EZ302U | 4.4                 | 9.2                 | 74                 | 16.00 | 0.44                   | 0.89                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.33   | 1.8               | 1.9                | 3.4      | 1.1 | ZTR216SPH432_0160 EZ303U | 6.1                 | 9.2                 | 104                | 16.00 | 0.44                   | 0.89                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.53   | 1.6               | 1.7                | 2.4      | 1.1 | ZTR216SPH431_0100 EZ401U | 4.8                 | 9.2                 | 82                 | 10.00 | 0.62                   | 1.24                   | 15                 | 5                        | 81                  | 2             | 16 | 34.0          |
| 0.57   | 1.5               | 1.6                | 3.0      | 1.0 | ZTR212SPH431_0070 EZ401U | 4.5                 | 11                  | 57                 | 7.000 | 0.61                   | 1.14                   | 11                 | 4                        | 96                  | 2             | 12 | 25.5          |
| 0.80   | 1.1               | 1.1                | 4.5      | 1.3 | ZTR212SPH431_0050 EZ401U | 3.2                 | 11                  | 41                 | 5.000 | 0.80                   | 1.60                   | 11                 | 4                        | 99                  | 2             | 12 | 25.5          |
| 1.00   | 0.8               | 0.9                | 5.9      | 1.5 | ZTR212SPH431_0040 EZ401U | 2.6                 | 11                  | 33                 | 4.000 | 0.87                   | 1.67                   | 11                 | 4                        | 99                  | 2             | 12 | 25.5          |
| 1.07   | 0.8               | 0.8                | 4.5      | 1.7 | ZTR216SPH431_0050 EZ401U | 2.4                 | 9.2                 | 41                 | 5.000 | 1.07                   | 2.13                   | 15                 | 5                        | 93                  | 2             | 16 | 34.0          |
| 1.07   | 1.2               | 1.3                | 6.9      | 1.1 | ZTR216SPH431_0050 EZ501U | 4.5                 | 9.2                 | 77                 | 5.000 | 1.07                   | 2.13                   | 15                 | 5                        | 93                  | 2             | 16 | 34.0          |
| 1.07   | 1.3               | 1.5                | 7.5      | 1.0 | ZTR216SPH431_0050 EZ402U | 4.5                 | 9.2                 | 77                 | 5.000 | 1.07                   | 2.13                   | 15                 | 5                        | 93                  | 2             | 16 | 34.0          |
| 1.33   | 0.6               | 0.7                | 5.9      | 2.0 | ZTR216SPH431_0040 EZ401U | 1.9                 | 9.2                 | 33                 | 4.000 | 1.16                   | 2.22                   | 15                 | 5                        | 95                  | 2             | 16 | 34.0          |
| 1.33   | 1.0               | 1.1                | 9.0      | 1.3 | ZTR216SPH431_0040 EZ501U | 3.6                 | 9.2                 | 61                 | 4.000 | 1.16                   | 2.22                   | 15                 | 5                        | 95                  | 2             | 16 | 34.0          |
| 1.33   | 1.1               | 1.2                | 9.8      | 1.2 | ZTR216SPH431_0040 EZ402U | 3.6                 | 9.2                 | 61                 | 4.000 | 1.16                   | 2.22                   | 15                 | 5                        | 95                  | 2             | 16 | 34.0          |
| <b>ZTR2PH4 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,1</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.27   | 2.0               | 2.1                | 1.0      | 1.1 | ZTR216SPH432_0400 EZ301U | 6.1                 | 9.2                 | 104                | 40.00 | 0.20                   | 0.36                   | 15                 | 5                        | 89                  | 2             | 16 | 34.0          |
| 0.29   | 1.8               | 1.9                | 1.2      | 1.0 | ZTR212SPH432_0280 EZ301U | 5.7                 | 11                  | 73                 | 28.00 | 0.21                   | 0.38                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.31   | 1.7               | 1.8                | 1.0      | 1.2 | ZTR216SPH432_0350 EZ301U | 5.4                 | 9.2                 | 91                 | 35.00 | 0.23                   | 0.41                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.32   | 1.6               | 1.7                | 1.2      | 1.1 | ZTR212SPH432_0250 EZ301U | 5.1                 | 11                  | 65                 | 25.00 | 0.24                   | 0.43                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.38   | 1.4               | 1.5                | 1.2      | 1.4 | ZTR216SPH432_0280 EZ301U | 4.3                 | 9.2                 | 73                 | 28.00 | 0.29                   | 0.51                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.40   | 1.3               | 1.4                | 1.4      | 1.3 | ZTR212SPH432_0200 EZ301U | 4.1                 | 11                  | 52                 | 20.00 | 0.27                   | 0.53                   | 11                 | 4                        | 97                  | 2             | 12 | 25.5          |
| 0.43   | 1.2               | 1.3                | 1.2      | 1.5 | ZTR216SPH432_0250 EZ301U | 3.8                 | 9.2                 | 65                 | 25.00 | 0.32                   | 0.57                   | 15                 | 5                        | 91                  | 2             | 16 | 34.0          |
| 0.50   | 1.0               | 1.1                | 1.7      | 1.5 | ZTR212SPH432_0160 EZ301U | 3.3                 | 11                  | 42                 | 16.00 | 0.33                   | 0.67                   | 11                 | 4                        | 96                  | 2             | 12 | 25.5          |
| 0.53   | 1.0               | 1.0                | 1.4      | 1.7 | ZTR216SPH432_0200 EZ301U | 3.1                 | 9.2                 | 52                 | 20.00 | 0.36                   | 0.71                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.53   | 1.6               | 1.8                | 2.3      | 1.0 | ZTR216SPH432_0200 EZ302U | 5.5                 | 9.2                 | 93                 | 20.00 | 0.36                   | 0.71                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.67   | 0.8               | 0.8                | 1.7      | 2.0 | ZTR216SPH432_0160 EZ301U | 2.5                 | 9.2                 | 42                 | 16.00 | 0.44                   | 0.89                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 0.67   | 1.3               | 1.5                | 2.8      | 1.2 | ZTR216SPH432_0160 EZ302U | 4.4                 | 9.2                 | 74                 | 16.00 | 0.44                   | 0.89                   | 15                 | 5                        | 90                  | 2             | 16 | 34.0          |
| 1.07   | 1.3               | 1.6                | 2.5      | 1.0 | ZTR216SPH431_0100 EZ401U | 4.8                 | 9.2                 | 82                 | 10.00 | 0.62                   | 1.24                   | 15                 | 5                        | 81                  | 2             | 16 | 34.0          |
| 1.52   | 0.9               | 1.1                | 3.1      | 1.3 | ZTR216SPH431_0070 EZ401U | 3.4                 | 9.2                 | 57                 | 7.000 | 0.81                   | 1.52                   | 15                 | 5                        | 89                  | 2             | 16 | 34.0          |
| 1.60   | 0.9               | 1.1                | 4.6      | 1.2 | ZTR212SPH431_0050 EZ401U | 3.2                 | 11                  | 41                 | 5.000 | 0.80                   | 1.60                   | 11                 | 4                        | 99                  | 2             | 12 | 25.5          |
| 2.13   | 1.0               | 1.2                | 6.9      | 1.1 | ZTR216SPH431_0050 EZ501U | 4.5                 | 9.2                 | 77                 | 5.000 | 1.07                   | 2.13                   | 15                 | 5                        | 93                  | 2             | 16 | 34.0          |
| 2.13   | 1.0               | 1.4                | 7.1      | 1.1 | ZTR216SPH431_0050 EZ402U | 4.5                 | 9.2                 | 77                 | 5.000 | 1.07                   | 2.13                   | 15                 | 5                        | 93                  | 2             | 16 | 34.0          |

5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{f2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR2PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.22   | 3.7               | 4.0                | 1.2      | 1.0 | ZTR223SPH532_0350 EZ401U | 11                  | 14                  | 259                 | 35.00 | 0.29                   | 0.58                   | 21                 | 7                        | 89                  | 2             | 23 | 48.8          |
| 0.25   | 3.2               | 3.5                | 1.4      | 1.0 | ZTR219SPH532_0250 EZ401U | 9.8                 | 15                  | 198                 | 25.00 | 0.31                   | 0.63                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.27   | 3.0               | 3.2                | 1.4      | 1.2 | ZTR223SPH532_0280 EZ401U | 9.1                 | 14                  | 221                 | 28.00 | 0.37                   | 0.73                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 0.31   | 2.7               | 2.9                | 1.4      | 1.3 | ZTR223SPH532_0250 EZ401U | 8.1                 | 14                  | 198                 | 25.00 | 0.38                   | 0.77                   | 21                 | 7                        | 90                  | 2             | 23 | 48.8          |
| 0.32   | 2.6               | 2.8                | 1.6      | 1.2 | ZTR219SPH532_0200 EZ401U | 7.8                 | 15                  | 158                 | 20.00 | 0.37                   | 0.74                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.40   | 2.1               | 2.2                | 2.0      | 1.4 | ZTR219SPH532_0160 EZ401U | 6.3                 | 15                  | 126                 | 16.00 | 0.46                   | 0.92                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.48   | 2.6               | 2.9                | 3.0      | 1.1 | ZTR223SPH532_0160 EZ501U | 9.8                 | 14                  | 238                 | 16.00 | 0.56                   | 1.12                   | 21                 | 7                        | 89                  | 2             | 23 | 48.8          |
| 0.48   | 2.9               | 3.2                | 3.3      | 1.0 | ZTR223SPH532_0160 EZ402U | 9.8                 | 14                  | 238                 | 16.00 | 0.56                   | 1.12                   | 21                 | 7                        | 89                  | 2             | 23 | 48.8          |
| 0.63   | 2.0               | 2.2                | 1.7      | 1.2 | ZTR219SPH531_0100 EZ501U | 7.6                 | 15                  | 154                 | 10.00 | 0.70                   | 1.37                   | 18                 | 6                        | 87                  | 2             | 19 | 40.3          |
| 0.91   | 1.4               | 1.6                | 2.1      | 1.5 | ZTR219SPH531_0070 EZ501U | 5.3                 | 15                  | 108                 | 7.000 | 0.91                   | 1.81                   | 18                 | 6                        | 92                  | 2             | 19 | 40.3          |
| 1.10   | 2.0               | 2.2                | 3.6      | 1.1 | ZTR223SPH531_0070 EZ502U | 8.5                 | 14                  | 208                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 1.10   | 2.0               | 2.3                | 3.6      | 1.1 | ZTR223SPH531_0070 EZ701U | 5.5                 | 14                  | 134                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 1.27   | 1.0               | 1.1                | 3.1      | 1.9 | ZTR219SPH531_0050 EZ501U | 3.8                 | 15                  | 77                  | 5.000 | 1.06                   | 2.32                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.27   | 1.8               | 1.9                | 5.3      | 1.1 | ZTR219SPH531_0050 EZ502U | 7.4                 | 15                  | 149                 | 5.000 | 1.06                   | 2.32                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.27   | 1.8               | 2.0                | 5.3      | 1.1 | ZTR219SPH531_0050 EZ701U | 4.8                 | 15                  | 96                  | 5.000 | 1.06                   | 2.32                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.53   | 0.8               | 0.9                | 3.1      | 2.3 | ZTR223SPH531_0050 EZ501U | 3.1                 | 14                  | 77                  | 5.000 | 1.28                   | 2.81                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.53   | 1.5               | 1.6                | 5.3      | 1.4 | ZTR223SPH531_0050 EZ502U | 6.1                 | 14                  | 149                 | 5.000 | 1.28                   | 2.81                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.53   | 1.5               | 1.6                | 5.3      | 1.4 | ZTR223SPH531_0050 EZ701U | 3.9                 | 14                  | 96                  | 5.000 | 1.28                   | 2.81                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.53   | 1.9               | 2.2                | 7.0      | 1.0 | ZTR223SPH531_0050 EZ503U | 8.5                 | 14                  | 206                 | 5.000 | 1.28                   | 2.81                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.58   | 0.8               | 0.9                | 4.1      | 2.2 | ZTR219SPH531_0040 EZ501U | 3.0                 | 15                  | 61                  | 4.000 | 1.16                   | 2.64                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.58   | 1.4               | 1.5                | 7.0      | 1.3 | ZTR219SPH531_0040 EZ502U | 5.9                 | 15                  | 119                 | 4.000 | 1.16                   | 2.64                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.58   | 1.4               | 1.6                | 7.0      | 1.3 | ZTR219SPH531_0040 EZ701U | 3.8                 | 15                  | 77                  | 4.000 | 1.16                   | 2.64                   | 18                 | 6                        | 95                  | 2             | 19 | 40.3          |
| 1.92   | 0.7               | 0.7                | 4.1      | 2.7 | ZTR223SPH531_0040 EZ501U | 2.5                 | 14                  | 61                  | 4.000 | 1.41                   | 3.19                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.92   | 1.2               | 1.3                | 7.0      | 1.6 | ZTR223SPH531_0040 EZ502U | 4.9                 | 14                  | 119                 | 4.000 | 1.41                   | 3.19                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.92   | 1.2               | 1.3                | 7.0      | 1.6 | ZTR223SPH531_0040 EZ701U | 3.1                 | 14                  | 77                  | 4.000 | 1.41                   | 3.19                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| 1.92   | 1.5               | 1.7                | 9.1      | 1.2 | ZTR223SPH531_0040 EZ503U | 6.8                 | 14                  | 165                 | 4.000 | 1.41                   | 3.19                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| <b>ZTR2PH5 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 2.88   | 1.5               | 2.4                | 10       | 1.1 | ZTR223SPH531_0040 EZ505U | 11                  | 14                  | 257                 | 4.000 | 1.41                   | 3.19                   | 21                 | 7                        | 92                  | 2             | 23 | 48.8          |
| <b>ZTR2PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.51   | 2.7               | 3.2                | 1.4      | 1.0 | ZTR219SPH532_0250 EZ401U | 9.8                 | 15                  | 198                 | 25.00 | 0.31                   | 0.63                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.55   | 2.5               | 3.0                | 1.4      | 1.1 | ZTR223SPH532_0280 EZ401U | 9.1                 | 14                  | 221                 | 28.00 | 0.37                   | 0.73                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 0.61   | 2.2               | 2.7                | 1.4      | 1.2 | ZTR223SPH532_0250 EZ401U | 8.1                 | 14                  | 198                 | 25.00 | 0.38                   | 0.77                   | 21                 | 7                        | 90                  | 2             | 23 | 48.8          |
| 0.63   | 2.1               | 2.6                | 1.6      | 1.2 | ZTR219SPH532_0200 EZ401U | 7.8                 | 15                  | 158                 | 20.00 | 0.37                   | 0.74                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.79   | 1.7               | 2.1                | 1.9      | 1.4 | ZTR219SPH532_0160 EZ401U | 6.3                 | 15                  | 126                 | 16.00 | 0.46                   | 0.92                   | 18                 | 6                        | 93                  | 2             | 19 | 40.3          |
| 0.96   | 2.1               | 2.7                | 2.8      | 1.1 | ZTR223SPH532_0160 EZ501U | 9.8                 | 14                  | 238                 | 16.00 | 0.56                   | 1.12                   | 21                 | 7                        | 89                  | 2             | 23 | 48.8          |
| 0.96   | 2.1               | 3.0                | 2.9      | 1.1 | ZTR223SPH532_0160 EZ402U | 9.8                 | 14                  | 238                 | 16.00 | 0.56                   | 1.12                   | 21                 | 7                        | 89                  | 2             | 23 | 48.8          |
| 1.27   | 1.6               | 2.1                | 1.7      | 1.2 | ZTR219SPH531_0100 EZ501U | 7.6                 | 15                  | 154                 | 10.00 | 0.70                   | 1.37                   | 18                 | 6                        | 87                  | 2             | 19 | 40.3          |
| 1.81   | 1.1               | 1.5                | 2.1      | 1.5 | ZTR219SPH531_0070 EZ501U | 5.3                 | 15                  | 108                 | 7.000 | 0.91                   | 1.81                   | 18                 | 6                        | 92                  | 2             | 19 | 40.3          |
| 1.81   | 1.7               | 2.6                | 3.2      | 1.0 | ZTR219SPH531_0070 EZ502U | 10                  | 15                  | 208                 | 7.000 | 0.91                   | 1.81                   | 18                 | 6                        | 92                  | 2             | 19 | 40.3          |
| 1.81   | 1.7               | 2.6                | 3.2      | 1.0 | ZTR219SPH531_0070 EZ701U | 6.7                 | 15                  | 134                 | 7.000 | 0.91                   | 1.81                   | 18                 | 6                        | 92                  | 2             | 19 | 40.3          |
| 2.19   | 0.9               | 1.2                | 2.1      | 1.9 | ZTR223SPH531_0070 EZ501U | 4.4                 | 14                  | 108                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 2.19   | 1.4               | 2.1                | 3.2      | 1.2 | ZTR223SPH531_0070 EZ502U | 8.5                 | 14                  | 208                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 2.19   | 1.4               | 2.2                | 3.2      | 1.2 | ZTR223SPH531_0070 EZ701U | 5.5                 | 14                  | 134                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| 2.19   | 1.7               | 2.9                | 3.8      | 1.0 | ZTR223SPH531_0070 EZ503U | 11                  | 14                  | 259                 | 7.000 | 1.10                   | 2.19                   | 21                 | 7                        | 88                  | 2             | 23 | 48.8          |
| <b>ZTR3PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 9,9</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.25   | 3.3               | 3.5                | 1.4      | 1.0 | ZTR314SPH532_0280 EZ401U | 9.9                 | 14                  | 221                 | 28.00 | 0.33                   | 0.67                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |
| 0.28   | 2.9               | 3.1                | 1.4      | 1.1 | ZTR314SPH532_0250 EZ401U | 8.9                 | 14                  | 198                 | 25.00 | 0.35                   | 0.70                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 0.35   | 2.3               | 2.5                | 1.6      | 1.3 | ZTR314SPH532_0200 EZ401U | 7.1                 | 14                  | 158                 | 20.00 | 0.41                   | 0.82                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 0.44   | 1.9               | 2.0                | 2.0      | 1.5 | ZTR314SPH532_0160 EZ401U | 5.7                 | 14                  | 126                 | 16.00 | 0.51                   | 1.02                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 0.70   | 1.9               | 2.0                | 1.7      | 1.3 | ZTR314SPH531_0100 EZ501U | 6.9                 | 14                  | 154                 | 10.00 | 0.77                   | 1.52                   | 19                 | 6                        | 80                  | 3             | 14 | 44.6          |
| 1.00   | 1.3               | 1.4                | 2.1      | 1.7 | ZTR314SPH531_0070 EZ501U | 4.8                 | 14                  | 108                 | 7.000 | 1.00                   | 2.00                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |
| 1.40   | 0.9               | 1.0                | 3.1      | 2.1 | ZTR314SPH531_0050 EZ501U | 3.4                 | 14                  | 77                  | 5.000 | 1.17                   | 2.57                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.40   | 1.6               | 1.7                | 5.3      | 1.2 | ZTR314SPH531_0050 EZ502U | 6.7                 | 14                  | 149                 | 5.000 | 1.17                   | 2.57                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.40   | 1.6               | 1.8                | 5.3      | 1.2 | ZTR314SPH531_0050 EZ701U | 4.3                 | 14                  | 96                  | 5.000 | 1.17                   | 2.57                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.75   | 0.7               | 0.8                | 4.1      | 2.4 | ZTR314SPH531_0040 EZ501U | 2.8                 | 14                  | 61                  | 4.000 | 1.28                   | 2.92                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.75   | 1.3               | 1.4                | 7.0      | 1.4 | ZTR314SPH531_0040 EZ502U | 5.3                 | 14                  | 119                 | 4.000 | 1.28                   | 2.92                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.75   | 1.3               | 1.4                | 7.0      | 1.4 | ZTR314SPH531_0040 EZ701U | 3.4                 | 14                  | 77                  | 4.000 | 1.28                   | 2.92                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| 1.75   | 1.7               | 1.9                | 9.1      | 1.1 | ZTR314SPH531_0040 EZ503U | 7.4                 | 14                  | 165                 | 4.000 | 1.28                   | 2.92                   | 19                 | 6                        | 89                  | 3             | 14 | 44.6          |
| <b>ZTR3PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 9,9</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.50   | 2.7               | 3.3                | 1.4      | 1.0 | ZTR314SPH532_0280 EZ401U | 9.9                 | 14                  | 221                 | 28.00 | 0.33                   | 0.67                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |
| 0.56   | 2.4               | 2.9                | 1.4      | 1.1 | ZTR314SPH532_0250 EZ401U | 8.9                 | 14                  | 198                 | 25.00 | 0.35                   | 0.70                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 0.70   | 1.9               | 2.3                | 1.6      | 1.3 | ZTR314SPH532_0200 EZ401U | 7.1                 | 14                  | 158                 | 20.00 | 0.41                   | 0.82                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 0.88   | 1.5               | 1.9                | 1.9      | 1.5 | ZTR314SPH532_0160 EZ401U | 5.7                 | 14                  | 126                 | 16.00 | 0.51                   | 1.02                   | 19                 | 6                        | 87                  | 3             | 14 | 44.6          |
| 1.40   | 1.5               | 1.9                | 1.7      | 1.3 | ZTR314SPH531_0100 EZ501U | 6.9                 | 14                  | 154                 | 10.00 | 0.77                   | 1.52                   | 19                 | 6                        | 80                  | 3             | 14 | 44.6          |
| 2.00   | 1.0               | 1.3                | 2.1      | 1.7 | ZTR314SPH531_0070 EZ501U | 4.8                 | 14                  | 108                 | 7.000 | 1.00                   | 2.00                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{f2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR3PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 9,9</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 2.00   | 1.6               | 2.4                | 3.2      | 1.1 | ZTR314SPH531_0070 EZ502U | 9.3                 | 14                  | 208                 | 7.000 | 1.00                   | 2.00                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |
| 2.00   | 1.6               | 2.4                | 3.2      | 1.1 | ZTR314SPH531_0070 EZ701U | 6.0                 | 14                  | 134                 | 7.000 | 1.00                   | 2.00                   | 19                 | 6                        | 86                  | 3             | 14 | 44.6          |
| <b>ZTR2PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 15</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.11   | 11                | 13                 | 0.7      | 1.1 | ZTR223SPH732_0700 EZ501U | 15                  | 29                  | 356                 | 70.00 | 0.14                   | 0.26                   | 21                 | 7                        | 115                 | 2             | 23 | 48.8          |
| 0.15   | 8.2               | 9.0                | 0.9      | 1.4 | ZTR223SPH732_0500 EZ501U | 15                  | 29                  | 356                 | 50.00 | 0.19                   | 0.36                   | 21                 | 7                        | 117                 | 2             | 23 | 48.8          |
| 0.19   | 6.6               | 7.2                | 1.1      | 1.6 | ZTR223SPH732_0400 EZ501U | 15                  | 29                  | 356                 | 40.00 | 0.24                   | 0.45                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.22   | 5.7               | 6.3                | 1.1      | 1.7 | ZTR223SPH732_0350 EZ501U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.22   | 9.9               | 11                 | 1.8      | 1.0 | ZTR223SPH732_0350 EZ502U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.22   | 9.9               | 11                 | 1.8      | 1.0 | ZTR223SPH732_0350 EZ701U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.27   | 4.6               | 5.0                | 1.2      | 2.0 | ZTR223SPH732_0280 EZ501U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.27   | 7.9               | 8.5                | 2.0      | 1.2 | ZTR223SPH732_0280 EZ502U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.27   | 7.9               | 8.9                | 2.0      | 1.2 | ZTR223SPH732_0280 EZ701U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.31   | 4.1               | 4.5                | 1.3      | 2.2 | ZTR223SPH732_0250 EZ501U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.31   | 7.1               | 7.6                | 2.3      | 1.3 | ZTR223SPH732_0250 EZ502U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.31   | 7.1               | 7.9                | 2.3      | 1.3 | ZTR223SPH732_0250 EZ701U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 3.3               | 3.6                | 1.6      | 2.5 | ZTR223SPH732_0200 EZ501U | 12                  | 29                  | 298                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 5.6               | 6.1                | 2.8      | 1.5 | ZTR223SPH732_0200 EZ502U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 5.6               | 6.3                | 2.8      | 1.5 | ZTR223SPH732_0200 EZ701U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 7.4               | 8.5                | 3.7      | 1.1 | ZTR223SPH732_0200 EZ503U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.48   | 2.6               | 2.9                | 1.9      | 2.9 | ZTR223SPH732_0160 EZ501U | 9.8                 | 29                  | 238                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.48   | 4.5               | 4.9                | 3.2      | 1.7 | ZTR223SPH732_0160 EZ502U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.48   | 4.5               | 5.1                | 3.2      | 1.7 | ZTR223SPH732_0160 EZ701U | 12                  | 29                  | 298                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.48   | 5.9               | 6.8                | 4.2      | 1.3 | ZTR223SPH732_0160 EZ503U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.48   | 7.3               | 8.8                | 5.2      | 1.0 | ZTR223SPH732_0160 EZ702U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.77   | 2.9               | 3.3                | 1.8      | 2.2 | ZTR223SPH731_0100 EZ701U | 7.9                 | 29                  | 192                 | 10.00 | 0.64                   | 1.28                   | 21                 | 7                        | 112                 | 2             | 23 | 48.8          |
| 0.77   | 4.7               | 5.7                | 3.0      | 1.4 | ZTR223SPH731_0100 EZ702U | 15                  | 29                  | 356                 | 10.00 | 0.64                   | 1.28                   | 21                 | 7                        | 112                 | 2             | 23 | 48.8          |
| 0.77   | 6.5               | 8.2                | 4.1      | 1.0 | ZTR223SPH731_0100 EZ703U | 15                  | 29                  | 356                 | 10.00 | 0.64                   | 1.28                   | 21                 | 7                        | 112                 | 2             | 23 | 48.8          |
| 1.10   | 2.0               | 2.3                | 2.0      | 2.8 | ZTR223SPH731_0070 EZ701U | 5.5                 | 29                  | 134                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 1.10   | 3.3               | 4.0                | 3.3      | 1.7 | ZTR223SPH731_0070 EZ702U | 11                  | 29                  | 276                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 1.10   | 4.5               | 5.7                | 4.5      | 1.3 | ZTR223SPH731_0070 EZ703U | 15                  | 29                  | 356                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 1.53   | 1.5               | 1.6                | 3.1      | 3.5 | ZTR223SPH731_0050 EZ701U | 3.9                 | 29                  | 96                  | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.53   | 2.4               | 2.8                | 5.0      | 2.2 | ZTR223SPH731_0050 EZ702U | 8.1                 | 29                  | 197                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.53   | 3.2               | 4.1                | 6.8      | 1.6 | ZTR223SPH731_0050 EZ703U | 13                  | 29                  | 312                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.53   | 4.2               | 5.9                | 8.8      | 1.2 | ZTR223SPH731_0050 EZ705U | 15                  | 29                  | 356                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.53   | 4.4               | 7.3                | 9.2      | 1.2 | ZTR223SPH731_0050 EZ802U | 15                  | 29                  | 356                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.92   | 1.2               | 1.3                | 4.0      | 4.1 | ZTR223SPH731_0040 EZ701U | 3.1                 | 29                  | 77                  | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| 1.92   | 1.9               | 2.3                | 6.5      | 2.5 | ZTR223SPH731_0040 EZ702U | 6.5                 | 29                  | 157                 | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| 1.92   | 2.6               | 3.3                | 8.9      | 1.8 | ZTR223SPH731_0040 EZ703U | 10                  | 29                  | 250                 | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| 1.92   | 3.4               | 4.8                | 11       | 1.4 | ZTR223SPH731_0040 EZ705U | 15                  | 29                  | 356                 | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| 1.92   | 3.5               | 5.8                | 12       | 1.4 | ZTR223SPH731_0040 EZ802U | 15                  | 29                  | 356                 | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| 1.92   | 4.2               | 7.6                | 14       | 1.1 | ZTR223SPH731_0040 EZ803U | 15                  | 29                  | 356                 | 4.000 | 1.21                   | 2.56                   | 21                 | 7                        | 121                 | 2             | 23 | 48.8          |
| <b>ZTR2PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 15</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.72   | 5.8               | 9.3                | 4.1      | 1.1 | ZTR223SPH732_0160 EZ505U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 1.15   | 4.1               | 14                 | 3.0      | 1.4 | ZTR223SPH731_0100 EZ802U | 15                  | 29                  | 356                 | 10.00 | 0.64                   | 1.28                   | 21                 | 7                        | 112                 | 2             | 23 | 48.8          |
| 1.15   | 4.8               | 7.9                | 3.4      | 1.2 | ZTR223SPH731_0100 EZ703U | 15                  | 29                  | 356                 | 10.00 | 0.64                   | 1.28                   | 21                 | 7                        | 112                 | 2             | 23 | 48.8          |
| 1.64   | 2.9               | 9.5                | 3.3      | 1.7 | ZTR223SPH731_0070 EZ802U | 15                  | 29                  | 356                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 1.64   | 3.3               | 5.5                | 3.8      | 1.5 | ZTR223SPH731_0070 EZ703U | 15                  | 29                  | 356                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 1.64   | 4.5               | 8.3                | 5.2      | 1.1 | ZTR223SPH731_0070 EZ705U | 15                  | 29                  | 356                 | 7.000 | 0.91                   | 1.83                   | 21                 | 7                        | 116                 | 2             | 23 | 48.8          |
| 2.30   | 2.1               | 6.8                | 5.0      | 2.2 | ZTR223SPH731_0050 EZ802U | 15                  | 29                  | 356                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 2.30   | 2.4               | 3.9                | 5.7      | 1.9 | ZTR223SPH731_0050 EZ703U | 13                  | 29                  | 312                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 2.30   | 3.2               | 5.9                | 7.7      | 1.4 | ZTR223SPH731_0050 EZ705U | 15                  | 29                  | 356                 | 5.000 | 1.12                   | 2.56                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| <b>ZTR2PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 15</math> kN))</b>  |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.22   | 9.1               | 12                 | 0.7      | 1.1 | ZTR223SPH732_0700 EZ501U | 15                  | 29                  | 356                 | 70.00 | 0.14                   | 0.26                   | 21                 | 7                        | 115                 | 2             | 23 | 48.8          |
| 0.31   | 6.5               | 8.4                | 0.9      | 1.4 | ZTR223SPH732_0500 EZ501U | 15                  | 29                  | 356                 | 50.00 | 0.19                   | 0.36                   | 21                 | 7                        | 117                 | 2             | 23 | 48.8          |
| 0.38   | 5.2               | 6.7                | 1.1      | 1.6 | ZTR223SPH732_0400 EZ501U | 15                  | 29                  | 356                 | 40.00 | 0.24                   | 0.45                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 7.9               | 12                 | 1.7      | 1.0 | ZTR223SPH732_0400 EZ502U | 15                  | 29                  | 356                 | 40.00 | 0.24                   | 0.45                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.38   | 7.9               | 12                 | 1.7      | 1.0 | ZTR223SPH732_0400 EZ701U | 15                  | 29                  | 356                 | 40.00 | 0.24                   | 0.45                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.44   | 4.5               | 5.9                | 1.0      | 1.7 | ZTR223SPH732_0350 EZ501U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.44   | 6.9               | 10                 | 1.6      | 1.1 | ZTR223SPH732_0350 EZ502U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.44   | 6.9               | 11                 | 1.6      | 1.1 | ZTR223SPH732_0350 EZ701U | 15                  | 29                  | 356                 | 35.00 | 0.27                   | 0.51                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.55   | 3.6               | 4.7                | 1.1      | 2.0 | ZTR223SPH732_0280 EZ501U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.55   | 5.5               | 8.3                | 1.7      | 1.3 | ZTR223SPH732_0280 EZ502U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.55   | 5.5               | 8.4                | 1.7      | 1.3 | ZTR223SPH732_0280 EZ701U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.55   | 6.6               | 11                 | 2.1      | 1.1 | ZTR223SPH732_0280 EZ503U | 15                  | 29                  | 356                 | 28.00 | 0.34                   | 0.64                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.61   | 3.2               | 4.2                | 1.3      | 2.2 | ZTR223SPH732_0250 EZ501U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.61   | 5.0               | 7.4                | 2.0      | 1.4 | ZTR223SPH732_0250 EZ502U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |



5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{f2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR2PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 15</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.61  | 5.0               | 7.5                | 2.0      | 1.4 | ZTR223SPH732_0250 EZ701U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.61  | 5.9               | 10                 | 2.3      | 1.2 | ZTR223SPH732_0250 EZ503U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.61  | 6.9               | 14                 | 2.7      | 1.0 | ZTR223SPH732_0250 EZ702U | 15                  | 29                  | 356                 | 25.00 | 0.36                   | 0.72                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.77  | 2.6               | 3.4                | 1.5      | 2.5 | ZTR223SPH732_0200 EZ501U | 12                  | 29                  | 298                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.77  | 4.0               | 5.9                | 2.2      | 1.6 | ZTR223SPH732_0200 EZ502U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.77  | 4.0               | 6.0                | 2.2      | 1.6 | ZTR223SPH732_0200 EZ701U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.77  | 4.7               | 8.1                | 2.6      | 1.4 | ZTR223SPH732_0200 EZ503U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.77  | 5.5               | 11                 | 3.1      | 1.2 | ZTR223SPH732_0200 EZ702U | 15                  | 29                  | 356                 | 20.00 | 0.38                   | 0.77                   | 21                 | 7                        | 118                 | 2             | 23 | 48.8          |
| 0.96  | 2.1               | 2.7                | 1.6      | 2.9 | ZTR223SPH732_0160 EZ501U | 9.8                 | 29                  | 238                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.96  | 3.2               | 4.8                | 2.5      | 1.9 | ZTR223SPH732_0160 EZ502U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.96  | 3.2               | 4.8                | 2.5      | 1.9 | ZTR223SPH732_0160 EZ701U | 12                  | 29                  | 298                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.96  | 3.8               | 6.5                | 3.0      | 1.6 | ZTR223SPH732_0160 EZ503U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| 0.96  | 4.4               | 8.7                | 3.4      | 1.4 | ZTR223SPH732_0160 EZ702U | 15                  | 29                  | 356                 | 16.00 | 0.48                   | 0.96                   | 21                 | 7                        | 119                 | 2             | 23 | 48.8          |
| <b>ZTR3PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 19</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.11  | 11                | 12                 | 0.7      | 1.1 | ZTR316SPH732_0700 EZ501U | 17                  | 30                  | 446                 | 70.00 | 0.14                   | 0.27                   | 22                 | 7                        | 114                 | 3             | 16 | 50.9          |
| 0.16  | 7.9               | 8.6                | 0.9      | 1.4 | ZTR316SPH732_0500 EZ501U | 17                  | 30                  | 446                 | 50.00 | 0.20                   | 0.37                   | 22                 | 7                        | 116                 | 3             | 16 | 50.9          |
| 0.20  | 6.3               | 6.9                | 1.1      | 1.6 | ZTR316SPH732_0400 EZ501U | 17                  | 30                  | 446                 | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.23  | 5.5               | 6.0                | 1.1      | 1.8 | ZTR316SPH732_0350 EZ501U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.23  | 9.5               | 10                 | 1.8      | 1.0 | ZTR316SPH732_0350 EZ502U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.23  | 9.5               | 11                 | 1.8      | 1.0 | ZTR316SPH732_0350 EZ701U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.24  | 5.3               | 5.8                | 1.1      | 1.9 | ZTR319SPH732_0400 EZ501U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.24  | 9.1               | 9.8                | 1.9      | 1.1 | ZTR319SPH732_0400 EZ502U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.24  | 9.1               | 10                 | 1.9      | 1.1 | ZTR319SPH732_0400 EZ701U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.27  | 4.6               | 5.1                | 1.1      | 2.1 | ZTR319SPH732_0350 EZ501U | 17                  | 26                  | 521                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.27  | 8.0               | 8.6                | 1.8      | 1.2 | ZTR319SPH732_0350 EZ502U | 19                  | 26                  | 565                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.27  | 8.0               | 8.9                | 1.8      | 1.2 | ZTR319SPH732_0350 EZ701U | 19                  | 26                  | 565                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.29  | 4.4               | 4.8                | 1.2      | 2.0 | ZTR316SPH732_0280 EZ501U | 16                  | 30                  | 417                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.29  | 7.6               | 8.2                | 2.0      | 1.2 | ZTR316SPH732_0280 EZ502U | 17                  | 30                  | 446                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.29  | 7.6               | 8.5                | 2.0      | 1.2 | ZTR316SPH732_0280 EZ701U | 17                  | 30                  | 446                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.32  | 3.9               | 4.3                | 1.3      | 2.2 | ZTR316SPH732_0250 EZ501U | 15                  | 30                  | 372                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.32  | 6.8               | 7.3                | 2.3      | 1.3 | ZTR316SPH732_0250 EZ502U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.32  | 6.8               | 7.6                | 2.3      | 1.3 | ZTR316SPH732_0250 EZ701U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.34  | 3.7               | 4.0                | 1.2      | 2.4 | ZTR319SPH732_0280 EZ501U | 14                  | 26                  | 417                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.34  | 6.4               | 6.9                | 2.0      | 1.4 | ZTR319SPH732_0280 EZ502U | 19                  | 26                  | 565                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.34  | 6.4               | 7.1                | 2.0      | 1.4 | ZTR319SPH732_0280 EZ701U | 17                  | 26                  | 521                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.34  | 8.4               | 9.6                | 2.7      | 1.1 | ZTR319SPH732_0280 EZ503U | 19                  | 26                  | 565                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.38  | 3.3               | 3.6                | 1.3      | 2.6 | ZTR319SPH732_0250 EZ501U | 12                  | 26                  | 372                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.38  | 5.7               | 6.2                | 2.3      | 1.5 | ZTR319SPH732_0250 EZ502U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.38  | 5.7               | 6.4                | 2.3      | 1.5 | ZTR319SPH732_0250 EZ701U | 15                  | 26                  | 465                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.38  | 7.5               | 8.5                | 3.0      | 1.2 | ZTR319SPH732_0250 EZ503U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.40  | 3.1               | 3.4                | 1.6      | 2.6 | ZTR316SPH732_0200 EZ501U | 12                  | 30                  | 298                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.40  | 5.4               | 5.8                | 2.8      | 1.5 | ZTR316SPH732_0200 EZ502U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.40  | 5.4               | 6.1                | 2.8      | 1.5 | ZTR316SPH732_0200 EZ701U | 15                  | 30                  | 372                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.40  | 7.1               | 8.1                | 3.7      | 1.1 | ZTR316SPH732_0200 EZ503U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.48  | 2.6               | 2.9                | 1.6      | 3.0 | ZTR319SPH732_0200 EZ501U | 9.8                 | 26                  | 298                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48  | 4.6               | 4.9                | 2.8      | 1.8 | ZTR319SPH732_0200 EZ502U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48  | 4.6               | 5.1                | 2.8      | 1.8 | ZTR319SPH732_0200 EZ701U | 12                  | 26                  | 372                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48  | 6.0               | 6.8                | 3.7      | 1.3 | ZTR319SPH732_0200 EZ503U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48  | 7.4               | 8.9                | 4.6      | 1.1 | ZTR319SPH732_0200 EZ702U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.50  | 2.5               | 2.7                | 1.9      | 3.0 | ZTR316SPH732_0160 EZ501U | 9.3                 | 30                  | 238                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.50  | 4.3               | 4.7                | 3.2      | 1.7 | ZTR316SPH732_0160 EZ502U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.50  | 4.3               | 4.8                | 3.2      | 1.7 | ZTR316SPH732_0160 EZ701U | 12                  | 30                  | 298                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.50  | 5.7               | 6.5                | 4.2      | 1.3 | ZTR316SPH732_0160 EZ503U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.50  | 7.0               | 8.4                | 5.2      | 1.1 | ZTR316SPH732_0160 EZ702U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.59  | 2.1               | 2.3                | 1.9      | 3.5 | ZTR319SPH732_0160 EZ501U | 7.9                 | 26                  | 238                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.59  | 3.6               | 3.9                | 3.2      | 2.0 | ZTR319SPH732_0160 EZ502U | 15                  | 26                  | 461                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.59  | 3.6               | 4.1                | 3.2      | 2.0 | ZTR319SPH732_0160 EZ701U | 9.8                 | 26                  | 298                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.59  | 4.8               | 5.5                | 4.2      | 1.6 | ZTR319SPH732_0160 EZ503U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.59  | 5.9               | 7.1                | 5.2      | 1.3 | ZTR319SPH732_0160 EZ702U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.59  | 6.6               | 7.9                | 5.9      | 1.1 | ZTR319SPH732_0160 EZ505U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 0.80  | 2.8               | 3.1                | 1.8      | 2.3 | ZTR316SPH731_0100 EZ701U | 7.5                 | 30                  | 192                 | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 110                 | 3             | 16 | 50.9          |
| 0.80  | 4.5               | 5.4                | 3.0      | 1.4 | ZTR316SPH731_0100 EZ702U | 15                  | 30                  | 394                 | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 110                 | 3             | 16 | 50.9          |
| 0.80  | 6.2               | 7.8                | 4.1      | 1.0 | ZTR316SPH731_0100 EZ703U | 17                  | 30                  | 446                 | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 110                 | 3             | 16 | 50.9          |
| 0.95  | 2.3               | 2.6                | 1.8      | 2.7 | ZTR319SPH731_0100 EZ701U | 6.3                 | 26                  | 192                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |
| 0.95  | 3.8               | 4.6                | 3.0      | 1.7 | ZTR319SPH731_0100 EZ702U | 13                  | 26                  | 394                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |
| 0.95  | 5.2               | 6.6                | 4.1      | 1.2 | ZTR319SPH731_0100 EZ703U | 19                  | 26                  | 565                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |

| $v_{Z2N}$<br>[m/s]  | $F_{Z2N}$<br>[kN] | $F_{Z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{Z2acc}$<br>[kN] | $F_{Z2NOT}$<br>[kN] | $M_{Z2acc}$<br>[Nm] | i     | $v_{Z2maxDB}$<br>[m/s] | $v_{Z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR3PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{Z2acc,max} = 19</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 1.14  | 2.0               | 2.2                | 2.0      | 2.9 | ZTR316SPH731_0070 EZ701U | 5.3                 | 30                  | 134                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.14  | 3.2               | 3.8                | 3.3      | 1.8 | ZTR316SPH731_0070 EZ702U | 11                  | 30                  | 276                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.14  | 4.4               | 5.5                | 4.5      | 1.3 | ZTR316SPH731_0070 EZ703U | 17                  | 30                  | 437                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.14  | 5.6               | 8.0                | 5.9      | 1.0 | ZTR316SPH731_0070 EZ705U | 17                  | 30                  | 446                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.36  | 1.6               | 1.8                | 2.0      | 3.4 | ZTR319SPH731_0070 EZ701U | 4.4                 | 26                  | 134                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 1.36  | 2.7               | 3.2                | 3.3      | 2.1 | ZTR319SPH731_0070 EZ702U | 9.1                 | 26                  | 276                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 1.36  | 3.7               | 4.6                | 4.5      | 1.5 | ZTR319SPH731_0070 EZ703U | 14                  | 26                  | 437                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 1.36  | 4.7               | 6.7                | 5.9      | 1.2 | ZTR319SPH731_0070 EZ705U | 19                  | 26                  | 565                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 1.36  | 5.0               | 8.2                | 6.1      | 1.1 | ZTR319SPH731_0070 EZ802U | 19                  | 26                  | 565                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 1.60  | 1.4               | 1.6                | 3.1      | 3.6 | ZTR316SPH731_0050 EZ701U | 3.8                 | 30                  | 96                  | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.60  | 2.3               | 2.7                | 5.0      | 2.2 | ZTR316SPH731_0050 EZ702U | 7.7                 | 30                  | 197                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.60  | 3.1               | 3.9                | 6.8      | 1.6 | ZTR316SPH731_0050 EZ703U | 12                  | 30                  | 312                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.60  | 4.0               | 5.7                | 8.8      | 1.3 | ZTR316SPH731_0050 EZ705U | 17                  | 30                  | 446                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.60  | 4.2               | 7.0                | 9.2      | 1.2 | ZTR316SPH731_0050 EZ802U | 17                  | 30                  | 446                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.60  | 5.0               | 9.1                | 11       | 1.0 | ZTR316SPH731_0050 EZ803U | 17                  | 30                  | 446                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.90  | 1.2               | 1.3                | 3.1      | 4.3 | ZTR319SPH731_0050 EZ701U | 3.2                 | 26                  | 96                  | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.90  | 1.9               | 2.3                | 5.0      | 2.6 | ZTR319SPH731_0050 EZ702U | 6.5                 | 26                  | 197                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.90  | 2.6               | 3.3                | 6.8      | 1.9 | ZTR319SPH731_0050 EZ703U | 10                  | 26                  | 312                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.90  | 3.4               | 4.8                | 8.8      | 1.5 | ZTR319SPH731_0050 EZ705U | 17                  | 26                  | 499                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.90  | 3.5               | 5.9                | 9.2      | 1.4 | ZTR319SPH731_0050 EZ802U | 16                  | 26                  | 480                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.90  | 4.2               | 7.7                | 11       | 1.2 | ZTR319SPH731_0050 EZ803U | 19                  | 26                  | 565                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 2.00  | 1.1               | 1.3                | 4.0      | 4.2 | ZTR316SPH731_0040 EZ701U | 3.0                 | 30                  | 77                  | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.00  | 1.8               | 2.2                | 6.5      | 2.6 | ZTR316SPH731_0040 EZ702U | 6.2                 | 30                  | 157                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.00  | 2.5               | 3.1                | 8.9      | 1.9 | ZTR316SPH731_0040 EZ703U | 9.8                 | 30                  | 250                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.00  | 3.2               | 4.6                | 11       | 1.5 | ZTR316SPH731_0040 EZ705U | 16                  | 30                  | 399                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.00  | 3.4               | 5.6                | 12       | 1.4 | ZTR316SPH731_0040 EZ802U | 15                  | 30                  | 384                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.00  | 4.0               | 7.3                | 14       | 1.2 | ZTR316SPH731_0040 EZ803U | 17                  | 30                  | 446                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 120                 | 3             | 16 | 50.9          |
| 2.38  | 0.9               | 1.1                | 4.0      | 5.0 | ZTR319SPH731_0040 EZ701U | 2.5                 | 26                  | 77                  | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| 2.38  | 1.5               | 1.8                | 6.5      | 3.1 | ZTR319SPH731_0040 EZ702U | 5.2                 | 26                  | 157                 | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| 2.38  | 2.1               | 2.6                | 8.9      | 2.2 | ZTR319SPH731_0040 EZ703U | 8.3                 | 26                  | 250                 | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| 2.38  | 2.7               | 3.8                | 11       | 1.7 | ZTR319SPH731_0040 EZ705U | 13                  | 26                  | 399                 | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| 2.38  | 2.8               | 4.7                | 12       | 1.7 | ZTR319SPH731_0040 EZ802U | 13                  | 26                  | 384                 | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| 2.38  | 3.4               | 6.1                | 14       | 1.4 | ZTR319SPH731_0040 EZ803U | 18                  | 26                  | 557                 | 4.000 | 1.50                   | 3.17                   | 26                 | 9                        | 117                 | 3             | 19 | 60.5          |
| <b>ZTR3PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{Z2acc,max} = 19</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.57  | 7.3               | 12                 | 3.2      | 1.0 | ZTR319SPH732_0250 EZ505U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.60  | 6.9               | 11                 | 3.7      | 1.0 | ZTR316SPH732_0200 EZ505U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.75  | 5.6               | 8.9                | 4.1      | 1.2 | ZTR316SPH732_0160 EZ505U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 0.89  | 6.0               | 9.8                | 5.3      | 1.1 | ZTR319SPH732_0160 EZ703U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.20  | 4.0               | 13                 | 3.0      | 1.4 | ZTR316SPH731_0100 EZ802U | 17                  | 30                  | 446                 | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 110                 | 3             | 16 | 50.9          |
| 1.20  | 4.6               | 7.5                | 3.4      | 1.2 | ZTR316SPH731_0100 EZ703U | 17                  | 30                  | 446                 | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 110                 | 3             | 16 | 50.9          |
| 1.43  | 3.3               | 11                 | 3.0      | 1.7 | ZTR319SPH731_0100 EZ802U | 19                  | 26                  | 565                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |
| 1.43  | 3.8               | 6.3                | 3.4      | 1.4 | ZTR319SPH731_0100 EZ703U | 19                  | 26                  | 565                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |
| 1.43  | 5.2               | 9.5                | 4.7      | 1.1 | ZTR319SPH731_0100 EZ705U | 19                  | 26                  | 565                 | 10.00 | 0.79                   | 1.58                   | 26                 | 9                        | 105                 | 3             | 19 | 60.5          |
| 1.71  | 2.8               | 9.1                | 3.3      | 1.8 | ZTR316SPH731_0070 EZ802U | 17                  | 30                  | 446                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.71  | 3.2               | 5.3                | 3.8      | 1.5 | ZTR316SPH731_0070 EZ703U | 17                  | 30                  | 437                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 1.71  | 4.3               | 7.9                | 5.2      | 1.1 | ZTR316SPH731_0070 EZ705U | 17                  | 30                  | 446                 | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 115                 | 3             | 16 | 50.9          |
| 2.04  | 2.3               | 7.7                | 3.3      | 2.1 | ZTR319SPH731_0070 EZ802U | 19                  | 26                  | 565                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 2.04  | 2.7               | 4.4                | 3.8      | 1.8 | ZTR319SPH731_0070 EZ703U | 14                  | 26                  | 437                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 2.04  | 3.6               | 6.7                | 5.2      | 1.4 | ZTR319SPH731_0070 EZ705U | 19                  | 26                  | 565                 | 7.000 | 1.13                   | 2.26                   | 26                 | 9                        | 111                 | 3             | 19 | 60.5          |
| 2.40  | 2.0               | 6.5                | 5.0      | 2.2 | ZTR316SPH731_0050 EZ802U | 17                  | 30                  | 446                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 2.40  | 2.3               | 3.8                | 5.7      | 1.9 | ZTR316SPH731_0050 EZ703U | 12                  | 30                  | 312                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 2.40  | 3.1               | 5.7                | 7.7      | 1.4 | ZTR316SPH731_0050 EZ705U | 17                  | 30                  | 446                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 2.85  | 1.7               | 5.5                | 5.0      | 2.6 | ZTR319SPH731_0050 EZ802U | 16                  | 26                  | 480                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 2.85  | 1.9               | 3.2                | 5.7      | 2.3 | ZTR319SPH731_0050 EZ703U | 10                  | 26                  | 312                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 2.85  | 2.6               | 4.8                | 7.7      | 1.7 | ZTR319SPH731_0050 EZ705U | 17                  | 26                  | 499                 | 5.000 | 1.39                   | 3.17                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| <b>ZTR3PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{Z2acc,max} = 19</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.23  | 8.7               | 11                 | 0.7      | 1.1 | ZTR316SPH732_0700 EZ501U | 17                  | 30                  | 446                 | 70.00 | 0.14                   | 0.27                   | 22                 | 7                        | 114                 | 3             | 16 | 50.9          |
| 0.32  | 6.2               | 8.0                | 0.9      | 1.4 | ZTR316SPH732_0500 EZ501U | 17                  | 30                  | 446                 | 50.00 | 0.20                   | 0.37                   | 22                 | 7                        | 116                 | 3             | 16 | 50.9          |
| 0.38  | 8.0               | 12                 | 1.3      | 1.1 | ZTR319SPH732_0500 EZ502U | 19                  | 26                  | 565                 | 50.00 | 0.23                   | 0.44                   | 26                 | 9                        | 112                 | 3             | 19 | 60.5          |
| 0.38  | 8.0               | 12                 | 1.3      | 1.1 | ZTR319SPH732_0500 EZ701U | 19                  | 26                  | 565                 | 50.00 | 0.23                   | 0.44                   | 26                 | 9                        | 112                 | 3             | 19 | 60.5          |
| 0.40  | 5.0               | 6.4                | 1.1      | 1.6 | ZTR316SPH732_0400 EZ501U | 17                  | 30                  | 446                 | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.40  | 7.6               | 11                 | 1.7      | 1.1 | ZTR316SPH732_0400 EZ502U | 17                  | 30                  | 446                 | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.40  | 7.6               | 12                 | 1.7      | 1.1 | ZTR316SPH732_0400 EZ701U | 17                  | 30                  | 446                 | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.46  | 4.3               | 5.6                | 1.0      | 1.8 | ZTR316SPH732_0350 EZ501U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.46  | 6.6               | 10                 | 1.6      | 1.2 | ZTR316SPH732_0350 EZ502U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.46  | 6.6               | 10                 | 1.6      | 1.2 | ZTR316SPH732_0350 EZ701U | 17                  | 30                  | 446                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |



5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{Z2N}$<br>[m/s]   | $F_{Z2N}$<br>[kN] | $F_{Z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{Z2acc}$<br>[kN] | $F_{Z2NOT}$<br>[kN] | $M_{Z2acc}$<br>[Nm] | i     | $v_{Z2maxDB}$<br>[m/s] | $v_{Z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR3PH7 (n<sub>1N</sub> = 6000 rpm, (F<sub>Z2acc,max</sub> = 19 kN)</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.48   | 4.2               | 5.4                | 1.1      | 1.9 | ZTR319SPH732_0400 EZ501U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48   | 6.4               | 9.6                | 1.7      | 1.2 | ZTR319SPH732_0400 EZ502U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48   | 6.4               | 9.7                | 1.7      | 1.2 | ZTR319SPH732_0400 EZ701U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.48   | 7.6               | 13                 | 2.0      | 1.0 | ZTR319SPH732_0400 EZ503U | 19                  | 26                  | 565                 | 40.00 | 0.29                   | 0.55                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.54   | 3.7               | 4.7                | 1.0      | 2.1 | ZTR319SPH732_0350 EZ501U | 17                  | 26                  | 521                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.54   | 5.6               | 8.4                | 1.6      | 1.4 | ZTR319SPH732_0350 EZ502U | 19                  | 26                  | 565                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.54   | 5.6               | 8.5                | 1.6      | 1.4 | ZTR319SPH732_0350 EZ701U | 19                  | 26                  | 565                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.54   | 6.7               | 11                 | 1.9      | 1.1 | ZTR319SPH732_0350 EZ503U | 19                  | 26                  | 565                 | 35.00 | 0.34                   | 0.63                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.57   | 3.5               | 4.5                | 1.1      | 2.1 | ZTR316SPH732_0280 EZ501U | 16                  | 30                  | 417                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.57   | 5.3               | 8.0                | 1.7      | 1.3 | ZTR316SPH732_0280 EZ502U | 17                  | 30                  | 446                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.57   | 5.3               | 8.1                | 1.7      | 1.3 | ZTR316SPH732_0280 EZ701U | 17                  | 30                  | 446                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.57   | 6.3               | 11                 | 2.1      | 1.1 | ZTR316SPH732_0280 EZ503U | 17                  | 30                  | 446                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.64   | 3.1               | 4.0                | 1.3      | 2.2 | ZTR316SPH732_0250 EZ501U | 15                  | 30                  | 372                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.64   | 4.7               | 7.1                | 2.0      | 1.4 | ZTR316SPH732_0250 EZ502U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.64   | 4.7               | 7.2                | 2.0      | 1.4 | ZTR316SPH732_0250 EZ701U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.64   | 5.7               | 9.7                | 2.3      | 1.2 | ZTR316SPH732_0250 EZ503U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.64   | 6.6               | 13                 | 2.7      | 1.0 | ZTR316SPH732_0250 EZ702U | 17                  | 30                  | 446                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.68   | 2.9               | 3.8                | 1.1      | 2.4 | ZTR319SPH732_0280 EZ501U | 14                  | 26                  | 417                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.68   | 4.5               | 6.7                | 1.7      | 1.6 | ZTR319SPH732_0280 EZ502U | 19                  | 26                  | 565                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.68   | 4.5               | 6.8                | 1.7      | 1.6 | ZTR319SPH732_0280 EZ701U | 17                  | 26                  | 521                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.68   | 5.3               | 9.1                | 2.1      | 1.3 | ZTR319SPH732_0280 EZ503U | 19                  | 26                  | 565                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.68   | 6.2               | 12                 | 2.4      | 1.1 | ZTR319SPH732_0280 EZ702U | 19                  | 26                  | 565                 | 28.00 | 0.42                   | 0.79                   | 26                 | 9                        | 114                 | 3             | 19 | 60.5          |
| 0.76   | 2.6               | 3.4                | 1.3      | 2.6 | ZTR319SPH732_0250 EZ501U | 12                  | 26                  | 372                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.76   | 4.0               | 6.0                | 2.0      | 1.7 | ZTR319SPH732_0250 EZ502U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.76   | 4.0               | 6.1                | 2.0      | 1.7 | ZTR319SPH732_0250 EZ701U | 15                  | 26                  | 465                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.76   | 4.8               | 8.1                | 2.3      | 1.4 | ZTR319SPH732_0250 EZ503U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.76   | 5.5               | 11                 | 2.7      | 1.2 | ZTR319SPH732_0250 EZ702U | 19                  | 26                  | 565                 | 25.00 | 0.44                   | 0.89                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.80   | 2.5               | 3.2                | 1.5      | 2.6 | ZTR316SPH732_0200 EZ501U | 12                  | 30                  | 298                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.80   | 3.8               | 5.7                | 2.2      | 1.7 | ZTR316SPH732_0200 EZ502U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.80   | 3.8               | 5.8                | 2.2      | 1.7 | ZTR316SPH732_0200 EZ701U | 15                  | 30                  | 372                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.80   | 4.5               | 7.7                | 2.6      | 1.4 | ZTR316SPH732_0200 EZ503U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.80   | 5.3               | 10                 | 3.1      | 1.2 | ZTR316SPH732_0200 EZ702U | 17                  | 30                  | 446                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 117                 | 3             | 16 | 50.9          |
| 0.95   | 2.1               | 2.7                | 1.5      | 3.0 | ZTR319SPH732_0200 EZ501U | 9.8                 | 26                  | 298                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.95   | 3.2               | 4.8                | 2.2      | 2.0 | ZTR319SPH732_0200 EZ502U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.95   | 3.2               | 4.9                | 2.2      | 2.0 | ZTR319SPH732_0200 EZ701U | 12                  | 26                  | 372                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.95   | 3.8               | 6.5                | 2.6      | 1.7 | ZTR319SPH732_0200 EZ503U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 0.95   | 4.4               | 8.8                | 3.1      | 1.4 | ZTR319SPH732_0200 EZ702U | 19                  | 26                  | 565                 | 20.00 | 0.48                   | 0.95                   | 26                 | 9                        | 113                 | 3             | 19 | 60.5          |
| 1.00   | 2.0               | 2.6                | 1.6      | 3.0 | ZTR316SPH732_0160 EZ501U | 9.3                 | 30                  | 238                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.00   | 3.0               | 4.6                | 2.5      | 1.9 | ZTR316SPH732_0160 EZ502U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.00   | 3.0               | 4.6                | 2.5      | 1.9 | ZTR316SPH732_0160 EZ701U | 12                  | 30                  | 298                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.00   | 3.6               | 6.2                | 3.0      | 1.6 | ZTR316SPH732_0160 EZ503U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.00   | 4.2               | 8.4                | 3.4      | 1.4 | ZTR316SPH732_0160 EZ702U | 17                  | 30                  | 446                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 118                 | 3             | 16 | 50.9          |
| 1.19   | 1.7               | 2.2                | 1.6      | 3.5 | ZTR319SPH732_0160 EZ501U | 7.9                 | 26                  | 238                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.19   | 2.6               | 3.8                | 2.5      | 2.3 | ZTR319SPH732_0160 EZ502U | 15                  | 26                  | 461                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.19   | 2.6               | 3.9                | 2.5      | 2.3 | ZTR319SPH732_0160 EZ701U | 9.8                 | 26                  | 298                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.19   | 3.1               | 5.2                | 3.0      | 1.9 | ZTR319SPH732_0160 EZ503U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| 1.19   | 3.5               | 7.0                | 3.4      | 1.7 | ZTR319SPH732_0160 EZ702U | 19                  | 26                  | 565                 | 16.00 | 0.59                   | 1.19                   | 26                 | 9                        | 115                 | 3             | 19 | 60.5          |
| <b>ZTR4PH7 (n<sub>1N</sub> = 3000 rpm, (F<sub>Z2acc,max</sub> = 18 kN)</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.11   | 11                | 12                 | 0.7      | 1.1 | ZTR412SPH732_0700 EZ501U | 18                  | 28                  | 459                 | 70.00 | 0.14                   | 0.27                   | 22                 | 7                        | 110                 | 4             | 12 | 50.9          |
| 0.16   | 7.9               | 8.6                | 0.9      | 1.3 | ZTR412SPH732_0500 EZ501U | 18                  | 28                  | 459                 | 50.00 | 0.20                   | 0.37                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 0.20   | 6.3               | 6.9                | 1.1      | 1.5 | ZTR412SPH732_0400 EZ501U | 18                  | 28                  | 459                 | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.23   | 5.5               | 6.0                | 1.1      | 1.7 | ZTR412SPH732_0350 EZ501U | 18                  | 28                  | 459                 | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.29   | 4.4               | 4.8                | 1.2      | 2.0 | ZTR412SPH732_0280 EZ501U | 16                  | 28                  | 417                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.29   | 7.6               | 8.2                | 2.0      | 1.1 | ZTR412SPH732_0280 EZ502U | 18                  | 28                  | 459                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.29   | 7.6               | 8.5                | 2.0      | 1.1 | ZTR412SPH732_0280 EZ701U | 18                  | 28                  | 459                 | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.32   | 3.9               | 4.3                | 1.3      | 2.1 | ZTR412SPH732_0250 EZ501U | 15                  | 28                  | 372                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.32   | 6.8               | 7.3                | 2.3      | 1.2 | ZTR412SPH732_0250 EZ502U | 18                  | 28                  | 459                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.32   | 6.8               | 7.6                | 2.3      | 1.2 | ZTR412SPH732_0250 EZ701U | 18                  | 28                  | 459                 | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40   | 3.1               | 3.4                | 1.6      | 2.5 | ZTR412SPH732_0200 EZ501U | 12                  | 28                  | 298                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40   | 5.4               | 5.8                | 2.8      | 1.4 | ZTR412SPH732_0200 EZ502U | 18                  | 28                  | 459                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40   | 5.4               | 6.1                | 2.8      | 1.4 | ZTR412SPH732_0200 EZ701U | 15                  | 28                  | 372                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40   | 7.1               | 8.1                | 3.7      | 1.1 | ZTR412SPH732_0200 EZ503U | 18                  | 28                  | 459                 | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.50   | 2.5               | 2.7                | 1.9      | 2.9 | ZTR412SPH732_0160 EZ501U | 9.3                 | 28                  | 238                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.50   | 4.3               | 4.7                | 3.2      | 1.7 | ZTR412SPH732_0160 EZ502U | 18                  | 28                  | 459                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.50   | 4.3               | 4.8                | 3.2      | 1.7 | ZTR412SPH732_0160 EZ701U | 12                  | 28                  | 298                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.50   | 5.7               | 6.5                | 4.2      | 1.3 | ZTR412SPH732_0160 EZ503U | 18                  | 28                  | 459                 | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR4PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 18</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.50  | 7.0               | 8.4                | 5.2      | 1.0 | ZTR412SPH732_0160 EZ702U | 18                  | 28                  | 459                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.80  | 2.8               | 3.1                | 1.8      | 2.2 | ZTR412SPH731_0100 EZ701U | 7.5                 | 28                  | 192                | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 107                 | 4             | 12 | 50.9          |
| 0.80  | 4.5               | 5.4                | 3.0      | 1.4 | ZTR412SPH731_0100 EZ702U | 15                  | 28                  | 394                | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 107                 | 4             | 12 | 50.9          |
| 1.14  | 2.0               | 2.2                | 2.0      | 2.8 | ZTR412SPH731_0070 EZ701U | 5.3                 | 28                  | 134                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 1.14  | 3.2               | 3.8                | 3.3      | 1.7 | ZTR412SPH731_0070 EZ702U | 11                  | 28                  | 276                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 1.14  | 4.4               | 5.5                | 4.5      | 1.3 | ZTR412SPH731_0070 EZ703U | 17                  | 28                  | 437                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 1.60  | 1.4               | 1.6                | 3.1      | 3.5 | ZTR412SPH731_0050 EZ701U | 3.8                 | 28                  | 96                 | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 1.60  | 2.3               | 2.7                | 5.0      | 2.2 | ZTR412SPH731_0050 EZ702U | 7.7                 | 28                  | 197                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 1.60  | 3.1               | 3.9                | 6.8      | 1.6 | ZTR412SPH731_0050 EZ703U | 12                  | 28                  | 312                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 1.60  | 4.0               | 5.7                | 8.8      | 1.2 | ZTR412SPH731_0050 EZ705U | 18                  | 28                  | 459                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 1.60  | 4.2               | 7.0                | 9.2      | 1.2 | ZTR412SPH731_0050 EZ802U | 18                  | 28                  | 459                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 2.00  | 1.1               | 1.3                | 4.0      | 4.0 | ZTR412SPH731_0040 EZ701U | 3.0                 | 28                  | 77                 | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| 2.00  | 1.8               | 2.2                | 6.5      | 2.5 | ZTR412SPH731_0040 EZ702U | 6.2                 | 28                  | 157                | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| 2.00  | 2.5               | 3.1                | 8.9      | 1.8 | ZTR412SPH731_0040 EZ703U | 9.8                 | 28                  | 250                | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| 2.00  | 3.2               | 4.6                | 11       | 1.4 | ZTR412SPH731_0040 EZ705U | 16                  | 28                  | 399                | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| 2.00  | 3.4               | 5.6                | 12       | 1.3 | ZTR412SPH731_0040 EZ802U | 15                  | 28                  | 384                | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| 2.00  | 4.0               | 7.3                | 14       | 1.1 | ZTR412SPH731_0040 EZ803U | 18                  | 28                  | 459                | 4.000 | 1.27                   | 2.67                   | 22                 | 7                        | 116                 | 4             | 12 | 50.9          |
| <b>ZTR4PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 18</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.75  | 5.6               | 8.9                | 4.1      | 1.1 | ZTR412SPH732_0160 EZ505U | 18                  | 28                  | 459                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 1.20  | 4.0               | 13                 | 3.0      | 1.4 | ZTR412SPH731_0100 EZ802U | 18                  | 28                  | 459                | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 107                 | 4             | 12 | 50.9          |
| 1.20  | 4.6               | 7.5                | 3.4      | 1.2 | ZTR412SPH731_0100 EZ703U | 18                  | 28                  | 459                | 10.00 | 0.67                   | 1.33                   | 22                 | 7                        | 107                 | 4             | 12 | 50.9          |
| 1.71  | 2.8               | 9.1                | 3.3      | 1.7 | ZTR412SPH731_0070 EZ802U | 18                  | 28                  | 459                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 1.71  | 3.2               | 5.3                | 3.8      | 1.5 | ZTR412SPH731_0070 EZ703U | 17                  | 28                  | 437                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 1.71  | 4.3               | 7.9                | 5.2      | 1.1 | ZTR412SPH731_0070 EZ705U | 18                  | 28                  | 459                | 7.000 | 0.95                   | 1.91                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 2.40  | 2.0               | 6.5                | 5.0      | 2.1 | ZTR412SPH731_0050 EZ802U | 18                  | 28                  | 459                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 2.40  | 2.3               | 3.8                | 5.7      | 1.9 | ZTR412SPH731_0050 EZ703U | 12                  | 28                  | 312                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| 2.40  | 3.1               | 5.7                | 7.7      | 1.4 | ZTR412SPH731_0050 EZ705U | 18                  | 28                  | 459                | 5.000 | 1.17                   | 2.67                   | 22                 | 7                        | 115                 | 4             | 12 | 50.9          |
| <b>ZTR4PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 18</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.23  | 8.7               | 11                 | 0.7      | 1.1 | ZTR412SPH732_0700 EZ501U | 18                  | 28                  | 459                | 70.00 | 0.14                   | 0.27                   | 22                 | 7                        | 110                 | 4             | 12 | 50.9          |
| 0.32  | 6.2               | 8.0                | 0.9      | 1.3 | ZTR412SPH732_0500 EZ501U | 18                  | 28                  | 459                | 50.00 | 0.20                   | 0.37                   | 22                 | 7                        | 112                 | 4             | 12 | 50.9          |
| 0.40  | 5.0               | 6.4                | 1.1      | 1.6 | ZTR412SPH732_0400 EZ501U | 18                  | 28                  | 459                | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40  | 7.6               | 11                 | 1.7      | 1.0 | ZTR412SPH732_0400 EZ502U | 18                  | 28                  | 459                | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.40  | 7.6               | 12                 | 1.7      | 1.0 | ZTR412SPH732_0400 EZ701U | 18                  | 28                  | 459                | 40.00 | 0.25                   | 0.47                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.46  | 4.3               | 5.6                | 1.0      | 1.7 | ZTR412SPH732_0350 EZ501U | 18                  | 28                  | 459                | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.46  | 6.6               | 10                 | 1.6      | 1.1 | ZTR412SPH732_0350 EZ502U | 18                  | 28                  | 459                | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.46  | 6.6               | 10                 | 1.6      | 1.1 | ZTR412SPH732_0350 EZ701U | 18                  | 28                  | 459                | 35.00 | 0.28                   | 0.53                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.57  | 3.5               | 4.5                | 1.1      | 2.0 | ZTR412SPH732_0280 EZ501U | 16                  | 28                  | 417                | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.57  | 5.3               | 8.0                | 1.7      | 1.3 | ZTR412SPH732_0280 EZ502U | 18                  | 28                  | 459                | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.57  | 5.3               | 8.1                | 1.7      | 1.3 | ZTR412SPH732_0280 EZ701U | 18                  | 28                  | 459                | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.57  | 6.3               | 11                 | 2.1      | 1.1 | ZTR412SPH732_0280 EZ503U | 18                  | 28                  | 459                | 28.00 | 0.35                   | 0.67                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 0.64  | 3.1               | 4.0                | 1.3      | 2.1 | ZTR412SPH732_0250 EZ501U | 15                  | 28                  | 372                | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.64  | 4.7               | 7.1                | 2.0      | 1.4 | ZTR412SPH732_0250 EZ502U | 18                  | 28                  | 459                | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.64  | 4.7               | 7.2                | 2.0      | 1.4 | ZTR412SPH732_0250 EZ701U | 18                  | 28                  | 459                | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.64  | 5.7               | 9.7                | 2.3      | 1.2 | ZTR412SPH732_0250 EZ503U | 18                  | 28                  | 459                | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.64  | 6.6               | 13                 | 2.7      | 1.0 | ZTR412SPH732_0250 EZ702U | 18                  | 28                  | 459                | 25.00 | 0.37                   | 0.75                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.80  | 2.5               | 3.2                | 1.5      | 2.5 | ZTR412SPH732_0200 EZ501U | 12                  | 28                  | 298                | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.80  | 3.8               | 5.7                | 2.2      | 1.6 | ZTR412SPH732_0200 EZ502U | 18                  | 28                  | 459                | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.80  | 3.8               | 5.8                | 2.2      | 1.6 | ZTR412SPH732_0200 EZ701U | 15                  | 28                  | 372                | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.80  | 4.5               | 7.7                | 2.6      | 1.4 | ZTR412SPH732_0200 EZ503U | 18                  | 28                  | 459                | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 0.80  | 5.3               | 10                 | 3.1      | 1.2 | ZTR412SPH732_0200 EZ702U | 18                  | 28                  | 459                | 20.00 | 0.40                   | 0.80                   | 22                 | 7                        | 113                 | 4             | 12 | 50.9          |
| 1.00  | 2.0               | 2.6                | 1.6      | 2.9 | ZTR412SPH732_0160 EZ501U | 9.3                 | 28                  | 238                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 1.00  | 3.0               | 4.6                | 2.5      | 1.9 | ZTR412SPH732_0160 EZ502U | 18                  | 28                  | 459                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 1.00  | 3.0               | 4.6                | 2.5      | 1.9 | ZTR412SPH732_0160 EZ701U | 12                  | 28                  | 298                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 1.00  | 3.6               | 6.2                | 3.0      | 1.6 | ZTR412SPH732_0160 EZ503U | 18                  | 28                  | 459                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| 1.00  | 4.2               | 8.4                | 3.4      | 1.4 | ZTR412SPH732_0160 EZ702U | 18                  | 28                  | 459                | 16.00 | 0.50                   | 1.00                   | 22                 | 7                        | 114                 | 4             | 12 | 50.9          |
| <b>ZTR3PH8 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.43  | 20                | 30                 | 5.7      | 1.2 | ZTR332SPH832_0250 EZ805U | 25                  | 44                  | 1294               | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.53  | 16                | 24                 | 6.6      | 1.3 | ZTR332SPH832_0200 EZ805U | 25                  | 44                  | 1294               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.67  | 13                | 19                 | 8.4      | 1.6 | ZTR332SPH832_0160 EZ805U | 25                  | 44                  | 1294               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.07  | 8.2               | 12                 | 4.2      | 1.8 | ZTR332SPH831_0100 EZ805U | 25                  | 44                  | 1294               | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 162                 | 3             | 32 | 101.9         |
| 1.52  | 5.8               | 8.7                | 5.0      | 2.6 | ZTR332SPH831_0070 EZ805U | 25                  | 44                  | 1294               | 7.000 | 1.52                   | 3.05                   | 44                 | 15                       | 179                 | 3             | 32 | 101.9         |
| 2.13  | 4.1               | 6.2                | 7.5      | 3.3 | ZTR332SPH831_0050 EZ805U | 19                  | 44                  | 984                | 5.000 | 1.71                   | 4.27                   | 44                 | 15                       | 192                 | 3             | 32 | 101.9         |
| 2.67  | 3.3               | 5.0                | 12       | 3.8 | ZTR332SPH831_0040 EZ805U | 15                  | 39                  | 787                | 4.000 | 1.87                   | 4.67                   | 44                 | 15                       | 193                 | 3             | 32 | 101.9         |
| <b>ZTR3PH8 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.16  | 14                | 15                 | 0.7      | 1.3 | ZTR332SPH832_1000 EZ701U | 25                  | 44                  | 1294               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 161                 | 3             | 32 | 101.9         |
| 0.23  | 9.5               | 11                 | 0.6      | 2.6 | ZTR332SPH832_0700 EZ701U | 25                  | 44                  | 1294               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |

5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{z2N}$<br>[m/s]  | $F_{z2N}$<br>[kN] | $F_{z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{z2acc}$<br>[kN] | $F_{z2NOT}$<br>[kN] | $M_{z2acc}$<br>[Nm] | i     | $v_{z2maxDB}$<br>[m/s] | $v_{z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR3PH8 (<math>n_{1N} = 3000</math> rpm, (<math>F_{z2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.23  | 15                | 18                 | 1.0      | 1.6 | ZTR332SPH832_0700 EZ702U | 25                  | 44                  | 1294                | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.23  | 21                | 27                 | 1.3      | 1.2 | ZTR332SPH832_0700 EZ703U | 25                  | 44                  | 1294                | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.32  | 6.8               | 7.6                | 0.7      | 3.7 | ZTR332SPH832_0500 EZ701U | 18                  | 44                  | 930                 | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.32  | 11                | 13                 | 1.1      | 2.3 | ZTR332SPH832_0500 EZ702U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.32  | 15                | 19                 | 1.6      | 1.7 | ZTR332SPH832_0500 EZ703U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.32  | 19                | 28                 | 2.0      | 1.3 | ZTR332SPH832_0500 EZ705U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.32  | 20                | 34                 | 2.1      | 1.2 | ZTR332SPH832_0500 EZ802U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.32  | 24                | 44                 | 2.5      | 1.0 | ZTR332SPH832_0500 EZ803U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.40  | 5.4               | 6.1                | 1.0      | 3.7 | ZTR332SPH832_0400 EZ701U | 15                  | 44                  | 744                 | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.40  | 8.8               | 11                 | 1.6      | 2.3 | ZTR332SPH832_0400 EZ702U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.40  | 12                | 15                 | 2.2      | 1.7 | ZTR332SPH832_0400 EZ703U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.40  | 16                | 22                 | 2.8      | 1.3 | ZTR332SPH832_0400 EZ705U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.40  | 16                | 27                 | 2.9      | 1.2 | ZTR332SPH832_0400 EZ802U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.40  | 19                | 35                 | 3.5      | 1.0 | ZTR332SPH832_0400 EZ803U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.46  | 4.7               | 5.3                | 0.8      | 4.8 | ZTR332SPH832_0350 EZ701U | 13                  | 44                  | 651                 | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.46  | 7.7               | 9.2                | 1.4      | 2.9 | ZTR332SPH832_0350 EZ702U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.46  | 11                | 13                 | 1.9      | 2.1 | ZTR332SPH832_0350 EZ703U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.46  | 14                | 19                 | 2.4      | 1.7 | ZTR332SPH832_0350 EZ705U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.46  | 14                | 24                 | 2.5      | 1.6 | ZTR332SPH832_0350 EZ802U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.46  | 17                | 31                 | 3.0      | 1.3 | ZTR332SPH832_0350 EZ803U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.57  | 6.1               | 7.4                | 1.9      | 3.2 | ZTR332SPH832_0280 EZ702U | 21                  | 44                  | 1068                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.57  | 8.4               | 11                 | 2.6      | 2.3 | ZTR332SPH832_0280 EZ703U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.57  | 11                | 15                 | 3.4      | 1.8 | ZTR332SPH832_0280 EZ705U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.57  | 11                | 19                 | 3.5      | 1.7 | ZTR332SPH832_0280 EZ802U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.57  | 14                | 25                 | 4.2      | 1.5 | ZTR332SPH832_0280 EZ803U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.64  | 5.5               | 6.6                | 1.6      | 3.7 | ZTR332SPH832_0250 EZ702U | 19                  | 44                  | 953                 | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.64  | 7.5               | 9.5                | 2.2      | 2.7 | ZTR332SPH832_0250 EZ703U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.64  | 9.7               | 14                 | 2.9      | 2.1 | ZTR332SPH832_0250 EZ705U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.64  | 10                | 17                 | 3.0      | 2.0 | ZTR332SPH832_0250 EZ802U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.64  | 12                | 22                 | 3.6      | 1.7 | ZTR332SPH832_0250 EZ803U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.80  | 4.4               | 5.3                | 1.8      | 4.3 | ZTR332SPH832_0200 EZ702U | 15                  | 44                  | 763                 | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.80  | 6.0               | 7.6                | 2.5      | 3.1 | ZTR332SPH832_0200 EZ703U | 24                  | 44                  | 1209                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.80  | 7.8               | 11                 | 3.2      | 2.4 | ZTR332SPH832_0200 EZ705U | 25                  | 44                  | 1294                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.80  | 8.1               | 14                 | 3.4      | 2.3 | ZTR332SPH832_0200 EZ802U | 25                  | 44                  | 1294                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.80  | 9.7               | 18                 | 4.0      | 1.9 | ZTR332SPH832_0200 EZ803U | 25                  | 44                  | 1294                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 1.00  | 3.5               | 4.2                | 2.5      | 5.0 | ZTR332SPH832_0160 EZ702U | 12                  | 44                  | 610                 | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.00  | 4.8               | 6.1                | 3.5      | 3.6 | ZTR332SPH832_0160 EZ703U | 19                  | 44                  | 967                 | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.00  | 6.2               | 8.8                | 4.5      | 2.8 | ZTR332SPH832_0160 EZ705U | 25                  | 44                  | 1294                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.00  | 6.5               | 11                 | 4.7      | 2.7 | ZTR332SPH832_0160 EZ802U | 25                  | 44                  | 1294                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.00  | 7.8               | 14                 | 5.6      | 2.2 | ZTR332SPH832_0160 EZ803U | 25                  | 44                  | 1294                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.60  | 4.2               | 7.0                | 2.5      | 3.2 | ZTR332SPH831_0100 EZ802U | 19                  | 44                  | 960                 | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 162                 | 3             | 32 | 101.9         |
| 1.60  | 5.0               | 9.1                | 2.9      | 2.6 | ZTR332SPH831_0100 EZ803U | 25                  | 44                  | 1294                | 10.00 | 1.17                   | 2.13                   | 44                 | 15                       | 162                 | 3             | 32 | 101.9         |
| 2.29  | 2.9               | 4.9                | 2.9      | 4.5 | ZTR332SPH831_0070 EZ802U | 13                  | 44                  | 672                 | 7.000 | 1.52                   | 3.05                   | 44                 | 15                       | 179                 | 3             | 32 | 101.9         |
| 2.29  | 3.5               | 6.4                | 3.5      | 3.8 | ZTR332SPH831_0070 EZ803U | 19                  | 44                  | 974                 | 7.000 | 1.52                   | 3.05                   | 44                 | 15                       | 179                 | 3             | 32 | 101.9         |
| 3.20  | 2.5               | 4.5                | 5.2      | 4.7 | ZTR332SPH831_0050 EZ803U | 14                  | 44                  | 696                 | 5.000 | 1.71                   | 4.27                   | 44                 | 15                       | 192                 | 3             | 32 | 101.9         |
| <b>ZTR3PH8 (<math>n_{1N} = 4500</math> rpm, (<math>F_{z2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.34  | 13                | 44                 | 1.0      | 1.6 | ZTR332SPH832_0700 EZ802U | 25                  | 44                  | 1294                | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.34  | 15                | 26                 | 1.1      | 1.4 | ZTR332SPH832_0700 EZ703U | 25                  | 44                  | 1294                | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.34  | 21                | 38                 | 1.5      | 1.0 | ZTR332SPH832_0700 EZ705U | 25                  | 44                  | 1294                | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.48  | 9.6               | 31                 | 1.1      | 2.3 | ZTR332SPH832_0500 EZ802U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.48  | 11                | 18                 | 1.3      | 2.0 | ZTR332SPH832_0500 EZ703U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.48  | 15                | 27                 | 1.8      | 1.5 | ZTR332SPH832_0500 EZ705U | 25                  | 44                  | 1294                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.60  | 7.7               | 25                 | 1.6      | 2.3 | ZTR332SPH832_0400 EZ802U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.60  | 8.8               | 15                 | 1.8      | 2.0 | ZTR332SPH832_0400 EZ703U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.60  | 12                | 22                 | 2.5      | 1.5 | ZTR332SPH832_0400 EZ705U | 25                  | 44                  | 1294                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.69  | 6.7               | 22                 | 1.4      | 2.9 | ZTR332SPH832_0350 EZ802U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.69  | 7.7               | 13                 | 1.6      | 2.6 | ZTR332SPH832_0350 EZ703U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.69  | 10                | 19                 | 2.1      | 1.9 | ZTR332SPH832_0350 EZ705U | 25                  | 44                  | 1294                | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 0.86  | 5.4               | 18                 | 1.9      | 3.2 | ZTR332SPH832_0280 EZ802U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.86  | 6.2               | 10                 | 2.2      | 2.8 | ZTR332SPH832_0280 EZ703U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.86  | 8.4               | 15                 | 3.0      | 2.1 | ZTR332SPH832_0280 EZ705U | 25                  | 44                  | 1294                | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| 0.96  | 4.8               | 16                 | 1.6      | 3.7 | ZTR332SPH832_0250 EZ802U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.96  | 5.5               | 9.1                | 1.9      | 3.2 | ZTR332SPH832_0250 EZ703U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 0.96  | 7.5               | 14                 | 2.5      | 2.4 | ZTR332SPH832_0250 EZ705U | 25                  | 44                  | 1294                | 25.00 | 0.58                   | 1.17                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 1.20  | 3.8               | 13                 | 1.8      | 4.3 | ZTR332SPH832_0200 EZ802U | 25                  | 44                  | 1294                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 1.20  | 4.4               | 7.3                | 2.1      | 3.7 | ZTR332SPH832_0200 EZ703U | 24                  | 44                  | 1209                | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR3PH8 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.20  | 6.0               | 11                 | 2.8      | 2.7 | ZTR332SPH832_0200 EZ705U | 25                  | 44                  | 1294               | 20.00 | 0.67                   | 1.20                   | 44                 | 15                       | 185                 | 3             | 32 | 101.9         |
| 1.50  | 3.1               | 10                 | 2.5      | 5.0 | ZTR332SPH832_0160 EZ802U | 25                  | 44                  | 1294               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.50  | 3.5               | 5.8                | 2.9      | 4.3 | ZTR332SPH832_0160 EZ703U | 19                  | 44                  | 967                | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| 1.50  | 4.8               | 8.8                | 3.9      | 3.2 | ZTR332SPH832_0160 EZ705U | 25                  | 44                  | 1294               | 16.00 | 0.83                   | 1.50                   | 44                 | 15                       | 183                 | 3             | 32 | 101.9         |
| <b>ZTR3PH8 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 25</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.32  | 9.5               | 14                 | 0.6      | 1.4 | ZTR332SPH832_1000 EZ701U | 25                  | 44                  | 1294               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 161                 | 3             | 32 | 101.9         |
| 0.32  | 13                | 26                 | 0.9      | 1.0 | ZTR332SPH832_1000 EZ702U | 25                  | 44                  | 1294               | 100.0 | 0.16                   | 0.32                   | 44                 | 15                       | 161                 | 3             | 32 | 101.9         |
| 0.46  | 6.6               | 10                 | 0.5      | 3.0 | ZTR332SPH832_0700 EZ701U | 25                  | 44                  | 1294               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.46  | 9.2               | 18                 | 0.7      | 2.1 | ZTR332SPH832_0700 EZ702U | 25                  | 44                  | 1294               | 70.00 | 0.23                   | 0.46                   | 44                 | 15                       | 174                 | 3             | 32 | 101.9         |
| 0.64  | 4.7               | 7.2                | 0.6      | 4.2 | ZTR332SPH832_0500 EZ701U | 18                  | 44                  | 930                | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.64  | 6.6               | 13                 | 0.9      | 3.0 | ZTR332SPH832_0500 EZ702U | 25                  | 44                  | 1294               | 50.00 | 0.32                   | 0.64                   | 44                 | 15                       | 182                 | 3             | 32 | 101.9         |
| 0.80  | 3.8               | 5.8                | 0.9      | 4.2 | ZTR332SPH832_0400 EZ701U | 15                  | 44                  | 744                | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.80  | 5.3               | 10                 | 1.2      | 3.0 | ZTR332SPH832_0400 EZ702U | 25                  | 44                  | 1294               | 40.00 | 0.40                   | 0.80                   | 44                 | 15                       | 178                 | 3             | 32 | 101.9         |
| 0.91  | 4.6               | 9.1                | 1.0      | 3.9 | ZTR332SPH832_0350 EZ702U | 25                  | 44                  | 1294               | 35.00 | 0.46                   | 0.91                   | 44                 | 15                       | 184                 | 3             | 32 | 101.9         |
| 1.14  | 3.7               | 7.3                | 1.4      | 4.3 | ZTR332SPH832_0280 EZ702U | 21                  | 44                  | 1068               | 28.00 | 0.57                   | 1.14                   | 44                 | 15                       | 181                 | 3             | 32 | 101.9         |
| <b>ZTR4PH8 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 36</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.44  | 19                | 29                 | 6.6      | 1.1 | ZTR420SPH832_0200 EZ805U | 36                  | 50                  | 1511               | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.47  | 18                | 27                 | 8.4      | 1.1 | ZTR417SPH832_0160 EZ805U | 35                  | 55                  | 1263               | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.76  | 12                | 18                 | 4.2      | 1.4 | ZTR417SPH831_0100 EZ805U | 35                  | 55                  | 1263               | 10.00 | 0.83                   | 1.51                   | 31                 | 10                       | 201                 | 4             | 17 | 72.2          |
| 1.08  | 8.1               | 12                 | 5.0      | 1.8 | ZTR417SPH831_0070 EZ805U | 35                  | 55                  | 1263               | 7.000 | 1.08                   | 2.16                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 1.51  | 5.8               | 8.8                | 7.5      | 2.3 | ZTR417SPH831_0050 EZ805U | 27                  | 55                  | 984                | 5.000 | 1.21                   | 3.02                   | 31                 | 10                       | 222                 | 4             | 17 | 72.2          |
| 1.89  | 4.7               | 7.0                | 12       | 2.7 | ZTR417SPH831_0040 EZ805U | 22                  | 55                  | 787                | 4.000 | 1.32                   | 3.31                   | 31                 | 10                       | 223                 | 4             | 17 | 72.2          |
| <b>ZTR4PH8 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 36</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.11  | 19                | 21                 | 0.7      | 1.3 | ZTR417SPH832_1000 EZ701U | 35                  | 55                  | 1263               | 100.0 | 0.11                   | 0.23                   | 31                 | 10                       | 200                 | 4             | 17 | 72.2          |
| 0.16  | 13                | 15                 | 0.6      | 2.1 | ZTR417SPH832_0700 EZ701U | 35                  | 55                  | 1263               | 70.00 | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.16  | 22                | 26                 | 1.0      | 1.3 | ZTR417SPH832_0700 EZ702U | 35                  | 55                  | 1263               | 70.00 | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.19  | 11                | 13                 | 0.6      | 2.5 | ZTR420SPH832_0700 EZ701U | 31                  | 50                  | 1302               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.19  | 18                | 22                 | 1.0      | 1.5 | ZTR420SPH832_0700 EZ702U | 36                  | 50                  | 1511               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.19  | 25                | 32                 | 1.3      | 1.1 | ZTR420SPH832_0700 EZ703U | 36                  | 50                  | 1511               | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.23  | 9.5               | 11                 | 0.7      | 2.6 | ZTR417SPH832_0500 EZ701U | 26                  | 55                  | 930                | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.23  | 15                | 19                 | 1.1      | 1.6 | ZTR417SPH832_0500 EZ702U | 35                  | 55                  | 1263               | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.23  | 21                | 27                 | 1.6      | 1.2 | ZTR417SPH832_0500 EZ703U | 35                  | 55                  | 1263               | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.27  | 8.1               | 9.1                | 0.7      | 3.1 | ZTR420SPH832_0500 EZ701U | 22                  | 50                  | 930                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.27  | 13                | 16                 | 1.1      | 1.9 | ZTR420SPH832_0500 EZ702U | 36                  | 50                  | 1511               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.27  | 18                | 23                 | 1.6      | 1.4 | ZTR420SPH832_0500 EZ703U | 36                  | 50                  | 1511               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.27  | 23                | 33                 | 2.0      | 1.1 | ZTR420SPH832_0500 EZ705U | 36                  | 50                  | 1511               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.27  | 24                | 41                 | 2.1      | 1.0 | ZTR420SPH832_0500 EZ802U | 36                  | 50                  | 1511               | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.28  | 7.6               | 8.6                | 1.0      | 3.1 | ZTR417SPH832_0400 EZ701U | 21                  | 55                  | 744                | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.28  | 12                | 15                 | 1.6      | 1.9 | ZTR417SPH832_0400 EZ702U | 35                  | 55                  | 1263               | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.28  | 17                | 21                 | 2.2      | 1.4 | ZTR417SPH832_0400 EZ703U | 35                  | 55                  | 1263               | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.28  | 22                | 31                 | 2.8      | 1.1 | ZTR417SPH832_0400 EZ705U | 35                  | 55                  | 1263               | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.28  | 23                | 38                 | 2.9      | 1.0 | ZTR417SPH832_0400 EZ802U | 35                  | 55                  | 1263               | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.32  | 6.7               | 7.5                | 0.8      | 3.3 | ZTR417SPH832_0350 EZ701U | 18                  | 55                  | 651                | 35.00 | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.32  | 11                | 13                 | 1.4      | 2.1 | ZTR417SPH832_0350 EZ702U | 35                  | 55                  | 1263               | 35.00 | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.32  | 15                | 19                 | 1.9      | 1.5 | ZTR417SPH832_0350 EZ703U | 35                  | 55                  | 1263               | 35.00 | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.32  | 19                | 27                 | 2.4      | 1.2 | ZTR417SPH832_0350 EZ705U | 35                  | 55                  | 1263               | 35.00 | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.32  | 20                | 33                 | 2.5      | 1.1 | ZTR417SPH832_0350 EZ802U | 35                  | 55                  | 1263               | 35.00 | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.33  | 6.5               | 7.3                | 1.0      | 3.6 | ZTR420SPH832_0400 EZ701U | 18                  | 50                  | 744                | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.33  | 11                | 13                 | 1.6      | 2.2 | ZTR420SPH832_0400 EZ702U | 36                  | 50                  | 1511               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.33  | 14                | 18                 | 2.2      | 1.6 | ZTR420SPH832_0400 EZ703U | 36                  | 50                  | 1511               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.33  | 19                | 26                 | 2.8      | 1.2 | ZTR420SPH832_0400 EZ705U | 36                  | 50                  | 1511               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.33  | 20                | 33                 | 2.9      | 1.2 | ZTR420SPH832_0400 EZ802U | 36                  | 50                  | 1511               | 40.00 | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.38  | 5.7               | 6.4                | 0.8      | 3.9 | ZTR420SPH832_0350 EZ701U | 15                  | 50                  | 651                | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.38  | 9.2               | 11                 | 1.4      | 2.4 | ZTR420SPH832_0350 EZ702U | 31                  | 50                  | 1335               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.38  | 13                | 16                 | 1.9      | 1.7 | ZTR420SPH832_0350 EZ703U | 36                  | 50                  | 1511               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.38  | 16                | 23                 | 2.4      | 1.4 | ZTR420SPH832_0350 EZ705U | 36                  | 50                  | 1511               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.38  | 17                | 28                 | 2.5      | 1.3 | ZTR420SPH832_0350 EZ802U | 36                  | 50                  | 1511               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.38  | 20                | 37                 | 3.0      | 1.1 | ZTR420SPH832_0350 EZ803U | 36                  | 50                  | 1511               | 35.00 | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.41  | 5.3               | 6.0                | 1.2      | 3.9 | ZTR417SPH832_0280 EZ701U | 14                  | 55                  | 521                | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.41  | 8.7               | 10                 | 1.9      | 2.4 | ZTR417SPH832_0280 EZ702U | 30                  | 55                  | 1068               | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.41  | 12                | 15                 | 2.6      | 1.7 | ZTR417SPH832_0280 EZ703U | 35                  | 55                  | 1263               | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.41  | 15                | 22                 | 3.4      | 1.3 | ZTR417SPH832_0280 EZ705U | 35                  | 55                  | 1263               | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.41  | 16                | 27                 | 3.5      | 1.3 | ZTR417SPH832_0280 EZ802U | 35                  | 55                  | 1263               | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.41  | 19                | 35                 | 4.2      | 1.1 | ZTR417SPH832_0280 EZ803U | 35                  | 55                  | 1263               | 28.00 | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.45  | 4.8               | 5.3                | 1.0      | 4.2 | ZTR417SPH832_0250 EZ701U | 13                  | 55                  | 465                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.45  | 7.7               | 9.3                | 1.6      | 2.6 | ZTR417SPH832_0250 EZ702U | 26                  | 55                  | 953                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |



5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{z2N}$<br>[m/s]   | $F_{z2N}$<br>[kN] | $F_{z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{z2acc}$<br>[kN] | $F_{z2NOT}$<br>[kN] | $M_{z2acc}$<br>[Nm] | i     | $v_{z2maxDB}$<br>[m/s] | $v_{z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR4PH8 (n<sub>1N</sub> = 3000 rpm, (F<sub>z2acc,max</sub> = 36 kN)</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.45   | 11                | 13                 | 2.2      | 1.9 | ZTR417SPH832_0250 EZ703U | 35                  | 55                  | 1263                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.45   | 14                | 19                 | 2.9      | 1.4 | ZTR417SPH832_0250 EZ705U | 35                  | 55                  | 1263                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.45   | 14                | 24                 | 3.0      | 1.4 | ZTR417SPH832_0250 EZ802U | 35                  | 55                  | 1263                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.45   | 17                | 31                 | 3.6      | 1.2 | ZTR417SPH832_0250 EZ803U | 35                  | 55                  | 1263                | 25.00 | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.48   | 4.5               | 5.1                | 1.2      | 4.5 | ZTR420SPH832_0280 EZ701U | 12                  | 50                  | 521                 | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.48   | 7.4               | 8.8                | 1.9      | 2.8 | ZTR420SPH832_0280 EZ702U | 25                  | 50                  | 1068                | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.48   | 10                | 13                 | 2.6      | 2.0 | ZTR420SPH832_0280 EZ703U | 36                  | 50                  | 1511                | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.48   | 13                | 19                 | 3.4      | 1.6 | ZTR420SPH832_0280 EZ705U | 36                  | 50                  | 1511                | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.48   | 14                | 23                 | 3.5      | 1.5 | ZTR420SPH832_0280 EZ802U | 36                  | 50                  | 1511                | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.48   | 16                | 30                 | 4.2      | 1.3 | ZTR420SPH832_0280 EZ803U | 36                  | 50                  | 1511                | 28.00 | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.53   | 4.1               | 4.5                | 1.0      | 4.9 | ZTR420SPH832_0250 EZ701U | 11                  | 50                  | 465                 | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.53   | 6.6               | 7.9                | 1.6      | 3.0 | ZTR420SPH832_0250 EZ702U | 22                  | 50                  | 953                 | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.53   | 9.0               | 11                 | 2.2      | 2.2 | ZTR420SPH832_0250 EZ703U | 36                  | 50                  | 1511                | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.53   | 12                | 17                 | 2.9      | 1.7 | ZTR420SPH832_0250 EZ705U | 36                  | 50                  | 1511                | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.53   | 12                | 20                 | 3.0      | 1.6 | ZTR420SPH832_0250 EZ802U | 36                  | 50                  | 1511                | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.53   | 15                | 26                 | 3.6      | 1.4 | ZTR420SPH832_0250 EZ803U | 36                  | 50                  | 1511                | 25.00 | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.57   | 3.8               | 4.3                | 1.1      | 4.8 | ZTR417SPH832_0200 EZ701U | 10                  | 55                  | 372                 | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.57   | 6.2               | 7.4                | 1.8      | 3.0 | ZTR417SPH832_0200 EZ702U | 21                  | 55                  | 763                 | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.57   | 8.5               | 11                 | 2.5      | 2.2 | ZTR417SPH832_0200 EZ703U | 34                  | 55                  | 1209                | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.57   | 11                | 16                 | 3.2      | 1.7 | ZTR417SPH832_0200 EZ705U | 35                  | 55                  | 1263                | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.57   | 11                | 19                 | 3.4      | 1.6 | ZTR417SPH832_0200 EZ802U | 35                  | 55                  | 1263                | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.57   | 14                | 25                 | 4.0      | 1.3 | ZTR417SPH832_0200 EZ803U | 35                  | 55                  | 1263                | 20.00 | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.67   | 5.3               | 6.3                | 1.8      | 3.5 | ZTR420SPH832_0200 EZ702U | 18                  | 50                  | 763                 | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.67   | 7.2               | 9.1                | 2.5      | 2.5 | ZTR420SPH832_0200 EZ703U | 28                  | 50                  | 1209                | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.67   | 9.3               | 13                 | 3.2      | 2.0 | ZTR420SPH832_0200 EZ705U | 36                  | 50                  | 1511                | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.67   | 9.8               | 16                 | 3.4      | 1.9 | ZTR420SPH832_0200 EZ802U | 36                  | 50                  | 1511                | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.67   | 12                | 21                 | 4.0      | 1.6 | ZTR420SPH832_0200 EZ803U | 36                  | 50                  | 1511                | 20.00 | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.71   | 4.9               | 5.9                | 2.5      | 3.5 | ZTR417SPH832_0160 EZ702U | 17                  | 55                  | 610                 | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.71   | 6.8               | 8.6                | 3.5      | 2.5 | ZTR417SPH832_0160 EZ703U | 27                  | 55                  | 967                 | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.71   | 8.8               | 12                 | 4.5      | 2.0 | ZTR417SPH832_0160 EZ705U | 35                  | 55                  | 1263                | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.71   | 9.2               | 15                 | 4.7      | 1.9 | ZTR417SPH832_0160 EZ802U | 35                  | 55                  | 1263                | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.71   | 11                | 20                 | 5.6      | 1.6 | ZTR417SPH832_0160 EZ803U | 35                  | 55                  | 1263                | 16.00 | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.83   | 4.2               | 5.0                | 2.5      | 4.1 | ZTR420SPH832_0160 EZ702U | 14                  | 50                  | 610                 | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 0.83   | 5.8               | 7.3                | 3.5      | 2.9 | ZTR420SPH832_0160 EZ703U | 23                  | 50                  | 967                 | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 0.83   | 7.5               | 11                 | 4.5      | 2.3 | ZTR420SPH832_0160 EZ705U | 36                  | 50                  | 1511                | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 0.83   | 7.8               | 13                 | 4.7      | 2.2 | ZTR420SPH832_0160 EZ802U | 35                  | 50                  | 1488                | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 0.83   | 9.3               | 17                 | 5.6      | 1.8 | ZTR420SPH832_0160 EZ803U | 36                  | 50                  | 1511                | 16.00 | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 1.13   | 5.9               | 9.9                | 2.5      | 2.5 | ZTR417SPH831_0100 EZ802U | 27                  | 55                  | 960                 | 10.00 | 0.83                   | 1.51                   | 31                 | 10                       | 201                 | 4             | 17 | 72.2          |
| 1.13   | 7.1               | 13                 | 2.9      | 2.1 | ZTR417SPH831_0100 EZ803U | 35                  | 55                  | 1263                | 10.00 | 0.83                   | 1.51                   | 31                 | 10                       | 201                 | 4             | 17 | 72.2          |
| 1.33   | 5.0               | 8.4                | 2.5      | 2.9 | ZTR420SPH831_0100 EZ802U | 23                  | 50                  | 960                 | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 188                 | 4             | 20 | 84.9          |
| 1.33   | 6.0               | 11                 | 2.9      | 2.4 | ZTR420SPH831_0100 EZ803U | 33                  | 50                  | 1392                | 10.00 | 0.98                   | 1.78                   | 37                 | 12                       | 188                 | 4             | 20 | 84.9          |
| 1.62   | 4.2               | 6.9                | 2.9      | 3.1 | ZTR417SPH831_0070 EZ802U | 19                  | 55                  | 672                 | 7.000 | 1.08                   | 2.16                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 1.62   | 5.0               | 9.0                | 3.5      | 2.6 | ZTR417SPH831_0070 EZ803U | 27                  | 55                  | 974                 | 7.000 | 1.08                   | 2.16                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 1.91   | 3.5               | 5.9                | 2.9      | 3.7 | ZTR420SPH831_0070 EZ802U | 16                  | 50                  | 672                 | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 203                 | 4             | 20 | 84.9          |
| 1.91   | 4.2               | 7.6                | 3.5      | 3.1 | ZTR420SPH831_0070 EZ803U | 23                  | 50                  | 974                 | 7.000 | 1.27                   | 2.54                   | 37                 | 12                       | 203                 | 4             | 20 | 84.9          |
| 2.27   | 3.0               | 4.9                | 4.4      | 3.9 | ZTR417SPH831_0050 EZ802U | 13                  | 55                  | 480                 | 5.000 | 1.21                   | 3.02                   | 31                 | 10                       | 222                 | 4             | 17 | 72.2          |
| 2.27   | 3.5               | 6.4                | 5.2      | 3.3 | ZTR417SPH831_0050 EZ803U | 19                  | 55                  | 696                 | 5.000 | 1.21                   | 3.02                   | 31                 | 10                       | 222                 | 4             | 17 | 72.2          |
| 2.67   | 2.5               | 4.2                | 4.4      | 4.6 | ZTR420SPH831_0050 EZ802U | 11                  | 50                  | 480                 | 5.000 | 1.42                   | 3.56                   | 37                 | 12                       | 214                 | 4             | 20 | 84.9          |
| 2.67   | 3.0               | 5.5                | 5.2      | 3.8 | ZTR420SPH831_0050 EZ803U | 16                  | 50                  | 696                 | 5.000 | 1.42                   | 3.56                   | 37                 | 12                       | 214                 | 4             | 20 | 84.9          |
| 2.83   | 2.4               | 3.9                | 7.2      | 4.6 | ZTR417SPH831_0040 EZ802U | 11                  | 55                  | 384                 | 4.000 | 1.32                   | 3.31                   | 31                 | 10                       | 223                 | 4             | 17 | 72.2          |
| 2.83   | 2.8               | 5.1                | 8.6      | 3.8 | ZTR417SPH831_0040 EZ803U | 15                  | 55                  | 557                 | 4.000 | 1.32                   | 3.31                   | 31                 | 10                       | 223                 | 4             | 17 | 72.2          |
| 3.33   | 2.4               | 4.4                | 8.6      | 4.5 | ZTR420SPH831_0040 EZ803U | 13                  | 47                  | 557                 | 4.000 | 1.56                   | 3.89                   | 37                 | 12                       | 215                 | 4             | 20 | 84.9          |
| <b>ZTR4PH8 (n<sub>1N</sub> = 4500 rpm, (F<sub>z2acc,max</sub> = 36 kN)</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.24   | 19                | 62                 | 1.0      | 1.3 | ZTR417SPH832_0700 EZ802U | 35                  | 55                  | 1263                | 70.00 | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.24   | 22                | 36                 | 1.1      | 1.1 | ZTR417SPH832_0700 EZ703U | 35                  | 55                  | 1263                | 70.00 | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.29   | 16                | 53                 | 1.0      | 1.5 | ZTR420SPH832_0700 EZ802U | 36                  | 50                  | 1511                | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.29   | 19                | 31                 | 1.1      | 1.3 | ZTR420SPH832_0700 EZ703U | 36                  | 50                  | 1511                | 70.00 | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.34   | 14                | 44                 | 1.1      | 1.6 | ZTR417SPH832_0500 EZ802U | 35                  | 55                  | 1263                | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.34   | 16                | 26                 | 1.3      | 1.4 | ZTR417SPH832_0500 EZ703U | 35                  | 55                  | 1263                | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.34   | 21                | 39                 | 1.8      | 1.0 | ZTR417SPH832_0500 EZ705U | 35                  | 55                  | 1263                | 50.00 | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.40   | 12                | 38                 | 1.1      | 1.9 | ZTR420SPH832_0500 EZ802U | 36                  | 50                  | 1511                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.40   | 13                | 22                 | 1.3      | 1.6 | ZTR420SPH832_0500 EZ703U | 36                  | 50                  | 1511                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.40   | 18                | 33                 | 1.8      | 1.2 | ZTR420SPH832_0500 EZ705U | 36                  | 50                  | 1511                | 50.00 | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.43   | 11                | 36                 | 1.6      | 1.9 | ZTR417SPH832_0400 EZ802U | 35                  | 55                  | 1263                | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.43   | 12                | 21                 | 1.8      | 1.6 | ZTR417SPH832_0400 EZ703U | 35                  | 55                  | 1263                | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.43   | 17                | 31                 | 2.5      | 1.2 | ZTR417SPH832_0400 EZ705U | 35                  | 55                  | 1263                | 40.00 | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |

| $v_{Z2N}$<br>[m/s]  | $F_{Z2N}$<br>[kN] | $F_{Z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{Z2acc}$<br>[kN] | $F_{Z2NOT}$<br>[kN] | $M_{Z2acc}$<br>[Nm] | i      | $v_{Z2maxDB}$<br>[m/s] | $v_{Z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|--------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR4PH8 (<math>n_{1N} = 4500</math> rpm, (<math>F_{Z2acc,max} = 36</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |        |                        |                        |                    |                          |                     |               |    |               |
| 0.49  | 9.5               | 31                 | 1.4      | 2.1 | ZTR417SPH832_0350 EZ802U | 35                  | 55                  | 1263                | 35.00  | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.49  | 11                | 18                 | 1.6      | 1.8 | ZTR417SPH832_0350 EZ703U | 35                  | 55                  | 1263                | 35.00  | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.49  | 15                | 27                 | 2.1      | 1.3 | ZTR417SPH832_0350 EZ705U | 35                  | 55                  | 1263                | 35.00  | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.50  | 9.2               | 30                 | 1.6      | 2.2 | ZTR420SPH832_0400 EZ802U | 36                  | 50                  | 1511                | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.50  | 11                | 18                 | 1.8      | 1.9 | ZTR420SPH832_0400 EZ703U | 36                  | 50                  | 1511                | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.50  | 14                | 26                 | 2.5      | 1.4 | ZTR420SPH832_0400 EZ705U | 36                  | 50                  | 1511                | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.57  | 8.1               | 26                 | 1.4      | 2.4 | ZTR420SPH832_0350 EZ802U | 36                  | 50                  | 1511                | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.57  | 9.3               | 15                 | 1.6      | 2.1 | ZTR420SPH832_0350 EZ703U | 36                  | 50                  | 1511                | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.57  | 13                | 23                 | 2.1      | 1.5 | ZTR420SPH832_0350 EZ705U | 36                  | 50                  | 1511                | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.61  | 7.6               | 25                 | 1.9      | 2.4 | ZTR417SPH832_0280 EZ802U | 35                  | 55                  | 1263                | 28.00  | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.61  | 8.7               | 14                 | 2.2      | 2.1 | ZTR417SPH832_0280 EZ703U | 35                  | 55                  | 1263                | 28.00  | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.61  | 12                | 22                 | 3.0      | 1.5 | ZTR417SPH832_0280 EZ705U | 35                  | 55                  | 1263                | 28.00  | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.68  | 6.8               | 22                 | 1.6      | 2.6 | ZTR417SPH832_0250 EZ802U | 35                  | 55                  | 1263                | 25.00  | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.68  | 7.8               | 13                 | 1.9      | 2.2 | ZTR417SPH832_0250 EZ703U | 35                  | 55                  | 1263                | 25.00  | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.68  | 11                | 19                 | 2.5      | 1.6 | ZTR417SPH832_0250 EZ705U | 35                  | 55                  | 1263                | 25.00  | 0.41                   | 0.83                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.71  | 6.4               | 21                 | 1.9      | 2.8 | ZTR420SPH832_0280 EZ802U | 36                  | 50                  | 1511                | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.71  | 7.4               | 12                 | 2.2      | 2.4 | ZTR420SPH832_0280 EZ703U | 36                  | 50                  | 1511                | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.71  | 10                | 18                 | 3.0      | 1.8 | ZTR420SPH832_0280 EZ705U | 36                  | 50                  | 1511                | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| 0.80  | 5.8               | 19                 | 1.6      | 3.0 | ZTR420SPH832_0250 EZ802U | 36                  | 50                  | 1511                | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.80  | 6.6               | 11                 | 1.9      | 2.6 | ZTR420SPH832_0250 EZ703U | 36                  | 50                  | 1511                | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.80  | 9.0               | 16                 | 2.5      | 1.9 | ZTR420SPH832_0250 EZ705U | 36                  | 50                  | 1511                | 25.00  | 0.48                   | 0.98                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 0.85  | 5.4               | 18                 | 1.8      | 3.0 | ZTR417SPH832_0200 EZ802U | 35                  | 55                  | 1263                | 20.00  | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.85  | 6.2               | 10                 | 2.1      | 2.6 | ZTR417SPH832_0200 EZ703U | 34                  | 55                  | 1209                | 20.00  | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 0.85  | 8.5               | 15                 | 2.8      | 1.9 | ZTR417SPH832_0200 EZ705U | 35                  | 55                  | 1263                | 20.00  | 0.47                   | 0.85                   | 31                 | 10                       | 218                 | 4             | 17 | 72.2          |
| 1.00  | 4.6               | 15                 | 1.8      | 3.5 | ZTR420SPH832_0200 EZ802U | 36                  | 50                  | 1511                | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 1.00  | 5.3               | 8.8                | 2.1      | 3.0 | ZTR420SPH832_0200 EZ703U | 28                  | 50                  | 1209                | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 1.00  | 7.2               | 13                 | 2.8      | 2.2 | ZTR420SPH832_0200 EZ705U | 36                  | 50                  | 1511                | 20.00  | 0.56                   | 1.00                   | 37                 | 12                       | 208                 | 4             | 20 | 84.9          |
| 1.06  | 4.3               | 14                 | 2.5      | 3.5 | ZTR417SPH832_0160 EZ802U | 35                  | 55                  | 1263                | 16.00  | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 1.06  | 5.0               | 8.2                | 2.9      | 3.0 | ZTR417SPH832_0160 EZ703U | 27                  | 55                  | 967                 | 16.00  | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 1.06  | 6.8               | 12                 | 3.9      | 2.2 | ZTR417SPH832_0160 EZ705U | 35                  | 55                  | 1263                | 16.00  | 0.59                   | 1.06                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 1.25  | 3.7               | 12                 | 2.5      | 4.0 | ZTR420SPH832_0160 EZ802U | 35                  | 50                  | 1488                | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 1.25  | 4.2               | 7.0                | 2.9      | 3.5 | ZTR420SPH832_0160 EZ703U | 23                  | 50                  | 967                 | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| 1.25  | 5.7               | 11                 | 3.9      | 2.6 | ZTR420SPH832_0160 EZ705U | 36                  | 50                  | 1511                | 16.00  | 0.69                   | 1.25                   | 37                 | 12                       | 206                 | 4             | 20 | 84.9          |
| <b>ZTR4PH8 (<math>n_{1N} = 6000</math> rpm, (<math>F_{Z2acc,max} = 36</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |        |                        |                        |                    |                          |                     |               |    |               |
| 0.23  | 13                | 20                 | 0.6      | 1.4 | ZTR417SPH832_1000 EZ701U | 35                  | 55                  | 1263                | 100.00 | 0.11                   | 0.23                   | 31                 | 10                       | 200                 | 4             | 17 | 72.2          |
| 0.23  | 19                | 37                 | 0.9      | 1.0 | ZTR417SPH832_1000 EZ702U | 35                  | 55                  | 1263                | 100.00 | 0.11                   | 0.23                   | 31                 | 10                       | 200                 | 4             | 17 | 72.2          |
| 0.27  | 11                | 17                 | 0.6      | 1.4 | ZTR420SPH832_1000 EZ701U | 33                  | 50                  | 1380                | 100.00 | 0.13                   | 0.27                   | 37                 | 12                       | 186                 | 4             | 20 | 84.9          |
| 0.27  | 16                | 31                 | 0.9      | 1.0 | ZTR420SPH832_1000 EZ702U | 33                  | 50                  | 1380                | 100.00 | 0.13                   | 0.27                   | 37                 | 12                       | 186                 | 4             | 20 | 84.9          |
| 0.32  | 9.4               | 14                 | 0.5      | 2.4 | ZTR417SPH832_0700 EZ701U | 35                  | 55                  | 1263                | 70.00  | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.32  | 13                | 26                 | 0.7      | 1.7 | ZTR417SPH832_0700 EZ702U | 35                  | 55                  | 1263                | 70.00  | 0.16                   | 0.32                   | 31                 | 10                       | 210                 | 4             | 17 | 72.2          |
| 0.38  | 8.0               | 12                 | 0.5      | 2.8 | ZTR420SPH832_0700 EZ701U | 31                  | 50                  | 1302                | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.38  | 11                | 22                 | 0.7      | 2.0 | ZTR420SPH832_0700 EZ702U | 36                  | 50                  | 1511                | 70.00  | 0.19                   | 0.38                   | 37                 | 12                       | 199                 | 4             | 20 | 84.9          |
| 0.45  | 6.7               | 10                 | 0.6      | 3.0 | ZTR417SPH832_0500 EZ701U | 26                  | 55                  | 930                 | 50.00  | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.45  | 9.3               | 18                 | 0.9      | 2.1 | ZTR417SPH832_0500 EZ702U | 35                  | 55                  | 1263                | 50.00  | 0.23                   | 0.45                   | 31                 | 10                       | 216                 | 4             | 17 | 72.2          |
| 0.53  | 5.7               | 8.7                | 0.6      | 3.5 | ZTR420SPH832_0500 EZ701U | 22                  | 50                  | 930                 | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.53  | 7.9               | 16                 | 0.9      | 2.5 | ZTR420SPH832_0500 EZ702U | 36                  | 50                  | 1511                | 50.00  | 0.27                   | 0.53                   | 37                 | 12                       | 205                 | 4             | 20 | 84.9          |
| 0.57  | 5.4               | 8.1                | 0.9      | 3.4 | ZTR417SPH832_0400 EZ701U | 21                  | 55                  | 744                 | 40.00  | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.57  | 7.4               | 15                 | 1.2      | 2.5 | ZTR417SPH832_0400 EZ702U | 35                  | 55                  | 1263                | 40.00  | 0.28                   | 0.57                   | 31                 | 10                       | 213                 | 4             | 17 | 72.2          |
| 0.65  | 4.7               | 7.1                | 0.7      | 3.8 | ZTR417SPH832_0350 EZ701U | 18                  | 55                  | 651                 | 35.00  | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.65  | 6.5               | 13                 | 1.0      | 2.7 | ZTR417SPH832_0350 EZ702U | 35                  | 55                  | 1263                | 35.00  | 0.32                   | 0.65                   | 31                 | 10                       | 217                 | 4             | 17 | 72.2          |
| 0.67  | 4.6               | 6.9                | 0.9      | 4.0 | ZTR420SPH832_0400 EZ701U | 18                  | 50                  | 744                 | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.67  | 6.3               | 13                 | 1.2      | 2.9 | ZTR420SPH832_0400 EZ702U | 36                  | 50                  | 1511                | 40.00  | 0.33                   | 0.67                   | 37                 | 12                       | 202                 | 4             | 20 | 84.9          |
| 0.76  | 4.0               | 6.1                | 0.7      | 4.4 | ZTR420SPH832_0350 EZ701U | 15                  | 50                  | 651                 | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.76  | 5.5               | 11                 | 1.0      | 3.2 | ZTR420SPH832_0350 EZ702U | 31                  | 50                  | 1335                | 35.00  | 0.38                   | 0.76                   | 37                 | 12                       | 207                 | 4             | 20 | 84.9          |
| 0.81  | 3.8               | 5.7                | 1.0      | 4.4 | ZTR417SPH832_0280 EZ701U | 14                  | 55                  | 521                 | 28.00  | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.81  | 5.2               | 10                 | 1.4      | 3.2 | ZTR417SPH832_0280 EZ702U | 30                  | 55                  | 1068                | 28.00  | 0.41                   | 0.81                   | 31                 | 10                       | 215                 | 4             | 17 | 72.2          |
| 0.95  | 4.4               | 8.8                | 1.4      | 3.7 | ZTR420SPH832_0280 EZ702U | 25                  | 50                  | 1068                | 28.00  | 0.48                   | 0.95                   | 37                 | 12                       | 204                 | 4             | 20 | 84.9          |
| <b>ZTR5PH8 (<math>n_{1N} = 2000</math> rpm, (<math>F_{Z2acc,max} = 34</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |        |                        |                        |                    |                          |                     |               |    |               |
| 0.40  | 21                | 32                 | 5.7      | 1.0 | ZTR518SPH832_0250 EZ805U | 34                  | 44                  | 1621                | 25.00  | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.50  | 17                | 26                 | 6.6      | 1.2 | ZTR518SPH832_0200 EZ805U | 34                  | 44                  | 1621                | 20.00  | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.63  | 14                | 21                 | 8.4      | 1.4 | ZTR518SPH832_0160 EZ805U | 34                  | 44                  | 1621                | 16.00  | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 1.00  | 8.8               | 13                 | 4.2      | 1.8 | ZTR518SPH831_0100 EZ805U | 29                  | 44                  | 1392                | 10.00  | 1.10                   | 2.00                   | 42                 | 14                       | 179                 | 5             | 18 | 95.5          |
| 1.43  | 6.2               | 9.3                | 5.0      | 2.3 | ZTR518SPH831_0070 EZ805U | 29                  | 44                  | 1378                | 7.000  | 1.43                   | 2.86                   | 42                 | 14                       | 197                 | 5             | 18 | 95.5          |
| 2.00  | 4.4               | 6.6                | 7.5      | 2.9 | ZTR518SPH831_0050 EZ805U | 21                  | 44                  | 984                 | 5.000  | 1.60                   | 4.00                   | 42                 | 14                       | 210                 | 5             | 18 | 95.5          |
| 2.50  | 3.5               | 5.3                | 12       | 3.4 | ZTR518SPH831_0040 EZ805U | 16                  | 42                  | 787                 | 4.000  | 1.75                   | 4.38                   | 42                 | 14                       | 212                 | 5             | 18 | 95.5          |

5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{Z2N}$<br>[m/s]  | $F_{Z2N}$<br>[kN] | $F_{Z2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{Z2acc}$<br>[kN] | $F_{Z2NOT}$<br>[kN] | $M_{Z2acc}$<br>[Nm] | i     | $v_{Z2maxDB}$<br>[m/s] | $v_{Z2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR5PH8 (<math>n_{1N} = 3000</math> rpm, (<math>F_{Z2acc,max} = 34</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.15  | 14                | 16                 | 0.7      | 1.3 | ZTR518SPH832_1000 EZ701U | 29                  | 44                  | 1380                | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 177                 | 5             | 18 | 95.5          |
| 0.21  | 10                | 11                 | 0.6      | 2.6 | ZTR518SPH832_0700 EZ701U | 27                  | 44                  | 1302                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.21  | 16                | 20                 | 1.0      | 1.6 | ZTR518SPH832_0700 EZ702U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.21  | 22                | 28                 | 1.3      | 1.2 | ZTR518SPH832_0700 EZ703U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.30  | 7.2               | 8.1                | 0.7      | 3.4 | ZTR518SPH832_0500 EZ701U | 19                  | 44                  | 930                 | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.30  | 12                | 14                 | 1.1      | 2.1 | ZTR518SPH832_0500 EZ702U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.30  | 16                | 20                 | 1.6      | 1.5 | ZTR518SPH832_0500 EZ703U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.30  | 21                | 29                 | 2.0      | 1.2 | ZTR518SPH832_0500 EZ705U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.30  | 22                | 36                 | 2.1      | 1.1 | ZTR518SPH832_0500 EZ802U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.38  | 5.8               | 6.5                | 1.0      | 3.7 | ZTR518SPH832_0400 EZ701U | 16                  | 44                  | 744                 | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.38  | 9.3               | 11                 | 1.6      | 2.3 | ZTR518SPH832_0400 EZ702U | 32                  | 44                  | 1525                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.38  | 13                | 16                 | 2.2      | 1.7 | ZTR518SPH832_0400 EZ703U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.38  | 17                | 24                 | 2.8      | 1.3 | ZTR518SPH832_0400 EZ705U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.38  | 17                | 29                 | 2.9      | 1.2 | ZTR518SPH832_0400 EZ802U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.38  | 21                | 38                 | 3.5      | 1.0 | ZTR518SPH832_0400 EZ803U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.43  | 5.0               | 5.7                | 0.8      | 4.3 | ZTR518SPH832_0350 EZ701U | 14                  | 44                  | 651                 | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.43  | 8.2               | 9.8                | 1.4      | 2.6 | ZTR518SPH832_0350 EZ702U | 28                  | 44                  | 1335                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.43  | 11                | 14                 | 1.9      | 1.9 | ZTR518SPH832_0350 EZ703U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.43  | 15                | 21                 | 2.4      | 1.5 | ZTR518SPH832_0350 EZ705U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.43  | 15                | 25                 | 2.5      | 1.4 | ZTR518SPH832_0350 EZ802U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.43  | 18                | 33                 | 3.0      | 1.2 | ZTR518SPH832_0350 EZ803U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.54  | 4.0               | 4.5                | 1.2      | 5.0 | ZTR518SPH832_0280 EZ701U | 11                  | 44                  | 521                 | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.54  | 6.5               | 7.9                | 1.9      | 3.1 | ZTR518SPH832_0280 EZ702U | 22                  | 44                  | 1068                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.54  | 9.0               | 11                 | 2.6      | 2.2 | ZTR518SPH832_0280 EZ703U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.54  | 12                | 16                 | 3.4      | 1.7 | ZTR518SPH832_0280 EZ705U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.54  | 12                | 20                 | 3.5      | 1.6 | ZTR518SPH832_0280 EZ802U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.54  | 15                | 26                 | 4.2      | 1.4 | ZTR518SPH832_0280 EZ803U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.60  | 5.8               | 7.0                | 1.6      | 3.3 | ZTR518SPH832_0250 EZ702U | 20                  | 44                  | 953                 | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.60  | 8.0               | 10                 | 2.2      | 2.4 | ZTR518SPH832_0250 EZ703U | 32                  | 44                  | 1511                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.60  | 10                | 15                 | 2.9      | 1.9 | ZTR518SPH832_0250 EZ705U | 34                  | 44                  | 1621                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.60  | 11                | 18                 | 3.0      | 1.8 | ZTR518SPH832_0250 EZ802U | 34                  | 44                  | 1621                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.60  | 13                | 23                 | 3.6      | 1.5 | ZTR518SPH832_0250 EZ803U | 34                  | 44                  | 1621                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.75  | 4.7               | 5.6                | 1.8      | 3.8 | ZTR518SPH832_0200 EZ702U | 16                  | 44                  | 763                 | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.75  | 6.4               | 8.1                | 2.5      | 2.8 | ZTR518SPH832_0200 EZ703U | 25                  | 44                  | 1209                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.75  | 8.3               | 12                 | 3.2      | 2.2 | ZTR518SPH832_0200 EZ705U | 34                  | 44                  | 1621                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.75  | 8.7               | 14                 | 3.4      | 2.1 | ZTR518SPH832_0200 EZ802U | 34                  | 44                  | 1621                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.75  | 10                | 19                 | 4.0      | 1.7 | ZTR518SPH832_0200 EZ803U | 34                  | 44                  | 1621                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 0.94  | 3.7               | 4.5                | 2.5      | 4.4 | ZTR518SPH832_0160 EZ702U | 13                  | 44                  | 610                 | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 0.94  | 5.1               | 6.5                | 3.5      | 3.2 | ZTR518SPH832_0160 EZ703U | 20                  | 44                  | 967                 | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 0.94  | 6.6               | 9.4                | 4.5      | 2.5 | ZTR518SPH832_0160 EZ705U | 32                  | 44                  | 1548                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 0.94  | 6.9               | 12                 | 4.7      | 2.4 | ZTR518SPH832_0160 EZ802U | 31                  | 44                  | 1488                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 0.94  | 8.3               | 15                 | 5.6      | 2.0 | ZTR518SPH832_0160 EZ803U | 34                  | 44                  | 1621                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 1.50  | 4.5               | 7.5                | 2.5      | 3.2 | ZTR518SPH831_0100 EZ802U | 20                  | 44                  | 960                 | 10.00 | 1.10                   | 2.00                   | 42                 | 14                       | 179                 | 5             | 18 | 95.5          |
| 1.50  | 5.3               | 9.7                | 2.9      | 2.6 | ZTR518SPH831_0100 EZ803U | 29                  | 44                  | 1392                | 10.00 | 1.10                   | 2.00                   | 42                 | 14                       | 179                 | 5             | 18 | 95.5          |
| 2.14  | 3.1               | 5.2                | 2.9      | 4.0 | ZTR518SPH831_0070 EZ802U | 14                  | 44                  | 672                 | 7.000 | 1.43                   | 2.86                   | 42                 | 14                       | 197                 | 5             | 18 | 95.5          |
| 2.14  | 3.7               | 6.8                | 3.5      | 3.4 | ZTR518SPH831_0070 EZ803U | 20                  | 44                  | 974                 | 7.000 | 1.43                   | 2.86                   | 42                 | 14                       | 197                 | 5             | 18 | 95.5          |
| 3.00  | 2.7               | 4.8                | 5.2      | 4.2 | ZTR518SPH831_0050 EZ803U | 15                  | 44                  | 696                 | 5.000 | 1.60                   | 4.00                   | 42                 | 14                       | 210                 | 5             | 18 | 95.5          |
| 3.75  | 2.1               | 3.9                | 8.6      | 4.9 | ZTR518SPH831_0040 EZ803U | 12                  | 42                  | 557                 | 4.000 | 1.75                   | 4.38                   | 42                 | 14                       | 212                 | 5             | 18 | 95.5          |
| <b>ZTR5PH8 (<math>n_{1N} = 4500</math> rpm, (<math>F_{Z2acc,max} = 34</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.32  | 14                | 47                 | 1.0      | 1.6 | ZTR518SPH832_0700 EZ802U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.32  | 16                | 27                 | 1.1      | 1.4 | ZTR518SPH832_0700 EZ703U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.32  | 22                | 41                 | 1.5      | 1.0 | ZTR518SPH832_0700 EZ705U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.45  | 10                | 34                 | 1.1      | 2.1 | ZTR518SPH832_0500 EZ802U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.45  | 12                | 19                 | 1.3      | 1.8 | ZTR518SPH832_0500 EZ703U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.45  | 16                | 29                 | 1.8      | 1.3 | ZTR518SPH832_0500 EZ705U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.56  | 8.2               | 27                 | 1.6      | 2.3 | ZTR518SPH832_0400 EZ802U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.56  | 9.4               | 16                 | 1.8      | 2.0 | ZTR518SPH832_0400 EZ703U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.56  | 13                | 23                 | 2.5      | 1.5 | ZTR518SPH832_0400 EZ705U | 34                  | 44                  | 1621                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.64  | 7.2               | 24                 | 1.4      | 2.6 | ZTR518SPH832_0350 EZ802U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.64  | 8.2               | 14                 | 1.6      | 2.3 | ZTR518SPH832_0350 EZ703U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.64  | 11                | 20                 | 2.1      | 1.7 | ZTR518SPH832_0350 EZ705U | 34                  | 44                  | 1621                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.80  | 5.7               | 19                 | 1.9      | 3.1 | ZTR518SPH832_0280 EZ802U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.80  | 6.6               | 11                 | 2.2      | 2.7 | ZTR518SPH832_0280 EZ703U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.80  | 8.9               | 16                 | 3.0      | 2.0 | ZTR518SPH832_0280 EZ705U | 34                  | 44                  | 1621                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| 0.90  | 5.1               | 17                 | 1.6      | 3.3 | ZTR518SPH832_0250 EZ802U | 34                  | 44                  | 1621                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 0.90  | 5.9               | 9.7                | 1.9      | 2.9 | ZTR518SPH832_0250 EZ703U | 32                  | 44                  | 1511                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |



| $v_{I2N}$<br>[m/s]   | $F_{I2N}$<br>[kN] | $F_{I2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{I2acc}$<br>[kN] | $F_{I2NOT}$<br>[kN] | $M_{I2acc}$<br>[Nm] | i     | $v_{I2maxDB}$<br>[m/s] | $v_{I2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR5PH8 (<math>n_{I1N} = 4500</math> rpm, (<math>F_{I2acc,max} = 34</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.90   | 8.0               | 15                 | 2.5      | 2.1 | ZTR518SPH832_0250 EZ705U | 34                  | 44                  | 1621                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 203                 | 5             | 18 | 95.5          |
| 1.13   | 4.1               | 13                 | 1.8      | 3.8 | ZTR518SPH832_0200 EZ802U | 34                  | 44                  | 1621                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 1.13   | 4.7               | 7.8                | 2.1      | 3.3 | ZTR518SPH832_0200 EZ703U | 25                  | 44                  | 1209                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 1.13   | 6.4               | 12                 | 2.8      | 2.4 | ZTR518SPH832_0200 EZ705U | 34                  | 44                  | 1621                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 5             | 18 | 95.5          |
| 1.41   | 3.3               | 11                 | 2.5      | 4.4 | ZTR518SPH832_0160 EZ802U | 31                  | 44                  | 1488                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 1.41   | 3.8               | 6.2                | 2.9      | 3.9 | ZTR518SPH832_0160 EZ703U | 20                  | 44                  | 967                 | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| 1.41   | 5.1               | 9.3                | 3.9      | 2.8 | ZTR518SPH832_0160 EZ705U | 32                  | 44                  | 1548                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 201                 | 5             | 18 | 95.5          |
| <b>ZTR5PH8 (<math>n_{I1N} = 6000</math> rpm, (<math>F_{I2acc,max} = 34</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.30   | 10                | 15                 | 0.6      | 1.4 | ZTR518SPH832_1000 EZ701U | 29                  | 44                  | 1380                | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 177                 | 5             | 18 | 95.5          |
| 0.30   | 14                | 28                 | 0.9      | 1.0 | ZTR518SPH832_1000 EZ702U | 29                  | 44                  | 1380                | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 177                 | 5             | 18 | 95.5          |
| 0.43   | 7.1               | 11                 | 0.5      | 3.0 | ZTR518SPH832_0700 EZ701U | 27                  | 44                  | 1302                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.43   | 9.8               | 19                 | 0.7      | 2.1 | ZTR518SPH832_0700 EZ702U | 34                  | 44                  | 1621                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 192                 | 5             | 18 | 95.5          |
| 0.60   | 5.1               | 7.7                | 0.6      | 3.8 | ZTR518SPH832_0500 EZ701U | 19                  | 44                  | 930                 | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.60   | 7.0               | 14                 | 0.9      | 2.8 | ZTR518SPH832_0500 EZ702U | 34                  | 44                  | 1621                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 200                 | 5             | 18 | 95.5          |
| 0.75   | 4.1               | 6.2                | 0.9      | 4.2 | ZTR518SPH832_0400 EZ701U | 16                  | 44                  | 744                 | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.75   | 5.6               | 11                 | 1.2      | 3.0 | ZTR518SPH832_0400 EZ702U | 32                  | 44                  | 1525                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 195                 | 5             | 18 | 95.5          |
| 0.86   | 3.5               | 5.4                | 0.7      | 4.8 | ZTR518SPH832_0350 EZ701U | 14                  | 44                  | 651                 | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 0.86   | 4.9               | 9.7                | 1.0      | 3.5 | ZTR518SPH832_0350 EZ702U | 28                  | 44                  | 1335                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 202                 | 5             | 18 | 95.5          |
| 1.07   | 3.9               | 7.8                | 1.4      | 4.0 | ZTR518SPH832_0280 EZ702U | 22                  | 44                  | 1068                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 5             | 18 | 95.5          |
| <b>ZTR6PH8 (<math>n_{I1N} = 2000</math> rpm, (<math>F_{I2acc,max} = 33</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.40   | 21                | 32                 | 5.7      | 1.0 | ZTR615SPH832_0250 EZ805U | 33                  | 44                  | 1577                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.50   | 17                | 26                 | 6.6      | 1.2 | ZTR615SPH832_0200 EZ805U | 33                  | 44                  | 1577                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.63   | 14                | 21                 | 8.4      | 1.4 | ZTR615SPH832_0160 EZ805U | 33                  | 44                  | 1577                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 1.00   | 8.8               | 13                 | 4.2      | 1.8 | ZTR615SPH831_0100 EZ805U | 29                  | 44                  | 1392                | 10.00 | 1.10                   | 2.00                   | 42                 | 14                       | 180                 | 6             | 15 | 95.5          |
| 1.43   | 6.2               | 9.3                | 5.0      | 2.3 | ZTR615SPH831_0070 EZ805U | 29                  | 44                  | 1378                | 7.000 | 1.43                   | 2.86                   | 42                 | 14                       | 198                 | 6             | 15 | 95.5          |
| 2.00   | 4.4               | 6.6                | 7.5      | 2.9 | ZTR615SPH831_0050 EZ805U | 21                  | 44                  | 984                 | 5.000 | 1.60                   | 4.00                   | 42                 | 14                       | 211                 | 6             | 15 | 95.5          |
| 2.50   | 3.5               | 5.3                | 12       | 3.4 | ZTR615SPH831_0040 EZ805U | 16                  | 42                  | 787                 | 4.000 | 1.75                   | 4.38                   | 42                 | 14                       | 213                 | 6             | 15 | 95.5          |
| <b>ZTR6PH8 (<math>n_{I1N} = 3000</math> rpm, (<math>F_{I2acc,max} = 33</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                     |       |                        |                        |                    |                          |                     |               |    |               |
| 0.15   | 14                | 16                 | 0.7      | 1.3 | ZTR615SPH832_1000 EZ701U | 29                  | 44                  | 1380                | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 178                 | 6             | 15 | 95.5          |
| 0.21   | 10                | 11                 | 0.6      | 2.6 | ZTR615SPH832_0700 EZ701U | 27                  | 44                  | 1302                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.21   | 16                | 20                 | 1.0      | 1.6 | ZTR615SPH832_0700 EZ702U | 33                  | 44                  | 1577                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.21   | 22                | 28                 | 1.3      | 1.2 | ZTR615SPH832_0700 EZ703U | 33                  | 44                  | 1577                | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.30   | 7.2               | 8.1                | 0.7      | 3.3 | ZTR615SPH832_0500 EZ701U | 19                  | 44                  | 930                 | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.30   | 12                | 14                 | 1.1      | 2.0 | ZTR615SPH832_0500 EZ702U | 33                  | 44                  | 1577                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.30   | 16                | 20                 | 1.6      | 1.5 | ZTR615SPH832_0500 EZ703U | 33                  | 44                  | 1577                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.30   | 21                | 29                 | 2.0      | 1.2 | ZTR615SPH832_0500 EZ705U | 33                  | 44                  | 1577                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.30   | 22                | 36                 | 2.1      | 1.1 | ZTR615SPH832_0500 EZ802U | 33                  | 44                  | 1577                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.38   | 5.8               | 6.5                | 1.0      | 3.7 | ZTR615SPH832_0400 EZ701U | 16                  | 44                  | 744                 | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.38   | 9.3               | 11                 | 1.6      | 2.3 | ZTR615SPH832_0400 EZ702U | 32                  | 44                  | 1525                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.38   | 13                | 16                 | 2.2      | 1.7 | ZTR615SPH832_0400 EZ703U | 33                  | 44                  | 1577                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.38   | 17                | 24                 | 2.8      | 1.3 | ZTR615SPH832_0400 EZ705U | 33                  | 44                  | 1577                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.38   | 17                | 29                 | 2.9      | 1.2 | ZTR615SPH832_0400 EZ802U | 33                  | 44                  | 1577                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.38   | 21                | 38                 | 3.5      | 1.0 | ZTR615SPH832_0400 EZ803U | 33                  | 44                  | 1577                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.43   | 5.0               | 5.7                | 0.8      | 4.2 | ZTR615SPH832_0350 EZ701U | 14                  | 44                  | 651                 | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.43   | 8.2               | 9.8                | 1.4      | 2.6 | ZTR615SPH832_0350 EZ702U | 28                  | 44                  | 1335                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.43   | 11                | 14                 | 1.9      | 1.9 | ZTR615SPH832_0350 EZ703U | 33                  | 44                  | 1577                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.43   | 15                | 21                 | 2.4      | 1.5 | ZTR615SPH832_0350 EZ705U | 33                  | 44                  | 1577                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.43   | 15                | 25                 | 2.5      | 1.4 | ZTR615SPH832_0350 EZ802U | 33                  | 44                  | 1577                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.43   | 18                | 33                 | 3.0      | 1.2 | ZTR615SPH832_0350 EZ803U | 33                  | 44                  | 1577                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.54   | 4.0               | 4.5                | 1.2      | 4.9 | ZTR615SPH832_0280 EZ701U | 11                  | 44                  | 521                 | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.54   | 6.5               | 7.9                | 1.9      | 3.0 | ZTR615SPH832_0280 EZ702U | 22                  | 44                  | 1068                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.54   | 9.0               | 11                 | 2.6      | 2.2 | ZTR615SPH832_0280 EZ703U | 33                  | 44                  | 1577                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.54   | 12                | 16                 | 3.4      | 1.7 | ZTR615SPH832_0280 EZ705U | 33                  | 44                  | 1577                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.54   | 12                | 20                 | 3.5      | 1.6 | ZTR615SPH832_0280 EZ802U | 33                  | 44                  | 1577                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.54   | 15                | 26                 | 4.2      | 1.4 | ZTR615SPH832_0280 EZ803U | 33                  | 44                  | 1577                | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.60   | 5.8               | 7.0                | 1.6      | 3.2 | ZTR615SPH832_0250 EZ702U | 20                  | 44                  | 953                 | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.60   | 8.0               | 10                 | 2.2      | 2.4 | ZTR615SPH832_0250 EZ703U | 32                  | 44                  | 1511                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.60   | 10                | 15                 | 2.9      | 1.8 | ZTR615SPH832_0250 EZ705U | 33                  | 44                  | 1577                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.60   | 11                | 18                 | 3.0      | 1.7 | ZTR615SPH832_0250 EZ802U | 33                  | 44                  | 1577                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.60   | 13                | 23                 | 3.6      | 1.5 | ZTR615SPH832_0250 EZ803U | 33                  | 44                  | 1577                | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.75   | 4.7               | 5.6                | 1.8      | 3.8 | ZTR615SPH832_0200 EZ702U | 16                  | 44                  | 763                 | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.75   | 6.4               | 8.1                | 2.5      | 2.7 | ZTR615SPH832_0200 EZ703U | 25                  | 44                  | 1209                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.75   | 8.3               | 12                 | 3.2      | 2.1 | ZTR615SPH832_0200 EZ705U | 33                  | 44                  | 1577                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.75   | 8.7               | 14                 | 3.4      | 2.0 | ZTR615SPH832_0200 EZ802U | 33                  | 44                  | 1577                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.75   | 10                | 19                 | 4.0      | 1.7 | ZTR615SPH832_0200 EZ803U | 33                  | 44                  | 1577                | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.94   | 3.7               | 4.5                | 2.5      | 4.4 | ZTR615SPH832_0160 EZ702U | 13                  | 44                  | 610                 | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |

5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR6PH8 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 33</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.94  | 5.1               | 6.5                | 3.5      | 3.2 | ZTR615SPH832_0160 EZ703U | 20                  | 44                  | 967                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 0.94  | 6.6               | 9.4                | 4.5      | 2.5 | ZTR615SPH832_0160 EZ705U | 32                  | 44                  | 1548               | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 0.94  | 6.9               | 12                 | 4.7      | 2.4 | ZTR615SPH832_0160 EZ802U | 31                  | 44                  | 1488               | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 0.94  | 8.3               | 15                 | 5.6      | 2.0 | ZTR615SPH832_0160 EZ803U | 33                  | 44                  | 1577               | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 1.50  | 4.5               | 7.5                | 2.5      | 3.1 | ZTR615SPH831_0100 EZ802U | 20                  | 44                  | 960                | 10.00 | 1.10                   | 2.00                   | 42                 | 14                       | 180                 | 6             | 15 | 95.5          |
| 1.50  | 5.3               | 9.7                | 2.9      | 2.6 | ZTR615SPH831_0100 EZ803U | 29                  | 44                  | 1392               | 10.00 | 1.10                   | 2.00                   | 42                 | 14                       | 180                 | 6             | 15 | 95.5          |
| 2.14  | 3.1               | 5.2                | 2.9      | 4.0 | ZTR615SPH831_0070 EZ802U | 14                  | 44                  | 672                | 7.000 | 1.43                   | 2.86                   | 42                 | 14                       | 198                 | 6             | 15 | 95.5          |
| 2.14  | 3.7               | 6.8                | 3.5      | 3.3 | ZTR615SPH831_0070 EZ803U | 20                  | 44                  | 974                | 7.000 | 1.43                   | 2.86                   | 42                 | 14                       | 198                 | 6             | 15 | 95.5          |
| 3.00  | 2.2               | 3.7                | 4.4      | 4.9 | ZTR615SPH831_0050 EZ802U | 10                  | 44                  | 480                | 5.000 | 1.60                   | 4.00                   | 42                 | 14                       | 211                 | 6             | 15 | 95.5          |
| 3.00  | 2.7               | 4.8                | 5.2      | 4.1 | ZTR615SPH831_0050 EZ803U | 15                  | 44                  | 696                | 5.000 | 1.60                   | 4.00                   | 42                 | 14                       | 211                 | 6             | 15 | 95.5          |
| 3.75  | 2.1               | 3.9                | 8.6      | 4.8 | ZTR615SPH831_0040 EZ803U | 12                  | 42                  | 557                | 4.000 | 1.75                   | 4.38                   | 42                 | 14                       | 213                 | 6             | 15 | 95.5          |
| <b>ZTR6PH8 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 33</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.32  | 14                | 47                 | 1.0      | 1.6 | ZTR615SPH832_0700 EZ802U | 33                  | 44                  | 1577               | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.32  | 16                | 27                 | 1.1      | 1.4 | ZTR615SPH832_0700 EZ703U | 33                  | 44                  | 1577               | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.32  | 22                | 41                 | 1.5      | 1.0 | ZTR615SPH832_0700 EZ705U | 33                  | 44                  | 1577               | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.45  | 10                | 34                 | 1.1      | 2.0 | ZTR615SPH832_0500 EZ802U | 33                  | 44                  | 1577               | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.45  | 12                | 19                 | 1.3      | 1.8 | ZTR615SPH832_0500 EZ703U | 33                  | 44                  | 1577               | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.45  | 16                | 29                 | 1.8      | 1.3 | ZTR615SPH832_0500 EZ705U | 33                  | 44                  | 1577               | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.56  | 8.2               | 27                 | 1.6      | 2.3 | ZTR615SPH832_0400 EZ802U | 33                  | 44                  | 1577               | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.56  | 9.4               | 16                 | 1.8      | 2.0 | ZTR615SPH832_0400 EZ703U | 33                  | 44                  | 1577               | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.56  | 13                | 23                 | 2.5      | 1.5 | ZTR615SPH832_0400 EZ705U | 33                  | 44                  | 1577               | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.64  | 7.2               | 24                 | 1.4      | 2.6 | ZTR615SPH832_0350 EZ802U | 33                  | 44                  | 1577               | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.64  | 8.2               | 14                 | 1.6      | 2.2 | ZTR615SPH832_0350 EZ703U | 33                  | 44                  | 1577               | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.64  | 11                | 20                 | 2.1      | 1.7 | ZTR615SPH832_0350 EZ705U | 33                  | 44                  | 1577               | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.80  | 5.7               | 19                 | 1.9      | 3.0 | ZTR615SPH832_0280 EZ802U | 33                  | 44                  | 1577               | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.80  | 6.6               | 11                 | 2.2      | 2.6 | ZTR615SPH832_0280 EZ703U | 33                  | 44                  | 1577               | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.80  | 8.9               | 16                 | 3.0      | 1.9 | ZTR615SPH832_0280 EZ705U | 33                  | 44                  | 1577               | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| 0.90  | 5.1               | 17                 | 1.6      | 3.2 | ZTR615SPH832_0250 EZ802U | 33                  | 44                  | 1577               | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.90  | 5.9               | 9.7                | 1.9      | 2.8 | ZTR615SPH832_0250 EZ703U | 32                  | 44                  | 1511               | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 0.90  | 8.0               | 15                 | 2.5      | 2.1 | ZTR615SPH832_0250 EZ705U | 33                  | 44                  | 1577               | 25.00 | 0.54                   | 1.10                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 1.13  | 4.1               | 13                 | 1.8      | 3.8 | ZTR615SPH832_0200 EZ802U | 33                  | 44                  | 1577               | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 1.13  | 4.7               | 7.8                | 2.1      | 3.3 | ZTR615SPH832_0200 EZ703U | 25                  | 44                  | 1209               | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 1.13  | 6.4               | 12                 | 2.8      | 2.4 | ZTR615SPH832_0200 EZ705U | 33                  | 44                  | 1577               | 20.00 | 0.63                   | 1.13                   | 42                 | 14                       | 204                 | 6             | 15 | 95.5          |
| 1.41  | 3.3               | 11                 | 2.5      | 4.4 | ZTR615SPH832_0160 EZ802U | 31                  | 44                  | 1488               | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 1.41  | 3.8               | 6.2                | 2.9      | 3.8 | ZTR615SPH832_0160 EZ703U | 20                  | 44                  | 967                | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| 1.41  | 5.1               | 9.3                | 3.9      | 2.8 | ZTR615SPH832_0160 EZ705U | 32                  | 44                  | 1548               | 16.00 | 0.78                   | 1.41                   | 42                 | 14                       | 202                 | 6             | 15 | 95.5          |
| <b>ZTR6PH8 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 33</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.30  | 10                | 15                 | 0.6      | 1.4 | ZTR615SPH832_1000 EZ701U | 29                  | 44                  | 1380               | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 178                 | 6             | 15 | 95.5          |
| 0.30  | 14                | 28                 | 0.9      | 1.0 | ZTR615SPH832_1000 EZ702U | 29                  | 44                  | 1380               | 100.0 | 0.15                   | 0.30                   | 42                 | 14                       | 178                 | 6             | 15 | 95.5          |
| 0.43  | 7.1               | 11                 | 0.5      | 3.0 | ZTR615SPH832_0700 EZ701U | 27                  | 44                  | 1302               | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.43  | 9.8               | 19                 | 0.7      | 2.1 | ZTR615SPH832_0700 EZ702U | 33                  | 44                  | 1577               | 70.00 | 0.21                   | 0.43                   | 42                 | 14                       | 193                 | 6             | 15 | 95.5          |
| 0.60  | 5.1               | 7.7                | 0.6      | 3.7 | ZTR615SPH832_0500 EZ701U | 19                  | 44                  | 930                | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.60  | 7.0               | 14                 | 0.9      | 2.7 | ZTR615SPH832_0500 EZ702U | 33                  | 44                  | 1577               | 50.00 | 0.30                   | 0.60                   | 42                 | 14                       | 201                 | 6             | 15 | 95.5          |
| 0.75  | 4.1               | 6.2                | 0.9      | 4.2 | ZTR615SPH832_0400 EZ701U | 16                  | 44                  | 744                | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.75  | 5.6               | 11                 | 1.2      | 3.0 | ZTR615SPH832_0400 EZ702U | 32                  | 44                  | 1525               | 40.00 | 0.38                   | 0.75                   | 42                 | 14                       | 196                 | 6             | 15 | 95.5          |
| 0.86  | 3.5               | 5.4                | 0.7      | 4.7 | ZTR615SPH832_0350 EZ701U | 14                  | 44                  | 651                | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 0.86  | 4.9               | 9.7                | 1.0      | 3.4 | ZTR615SPH832_0350 EZ702U | 28                  | 44                  | 1335               | 35.00 | 0.43                   | 0.86                   | 42                 | 14                       | 203                 | 6             | 15 | 95.5          |
| 1.07  | 3.9               | 7.8                | 1.4      | 4.0 | ZTR615SPH832_0280 EZ702U | 22                  | 44                  | 1068               | 28.00 | 0.54                   | 1.07                   | 42                 | 14                       | 199                 | 6             | 15 | 95.5          |
| <b>ZTR5PH9 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.22  | 39                | 59                 | 1.6      | 1.1 | ZTR519SPH942_0480 EZ805U | 67                  | 133                 | 3360               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 300                 | 5             | 19 | 100.8         |
| 0.25  | 34                | 51                 | 1.8      | 1.2 | ZTR519SPH942_0420 EZ805U | 67                  | 133                 | 3360               | 42.00 | 0.35                   | 0.57                   | 44                 | 15                       | 301                 | 5             | 19 | 100.8         |
| 0.26  | 32                | 49                 | 2.2      | 1.2 | ZTR519SPH942_0400 EZ805U | 67                  | 133                 | 3360               | 40.00 | 0.37                   | 0.59                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.33  | 26                | 39                 | 2.3      | 1.4 | ZTR519SPH942_0320 EZ805U | 67                  | 133                 | 3360               | 32.00 | 0.46                   | 0.74                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.35  | 24                | 37                 | 2.2      | 1.5 | ZTR519SPH942_0300 EZ805U | 67                  | 133                 | 3360               | 30.00 | 0.44                   | 0.70                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.38  | 23                | 34                 | 2.2      | 1.6 | ZTR519SPH942_0280 EZ805U | 67                  | 133                 | 3360               | 28.00 | 0.53                   | 0.85                   | 44                 | 15                       | 304                 | 5             | 19 | 100.8         |
| 0.44  | 19                | 29                 | 2.7      | 1.7 | ZTR519SPH942_0240 EZ805U | 67                  | 133                 | 3360               | 24.00 | 0.44                   | 0.77                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.53  | 16                | 24                 | 3.0      | 2.0 | ZTR519SPH942_0200 EZ805U | 67                  | 133                 | 3360               | 20.00 | 0.66                   | 1.06                   | 44                 | 15                       | 306                 | 5             | 19 | 100.8         |
| 0.59  | 15                | 22                 | 3.1      | 2.1 | ZTR519SPH942_0180 EZ805U | 67                  | 133                 | 3360               | 18.00 | 0.53                   | 0.88                   | 44                 | 15                       | 303                 | 5             | 19 | 100.8         |
| 0.66  | 13                | 20                 | 3.3      | 2.3 | ZTR519SPH942_0160 EZ805U | 61                  | 133                 | 3050               | 16.00 | 0.66                   | 1.15                   | 44                 | 15                       | 307                 | 5             | 19 | 100.8         |
| 0.88  | 9.7               | 15                 | 3.8      | 2.8 | ZTR519SPH942_0120 EZ805U | 45                  | 114                 | 2288               | 12.00 | 0.79                   | 1.32                   | 44                 | 15                       | 309                 | 5             | 19 | 100.8         |
| <b>ZTR5PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.26  | 25                | 41                 | 0.8      | 1.6 | ZTR519SPH942_0600 EZ802U | 67                  | 133                 | 3360               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.26  | 29                | 53                 | 0.9      | 1.4 | ZTR519SPH942_0600 EZ803U | 67                  | 133                 | 3360               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.33  | 20                | 33                 | 0.8      | 1.9 | ZTR519SPH942_0480 EZ802U | 67                  | 133                 | 3360               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 300                 | 5             | 19 | 100.8         |
| 0.33  | 24                | 43                 | 1.0      | 1.6 | ZTR519SPH942_0480 EZ803U | 67                  | 133                 | 3360               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 300                 | 5             | 19 | 100.8         |
| 0.38  | 17                | 29                 | 0.9      | 2.1 | ZTR519SPH942_0420 EZ802U | 67                  | 133                 | 3360               | 42.00 | 0.35                   | 0.57                   | 44                 | 15                       | 301                 | 5             | 19 | 100.8         |

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR5PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.38  | 21                | 37                 | 1.1      | 1.7 | ZTR519SPH942_0420 EZ803U | 67                  | 133                 | 3360               | 42.00 | 0.35                   | 0.57                   | 44                 | 15                       | 301                 | 5             | 19 | 100.8         |
| 0.40  | 16                | 27                 | 1.3      | 2.1 | ZTR519SPH942_0400 EZ802U | 67                  | 133                 | 3360               | 40.00 | 0.37                   | 0.59                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.40  | 20                | 36                 | 1.5      | 1.8 | ZTR519SPH942_0400 EZ803U | 67                  | 133                 | 3360               | 40.00 | 0.37                   | 0.59                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.50  | 13                | 22                 | 1.3      | 2.5 | ZTR519SPH942_0320 EZ802U | 59                  | 133                 | 2976               | 32.00 | 0.46                   | 0.74                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.50  | 16                | 28                 | 1.6      | 2.1 | ZTR519SPH942_0320 EZ803U | 67                  | 133                 | 3360               | 32.00 | 0.46                   | 0.74                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.53  | 12                | 21                 | 1.1      | 2.6 | ZTR519SPH942_0300 EZ802U | 55                  | 133                 | 2790               | 30.00 | 0.44                   | 0.70                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.53  | 15                | 27                 | 1.3      | 2.2 | ZTR519SPH942_0300 EZ803U | 67                  | 133                 | 3360               | 30.00 | 0.44                   | 0.70                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.57  | 12                | 19                 | 1.1      | 2.7 | ZTR519SPH942_0280 EZ802U | 52                  | 133                 | 2604               | 28.00 | 0.53                   | 0.85                   | 44                 | 15                       | 304                 | 5             | 19 | 100.8         |
| 0.57  | 14                | 25                 | 1.4      | 2.3 | ZTR519SPH942_0280 EZ803U | 67                  | 133                 | 3360               | 28.00 | 0.53                   | 0.85                   | 44                 | 15                       | 304                 | 5             | 19 | 100.8         |
| 0.66  | 9.9               | 16                 | 1.4      | 3.0 | ZTR519SPH942_0240 EZ802U | 44                  | 133                 | 2232               | 24.00 | 0.44                   | 0.77                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.66  | 12                | 21                 | 1.7      | 2.5 | ZTR519SPH942_0240 EZ803U | 64                  | 133                 | 3236               | 24.00 | 0.44                   | 0.77                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.79  | 8.2               | 14                 | 1.5      | 3.4 | ZTR519SPH942_0200 EZ802U | 37                  | 133                 | 1860               | 20.00 | 0.66                   | 1.06                   | 44                 | 15                       | 306                 | 5             | 19 | 100.8         |
| 0.79  | 9.8               | 18                 | 1.8      | 2.8 | ZTR519SPH942_0200 EZ803U | 54                  | 133                 | 2697               | 20.00 | 0.66                   | 1.06                   | 44                 | 15                       | 306                 | 5             | 19 | 100.8         |
| 0.88  | 7.4               | 12                 | 1.6      | 3.6 | ZTR519SPH942_0180 EZ802U | 33                  | 133                 | 1674               | 18.00 | 0.53                   | 0.88                   | 44                 | 15                       | 303                 | 5             | 19 | 100.8         |
| 0.88  | 8.8               | 16                 | 1.9      | 3.0 | ZTR519SPH942_0180 EZ803U | 48                  | 133                 | 2427               | 18.00 | 0.53                   | 0.88                   | 44                 | 15                       | 303                 | 5             | 19 | 100.8         |
| 0.99  | 6.6               | 11                 | 1.9      | 3.9 | ZTR519SPH942_0160 EZ802U | 30                  | 133                 | 1488               | 16.00 | 0.66                   | 1.15                   | 44                 | 15                       | 307                 | 5             | 19 | 100.8         |
| 0.99  | 7.9               | 14                 | 2.3      | 3.3 | ZTR519SPH942_0160 EZ803U | 43                  | 133                 | 2158               | 16.00 | 0.66                   | 1.15                   | 44                 | 15                       | 307                 | 5             | 19 | 100.8         |
| 1.32  | 4.9               | 8.2                | 2.2      | 4.7 | ZTR519SPH942_0120 EZ802U | 22                  | 114                 | 1116               | 12.00 | 0.79                   | 1.32                   | 44                 | 15                       | 309                 | 5             | 19 | 100.8         |
| 1.32  | 5.9               | 11                 | 2.6      | 4.0 | ZTR519SPH942_0120 EZ803U | 32                  | 114                 | 1618               | 12.00 | 0.79                   | 1.32                   | 44                 | 15                       | 309                 | 5             | 19 | 100.8         |
| <b>ZTR5PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.40  | 12                | 38                 | 0.4      | 3.0 | ZTR519SPH942_0600 EZ802U | 67                  | 133                 | 3360               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.50  | 9.3               | 31                 | 0.4      | 3.5 | ZTR519SPH942_0480 EZ802U | 67                  | 133                 | 3360               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 300                 | 5             | 19 | 100.8         |
| 0.57  | 8.1               | 27                 | 0.4      | 3.8 | ZTR519SPH942_0420 EZ802U | 67                  | 133                 | 3360               | 42.00 | 0.35                   | 0.57                   | 44                 | 15                       | 301                 | 5             | 19 | 100.8         |
| 0.59  | 7.8               | 25                 | 0.7      | 3.9 | ZTR519SPH942_0400 EZ802U | 67                  | 133                 | 3360               | 40.00 | 0.37                   | 0.59                   | 44                 | 15                       | 299                 | 5             | 19 | 100.8         |
| 0.74  | 6.2               | 20                 | 0.7      | 4.6 | ZTR519SPH942_0320 EZ802U | 59                  | 133                 | 2976               | 32.00 | 0.46                   | 0.74                   | 44                 | 15                       | 302                 | 5             | 19 | 100.8         |
| 0.85  | 5.4               | 18                 | 0.6      | 5.0 | ZTR519SPH942_0280 EZ802U | 52                  | 133                 | 2604               | 28.00 | 0.53                   | 0.85                   | 44                 | 15                       | 304                 | 5             | 19 | 100.8         |
| <b>ZTR6PH9 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.22  | 38                | 58                 | 1.6      | 1.1 | ZTR616SPH942_0480 EZ805U | 56                  | 112                 | 2844               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 306                 | 6             | 16 | 101.9         |
| 0.25  | 34                | 51                 | 1.8      | 1.2 | ZTR616SPH942_0420 EZ805U | 56                  | 112                 | 2844               | 42.00 | 0.36                   | 0.57                   | 44                 | 15                       | 307                 | 6             | 16 | 101.9         |
| 0.27  | 32                | 48                 | 2.2      | 1.2 | ZTR616SPH942_0400 EZ805U | 56                  | 112                 | 2844               | 40.00 | 0.37                   | 0.60                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.33  | 26                | 39                 | 2.3      | 1.4 | ZTR616SPH942_0320 EZ805U | 56                  | 112                 | 2844               | 32.00 | 0.47                   | 0.75                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.36  | 24                | 36                 | 2.2      | 1.5 | ZTR616SPH942_0300 EZ805U | 56                  | 112                 | 2844               | 30.00 | 0.44                   | 0.71                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.38  | 22                | 34                 | 2.2      | 1.6 | ZTR616SPH942_0280 EZ805U | 56                  | 112                 | 2844               | 28.00 | 0.53                   | 0.86                   | 44                 | 15                       | 310                 | 6             | 16 | 101.9         |
| 0.44  | 19                | 29                 | 2.7      | 1.7 | ZTR616SPH942_0240 EZ805U | 56                  | 112                 | 2844               | 24.00 | 0.44                   | 0.78                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.53  | 16                | 24                 | 3.0      | 2.0 | ZTR616SPH942_0200 EZ805U | 56                  | 112                 | 2844               | 20.00 | 0.67                   | 1.07                   | 44                 | 15                       | 312                 | 6             | 16 | 101.9         |
| 0.59  | 14                | 22                 | 3.1      | 2.1 | ZTR616SPH942_0180 EZ805U | 56                  | 112                 | 2844               | 18.00 | 0.53                   | 0.89                   | 44                 | 15                       | 309                 | 6             | 16 | 101.9         |
| 0.67  | 13                | 19                 | 3.3      | 2.3 | ZTR616SPH942_0160 EZ805U | 56                  | 112                 | 2844               | 16.00 | 0.67                   | 1.17                   | 44                 | 15                       | 313                 | 6             | 16 | 101.9         |
| 0.89  | 9.6               | 14                 | 3.8      | 2.7 | ZTR616SPH942_0120 EZ805U | 45                  | 112                 | 2288               | 12.00 | 0.80                   | 1.33                   | 44                 | 15                       | 315                 | 6             | 16 | 101.9         |
| <b>ZTR6PH9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.27  | 24                | 41                 | 0.8      | 1.6 | ZTR616SPH942_0600 EZ802U | 56                  | 112                 | 2844               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.27  | 29                | 53                 | 0.9      | 1.3 | ZTR616SPH942_0600 EZ803U | 56                  | 112                 | 2844               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.33  | 20                | 33                 | 0.8      | 1.9 | ZTR616SPH942_0480 EZ802U | 56                  | 112                 | 2844               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 306                 | 6             | 16 | 101.9         |
| 0.33  | 23                | 42                 | 1.0      | 1.6 | ZTR616SPH942_0480 EZ803U | 56                  | 112                 | 2844               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 306                 | 6             | 16 | 101.9         |
| 0.38  | 17                | 28                 | 0.9      | 2.0 | ZTR616SPH942_0420 EZ802U | 56                  | 112                 | 2844               | 42.00 | 0.36                   | 0.57                   | 44                 | 15                       | 307                 | 6             | 16 | 101.9         |
| 0.38  | 20                | 37                 | 1.1      | 1.7 | ZTR616SPH942_0420 EZ803U | 56                  | 112                 | 2844               | 42.00 | 0.36                   | 0.57                   | 44                 | 15                       | 307                 | 6             | 16 | 101.9         |
| 0.40  | 16                | 27                 | 1.3      | 2.1 | ZTR616SPH942_0400 EZ802U | 56                  | 112                 | 2844               | 40.00 | 0.37                   | 0.60                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.40  | 19                | 35                 | 1.5      | 1.8 | ZTR616SPH942_0400 EZ803U | 56                  | 112                 | 2844               | 40.00 | 0.37                   | 0.60                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.50  | 13                | 22                 | 1.3      | 2.4 | ZTR616SPH942_0320 EZ802U | 56                  | 112                 | 2844               | 32.00 | 0.47                   | 0.75                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.50  | 16                | 28                 | 1.6      | 2.0 | ZTR616SPH942_0320 EZ803U | 56                  | 112                 | 2844               | 32.00 | 0.47                   | 0.75                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.53  | 12                | 20                 | 1.1      | 2.5 | ZTR616SPH942_0300 EZ802U | 55                  | 112                 | 2790               | 30.00 | 0.44                   | 0.71                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.53  | 15                | 26                 | 1.3      | 2.1 | ZTR616SPH942_0300 EZ803U | 56                  | 112                 | 2844               | 30.00 | 0.44                   | 0.71                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.57  | 11                | 19                 | 1.1      | 2.7 | ZTR616SPH942_0280 EZ802U | 51                  | 112                 | 2604               | 28.00 | 0.53                   | 0.86                   | 44                 | 15                       | 310                 | 6             | 16 | 101.9         |
| 0.57  | 14                | 25                 | 1.4      | 2.2 | ZTR616SPH942_0280 EZ803U | 56                  | 112                 | 2844               | 28.00 | 0.53                   | 0.86                   | 44                 | 15                       | 310                 | 6             | 16 | 101.9         |
| 0.67  | 9.8               | 16                 | 1.4      | 3.0 | ZTR616SPH942_0240 EZ802U | 44                  | 112                 | 2232               | 24.00 | 0.44                   | 0.78                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.67  | 12                | 21                 | 1.7      | 2.5 | ZTR616SPH942_0240 EZ803U | 56                  | 112                 | 2844               | 24.00 | 0.44                   | 0.78                   | 44                 | 15                       | 308                 | 6             | 16 | 101.9         |
| 0.80  | 8.1               | 14                 | 1.5      | 3.3 | ZTR616SPH942_0200 EZ802U | 37                  | 112                 | 1860               | 20.00 | 0.67                   | 1.07                   | 44                 | 15                       | 312                 | 6             | 16 | 101.9         |
| 0.80  | 9.7               | 18                 | 1.8      | 2.8 | ZTR616SPH942_0200 EZ803U | 53                  | 112                 | 2697               | 20.00 | 0.67                   | 1.07                   | 44                 | 15                       | 312                 | 6             | 16 | 101.9         |
| 0.89  | 7.3               | 12                 | 1.6      | 3.6 | ZTR616SPH942_0180 EZ802U | 33                  | 112                 | 1674               | 18.00 | 0.53                   | 0.89                   | 44                 | 15                       | 309                 | 6             | 16 | 101.9         |
| 0.89  | 8.7               | 16                 | 1.9      | 3.0 | ZTR616SPH942_0180 EZ803U | 48                  | 112                 | 2427               | 18.00 | 0.53                   | 0.89                   | 44                 | 15                       | 309                 | 6             | 16 | 101.9         |
| 1.00  | 6.5               | 11                 | 1.9      | 3.9 | ZTR616SPH942_0160 EZ802U | 29                  | 112                 | 1488               | 16.00 | 0.67                   | 1.17                   | 44                 | 15                       | 313                 | 6             | 16 | 101.9         |
| 1.00  | 7.8               | 14                 | 2.3      | 3.2 | ZTR616SPH942_0160 EZ803U | 42                  | 112                 | 2158               | 16.00 | 0.67                   | 1.17                   | 44                 | 15                       | 313                 | 6             | 16 | 101.9         |
| 1.33  | 4.9               | 8.1                | 2.2      | 4.7 | ZTR616SPH942_0120 EZ802U | 22                  | 112                 | 1116               | 12.00 | 0.80                   | 1.33                   | 44                 | 15                       | 315                 | 6             | 16 | 101.9         |
| 1.33  | 5.8               | 11                 | 2.6      | 3.9 | ZTR616SPH942_0120 EZ803U | 32                  | 112                 | 1618               | 12.00 | 0.80                   | 1.33                   | 44                 | 15                       | 315                 | 6             | 16 | 101.9         |
| <b>ZTR6PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.40  | 12                | 38                 | 0.4      | 3.0 | ZTR616SPH942_0600 EZ802U | 56                  | 112                 | 2844               | 60.00 | 0.25                   | 0.40                   | 44                 | 15                       | 305                 | 6             | 16 | 101.9         |
| 0.50  | 9.2               | 30                 | 0.4      | 3.5 | ZTR616SPH942_0480 EZ802U | 56                  | 112                 | 2844               | 48.00 | 0.31                   | 0.50                   | 44                 | 15                       | 306                 | 6             | 16 | 101.9         |

5.2 Selection table 5 ZTRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[ $\mu$ m] | $\Delta s_{red}$<br>[ $\mu$ m] | $C_{lin}$<br>[N/ $\mu$ m] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------------|--------------------------------|---------------------------|---------------|----|---------------|
| <b>ZTR6PH9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                          |                     |                     |                    |       |                        |                        |                          |                                |                           |               |    |               |
| 0.57  | 8.1               | 26                 | 0.4      | 3.8 | ZTR616SPH942_0420 EZ802U | 56                  | 112                 | 2844               | 42.00 | 0.36                   | 0.57                   | 44                       | 15                             | 307                       | 6             | 16 | 101.9         |
| 0.60  | 7.7               | 25                 | 0.7      | 3.9 | ZTR616SPH942_0400 EZ802U | 56                  | 112                 | 2844               | 40.00 | 0.37                   | 0.60                   | 44                       | 15                             | 305                       | 6             | 16 | 101.9         |
| 0.75  | 6.1               | 20                 | 0.7      | 4.5 | ZTR616SPH942_0320 EZ802U | 56                  | 112                 | 2844               | 32.00 | 0.47                   | 0.75                   | 44                       | 15                             | 308                       | 6             | 16 | 101.9         |
| 0.86  | 5.4               | 18                 | 0.6      | 5.0 | ZTR616SPH942_0280 EZ802U | 51                  | 112                 | 2604               | 28.00 | 0.53                   | 0.86                   | 44                       | 15                             | 310                       | 6             | 16 | 101.9         |

## 5.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

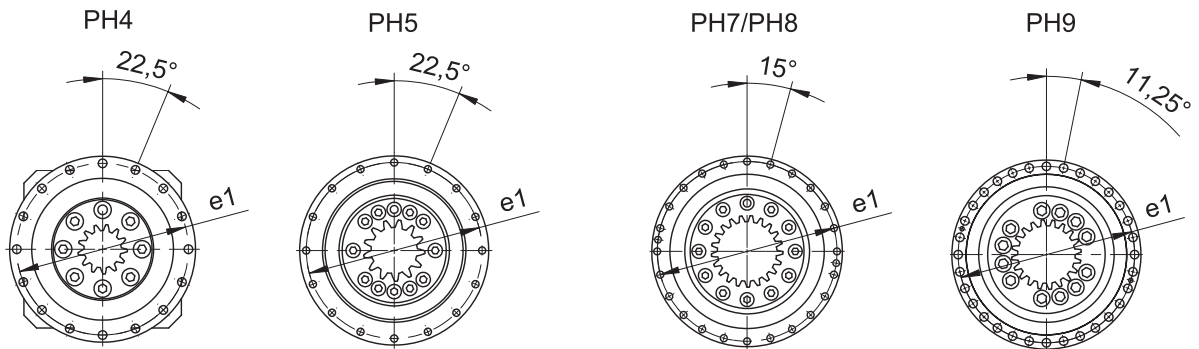
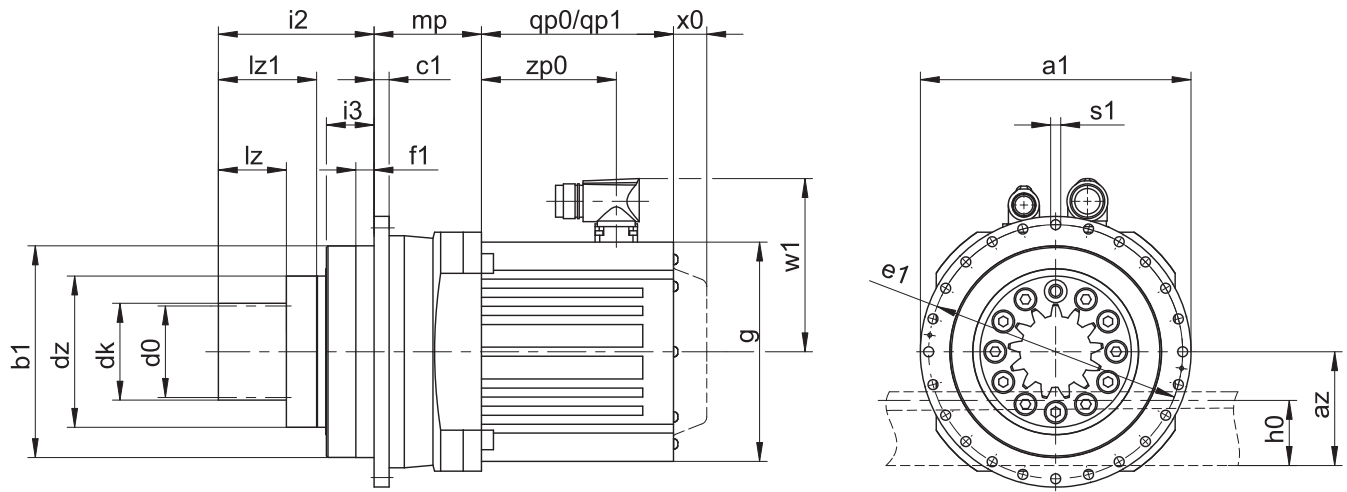
The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

x0 Applies to encoders using an optical measuring method.

qp1 Applies to motors with brake.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

Dimensions of gear units

| Type        | mn | Øa1               | az    | Øb1               | c1 | Ød0    | Ødk   | dz  | Øe1 | f1 | h0 | i2    | i3   | lz   | lz1   | Øs1  | x    |
|-------------|----|-------------------|-------|-------------------|----|--------|-------|-----|-----|----|----|-------|------|------|-------|------|------|
| ZTR212SPH4_ | 2  | 118 <sub>h7</sub> | 35.73 | 90 <sub>h7</sub>  | 7  | 25.47  | 31.5  | 63  | 109 | 10 | 22 | 71.0  | 23.5 | 26.0 | 41.0  | 5.5  | 0.50 |
| ZTR216SPH4_ | 2  | 118 <sub>h7</sub> | 38.98 | 90 <sub>h7</sub>  | 7  | 33.95  | 38.0  | 63  | 109 | 10 | 22 | 71.0  | 23.5 | 26.0 | 41.0  | 5.5  | 0.00 |
| ZTR219SPH5_ | 2  | 145 <sub>h7</sub> | 42.16 | 110 <sub>h7</sub> | 8  | 40.32  | 44.3  | 80  | 135 | 12 | 22 | 70.0  | 22.5 | 26.0 | 41.0  | 5.5  | 0.00 |
| ZTR223SPH5_ | 2  | 145 <sub>h7</sub> | 46.40 | 110 <sub>h7</sub> | 8  | 48.81  | 52.8  | 80  | 135 | 12 | 22 | 70.0  | 22.5 | 26.0 | 41.0  | 5.5  | 0.00 |
| ZTR314SPH5_ | 3  | 145 <sub>h7</sub> | 49.18 | 110 <sub>h7</sub> | 8  | 44.56  | 52.4  | 80  | 135 | 12 | 26 | 76.5  | 22.5 | 32.5 | 47.5  | 5.5  | 0.30 |
| ZTR223SPH7_ | 2  | 179 <sub>h7</sub> | 46.40 | 140 <sub>h7</sub> | 10 | 48.81  | 52.8  | 100 | 168 | 12 | 22 | 84.0  | 31.5 | 26.0 | 46.0  | 6.6  | 0.00 |
| ZTR316SPH7_ | 3  | 179 <sub>h7</sub> | 51.46 | 140 <sub>h7</sub> | 10 | 50.93  | 56.9  | 100 | 168 | 12 | 26 | 90.5  | 31.5 | 32.5 | 52.5  | 6.6  | 0.00 |
| ZTR319SPH7_ | 3  | 179 <sub>h7</sub> | 56.24 | 140 <sub>h7</sub> | 10 | 60.48  | 66.5  | 100 | 168 | 12 | 26 | 90.5  | 31.5 | 32.5 | 52.5  | 6.6  | 0.00 |
| ZTR412SPH7_ | 4  | 179 <sub>h7</sub> | 62.46 | 140 <sub>h7</sub> | 10 | 50.93  | 62.9  | 100 | 168 | 12 | 35 | 103.0 | 31.5 | 45.0 | 65.0  | 6.6  | 0.50 |
| ZTR332SPH8_ | 3  | 247 <sub>h7</sub> | 76.93 | 200 <sub>h7</sub> | 12 | 101.86 | 107.9 | 148 | 233 | 15 | 26 | 107.5 | 41.5 | 32.5 | 57.5  | 9.0  | 0.00 |
| ZTR417SPH8_ | 4  | 247 <sub>h7</sub> | 71.08 | 200 <sub>h7</sub> | 12 | 72.15  | 80.2  | 148 | 233 | 15 | 35 | 120.0 | 41.5 | 45.0 | 70.0  | 9.0  | 0.00 |
| ZTR420SPH8_ | 4  | 247 <sub>h7</sub> | 77.44 | 200 <sub>h7</sub> | 12 | 84.88  | 92.9  | 148 | 233 | 15 | 35 | 120.0 | 41.5 | 45.0 | 70.0  | 9.0  | 0.00 |
| ZTR518SPH8_ | 5  | 247 <sub>h7</sub> | 81.75 | 200 <sub>h7</sub> | 12 | 95.49  | 105.5 | 148 | 233 | 15 | 34 | 130.0 | 41.5 | 55.0 | 80.0  | 9.0  | 0.00 |
| ZTR615SPH8_ | 6  | 247 <sub>h7</sub> | 90.75 | 200 <sub>h7</sub> | 12 | 95.49  | 107.5 | 148 | 233 | 15 | 43 | 140.0 | 41.5 | 65.0 | 90.0  | 9.0  | 0.00 |
| ZTR519SPH9_ | 5  | 300               | 84.40 | 255 <sub>h7</sub> | 18 | 100.80 | 110.8 | 187 | 280 | 20 | 34 | 155.0 | 54.0 | 55.0 | 101.0 | 13.5 | 0.00 |
| ZTR616SPH9_ | 6  | 300               | 93.93 | 255 <sub>h7</sub> | 18 | 101.86 | 113.9 | 187 | 280 | 20 | 43 | 165.0 | 54.0 | 65.0 | 111.0 | 13.5 | 0.00 |

## Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |
| EZ803U | 190 | 238 | 315.0 | 156.5 | 22 | 184.0 |
| EZ805U | 190 | 320 | 397.0 | 156.5 | 22 | 266.0 |

## Dimensions of geared motors

| Type       | EZ3<br>mp | EZ4<br>mp | EZ5<br>mp | EZ7<br>mp | EZ8<br>mp |
|------------|-----------|-----------|-----------|-----------|-----------|
| ZTR_PH431_ | -         | 54.5      | 54.0      | -         | -         |
| ZTR_PH432_ | 99.0      | -         | -         | -         | -         |
| ZTR_PH531_ | -         | -         | 61.0      | 64.0      | -         |
| ZTR_PH532_ | -         | 103.0     | 102.5     | -         | -         |
| ZTR_PH731_ | -         | -         | -         | 71.0      | 81.0      |
| ZTR_PH732_ | -         | -         | 119.0     | 122.0     | -         |
| ZTR_PH831_ | -         | -         | -         | -         | 110.0     |
| ZTR_PH832_ | -         | -         | -         | 161.0     | 171.0     |
| ZTR_PH942_ | -         | -         | -         | -         | 210.5     |

## 5.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |    |   |    |   |    |   |   |   |   |   |   |   |      |        |
|---|----|---|----|---|----|---|---|---|---|---|---|---|------|--------|
| Z | TR | 3 | 19 | S | PH | 7 | 3 | 1 | S | F | S | S | 0050 | EZ703U |
|---|----|---|----|---|----|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design                          |
|--------|--------------------------------------|---------------------------------|
| Z      | Type                                 | Rack and pinion drive           |
| TR     | Design                               | Screwed flange pinion           |
| 3      | Module                               | $m_n = 3$ (example)             |
| 19     | Number of teeth                      | $z = 19$ (example)              |
| S      | Toothing                             | Helical (left-hand 19° 31' 42") |
| PH     | Type                                 | Planetary gear unit             |
| 7      | Size                                 | 7 (example)                     |
| 3      | Generation                           | Generation 3                    |
| 4      |                                      | Generation 4                    |
| 1      | Stages                               | Single-stage                    |
| 2      |                                      | Two-stage                       |
| S      | Housing                              | Standard                        |
| F      | Shaft                                | Flange shaft                    |
| S      | Bearing                              | Standard bearing                |
| V      |                                      | Reinforced bearing (PH3 – PH5)  |
| S      | Backlash                             | Standard                        |
| R      |                                      | Reduced (PH3 – PH9)             |
| 0050   | Transmission ratio ( $i \times 10$ ) | $i = 5$ (example)               |
| EZ703U | Motor                                | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

- A detailed type designation of the motor, see chapter [13](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [5.6.2](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

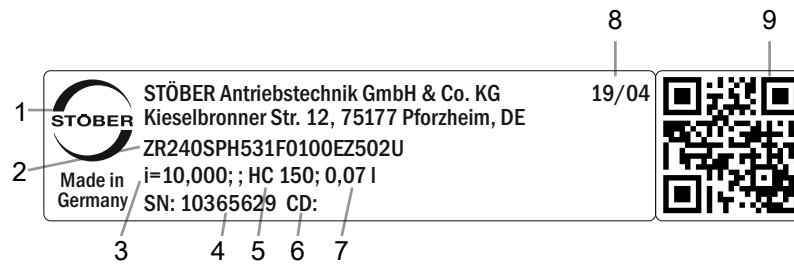
In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [5.5.1](#).



## 5.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 5.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

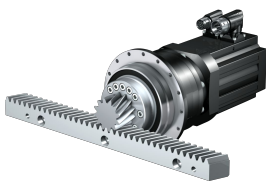
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 5.5 Product description

### 5.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



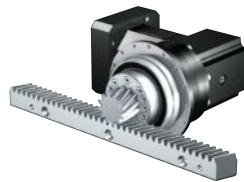
Catalog ID 443286\_en

Motor adapter



Catalog ID 443137\_en

KX right-angle input with MF motor adapter



On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 5.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 5.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 5.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 5.5.4.1 Rack and pinion drive lubrication

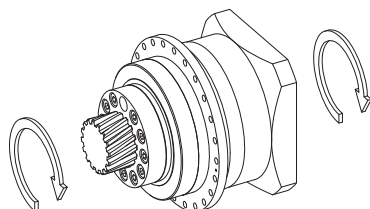
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 5.5.5 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | $\leq 90$ °C          |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 5.5.6 Direction of rotation

The input and output rotate in the same direction.



## 5.6 Project configuration

Project your drives using our SERVOfsoft designing software. Download SERVOfsoft for free at <https://www.stoeber.de/en/ServoSoft>.

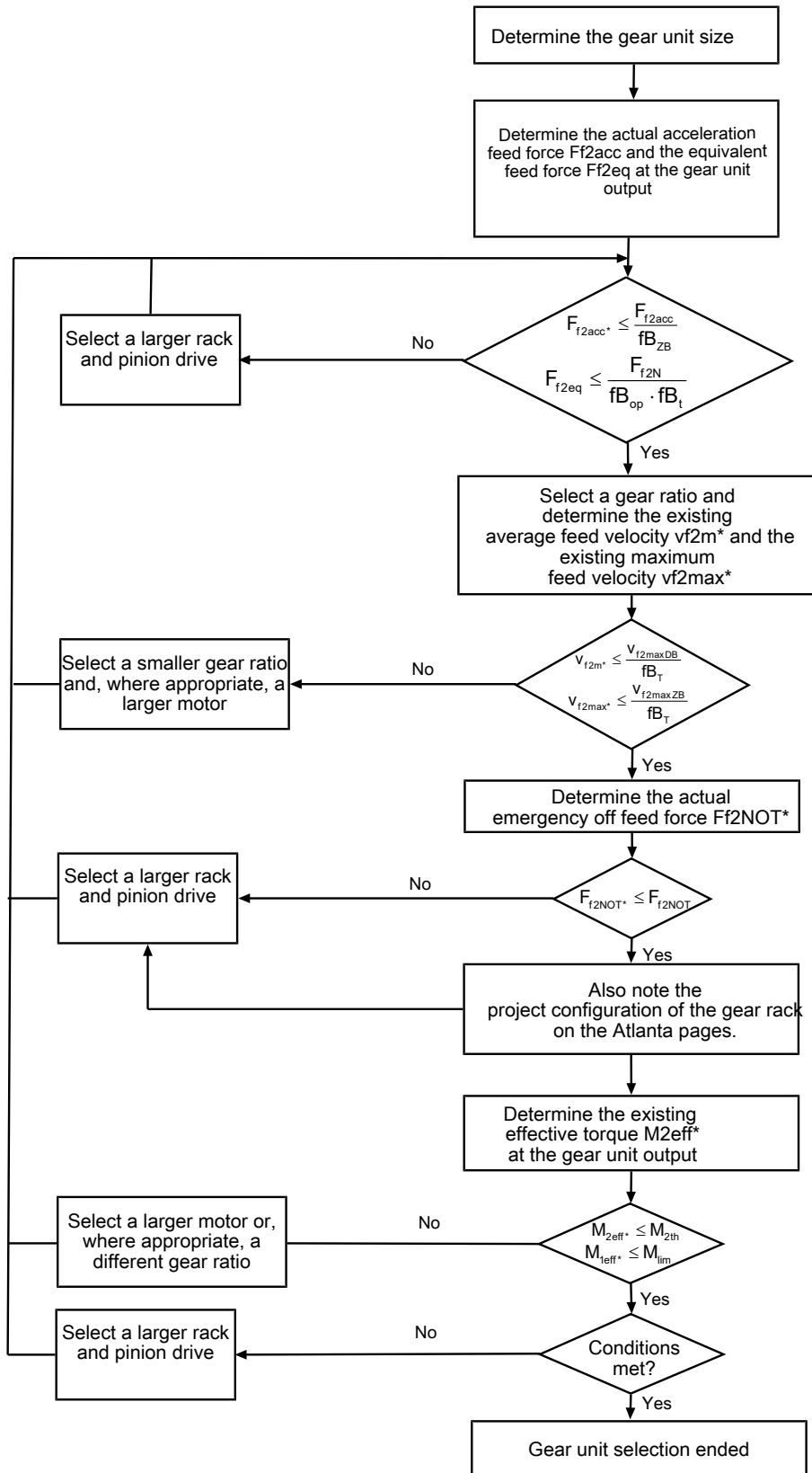
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 5.6.1 Drive selection

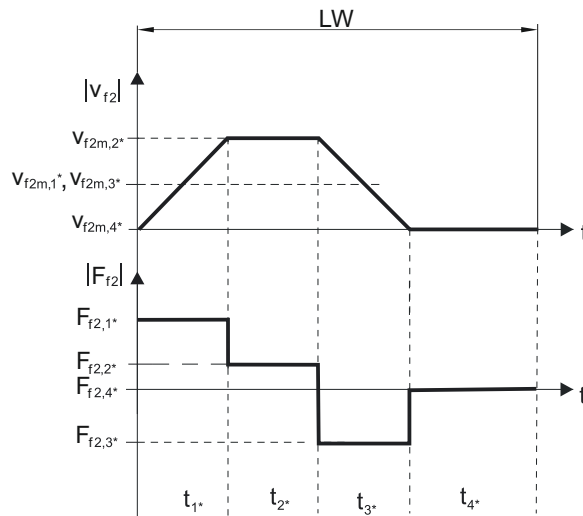


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

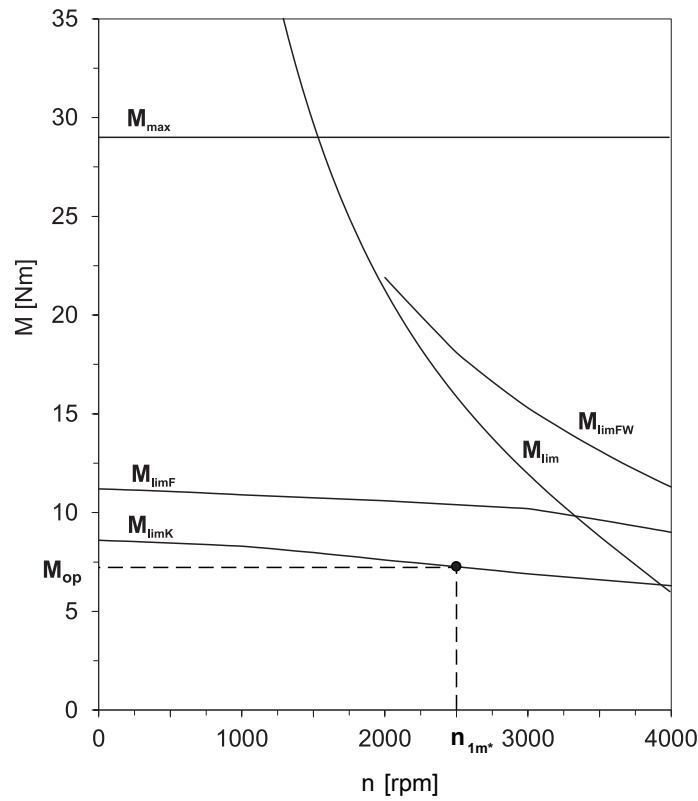
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [► 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

**5.6.2 Recommendation for radial shaft seal rings**

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

**5.7 Additional documentation**

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

| Documentation  | ID        |
|--|-----------|
| Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104 | 443354_de |
| Operating manual for EZ synchronous servo motors                     | 443032_en |
| Operating manual for gear racks (Atlanta)                            | 442455    |

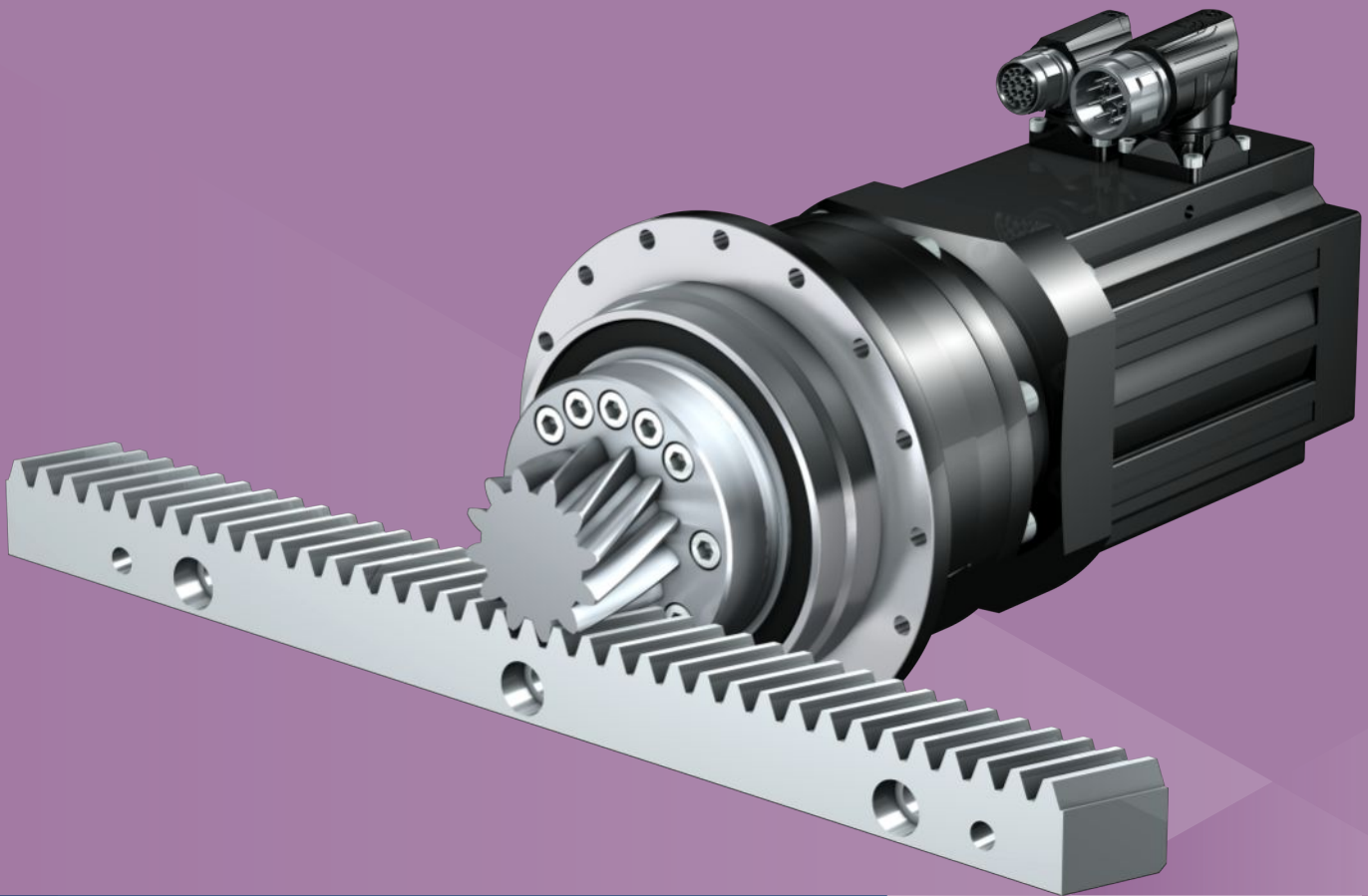




# 6 ZTRPHV rack and pinion drives

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## 6 Rack and pinion drives

# ZTRPHV

### 6.1 Overview

High-performance precision planetary geared motors with screwed flange pinion

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★☆ |
| Linear clearance  | ★★★★☆ |
| Price category  | €€€€  |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★☆ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 5 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Radial runout ≤ 10 μm (optional)                          | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                 |
|-------------|-----------------|
| $m_n$       | 5 – 6 mm        |
| $z$         | 16 – 19         |
| $F_{f2acc}$ | 22 – 67 kN      |
| $v_{f2N}$   | 0.13 – 0.39 m/s |
| $\Delta s$  | 15 – 44 μm      |

## 6.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 6.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                      | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{zacc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|---------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZTR5PHV9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.13   | 16                | 18                 | 0.2      | 3.1 | ZTR519SPHV943_1210 EZ701U | 43                  | 133                 | 2178               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.13   | 26                | 31                 | 0.4      | 1.9 | ZTR519SPHV943_1210 EZ702U | 67                  | 133                 | 3360               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.13   | 36                | 45                 | 0.5      | 1.4 | ZTR519SPHV943_1210 EZ703U | 67                  | 133                 | 3360               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.13   | 46                | 65                 | 0.7      | 1.1 | ZTR519SPHV943_1210 EZ705U | 67                  | 133                 | 3360               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.17   | 12                | 13                 | 0.3      | 3.8 | ZTR519SPHV943_0910 EZ701U | 33                  | 133                 | 1638               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.17   | 20                | 23                 | 0.4      | 2.3 | ZTR519SPHV943_0910 EZ702U | 67                  | 133                 | 3358               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.17   | 27                | 34                 | 0.6      | 1.7 | ZTR519SPHV943_0910 EZ703U | 67                  | 133                 | 3360               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.17   | 35                | 49                 | 0.8      | 1.3 | ZTR519SPHV943_0910 EZ705U | 67                  | 133                 | 3360               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.26   | 8.1               | 9.0                | 0.3      | 5.0 | ZTR519SPHV943_0610 EZ701U | 22                  | 133                 | 1098               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| 0.26   | 13                | 16                 | 0.5      | 3.1 | ZTR519SPHV943_0610 EZ702U | 45                  | 133                 | 2251               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| 0.26   | 18                | 23                 | 0.7      | 2.2 | ZTR519SPHV943_0610 EZ703U | 67                  | 133                 | 3360               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| 0.26   | 23                | 33                 | 1.0      | 1.7 | ZTR519SPHV943_0610 EZ705U | 67                  | 133                 | 3360               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| <b>ZTR5PHV9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 67</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.20   | 26                | 43                 | 0.4      | 1.7 | ZTR519SPHV943_1210 EZ703U | 67                  | 133                 | 3360               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.20   | 35                | 65                 | 0.6      | 1.2 | ZTR519SPHV943_1210 EZ705U | 67                  | 133                 | 3360               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 280                 | 5             | 19 | 100.8         |
| 0.26   | 20                | 33                 | 0.5      | 2.0 | ZTR519SPHV943_0910 EZ703U | 67                  | 133                 | 3360               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.26   | 27                | 49                 | 0.7      | 1.5 | ZTR519SPHV943_0910 EZ705U | 67                  | 133                 | 3360               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 283                 | 5             | 19 | 100.8         |
| 0.39   | 13                | 22                 | 0.6      | 2.6 | ZTR519SPHV943_0610 EZ703U | 67                  | 133                 | 3360               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| 0.39   | 18                | 33                 | 0.8      | 2.0 | ZTR519SPHV943_0610 EZ705U | 67                  | 133                 | 3360               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 284                 | 5             | 19 | 100.8         |
| <b>ZTR6PHV9 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.13   | 16                | 18                 | 0.2      | 3.1 | ZTR616SPHV943_1210 EZ701U | 43                  | 112                 | 2178               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.13   | 26                | 31                 | 0.4      | 1.9 | ZTR616SPHV943_1210 EZ702U | 56                  | 112                 | 2844               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.13   | 35                | 44                 | 0.5      | 1.4 | ZTR616SPHV943_1210 EZ703U | 56                  | 112                 | 2844               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.13   | 46                | 65                 | 0.7      | 1.1 | ZTR616SPHV943_1210 EZ705U | 56                  | 112                 | 2844               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.18   | 12                | 13                 | 0.3      | 3.8 | ZTR616SPHV943_0910 EZ701U | 32                  | 112                 | 1638               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.18   | 19                | 23                 | 0.4      | 2.3 | ZTR616SPHV943_0910 EZ702U | 56                  | 112                 | 2844               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.18   | 27                | 33                 | 0.6      | 1.7 | ZTR616SPHV943_0910 EZ703U | 56                  | 112                 | 2844               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.18   | 34                | 49                 | 0.8      | 1.3 | ZTR616SPHV943_0910 EZ705U | 56                  | 112                 | 2844               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.26   | 8.0               | 8.9                | 0.3      | 4.9 | ZTR616SPHV943_0610 EZ701U | 22                  | 112                 | 1098               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |
| 0.26   | 13                | 16                 | 0.5      | 3.0 | ZTR616SPHV943_0610 EZ702U | 44                  | 112                 | 2251               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |
| 0.26   | 18                | 22                 | 0.7      | 2.2 | ZTR616SPHV943_0610 EZ703U | 56                  | 112                 | 2844               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |
| 0.26   | 23                | 33                 | 1.0      | 1.7 | ZTR616SPHV943_0610 EZ705U | 56                  | 112                 | 2844               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |
| <b>ZTR6PHV9 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 56</math> kN))</b> |                   |                    |          |     |                           |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.20   | 26                | 43                 | 0.4      | 1.7 | ZTR616SPHV943_1210 EZ703U | 56                  | 112                 | 2844               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.20   | 35                | 64                 | 0.6      | 1.2 | ZTR616SPHV943_1210 EZ705U | 56                  | 112                 | 2844               | 121.0 | 0.11                   | 0.20                   | 44                 | 15                       | 285                 | 6             | 16 | 101.9         |
| 0.26   | 19                | 32                 | 0.5      | 2.0 | ZTR616SPHV943_0910 EZ703U | 56                  | 112                 | 2844               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.26   | 26                | 48                 | 0.7      | 1.5 | ZTR616SPHV943_0910 EZ705U | 56                  | 112                 | 2844               | 91.00 | 0.15                   | 0.26                   | 44                 | 15                       | 288                 | 6             | 16 | 101.9         |
| 0.39   | 13                | 22                 | 0.6      | 2.6 | ZTR616SPHV943_0610 EZ703U | 56                  | 112                 | 2844               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |
| 0.39   | 18                | 32                 | 0.8      | 1.9 | ZTR616SPHV943_0610 EZ705U | 56                  | 112                 | 2844               | 61.00 | 0.22                   | 0.39                   | 44                 | 15                       | 289                 | 6             | 16 | 101.9         |

## 6.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

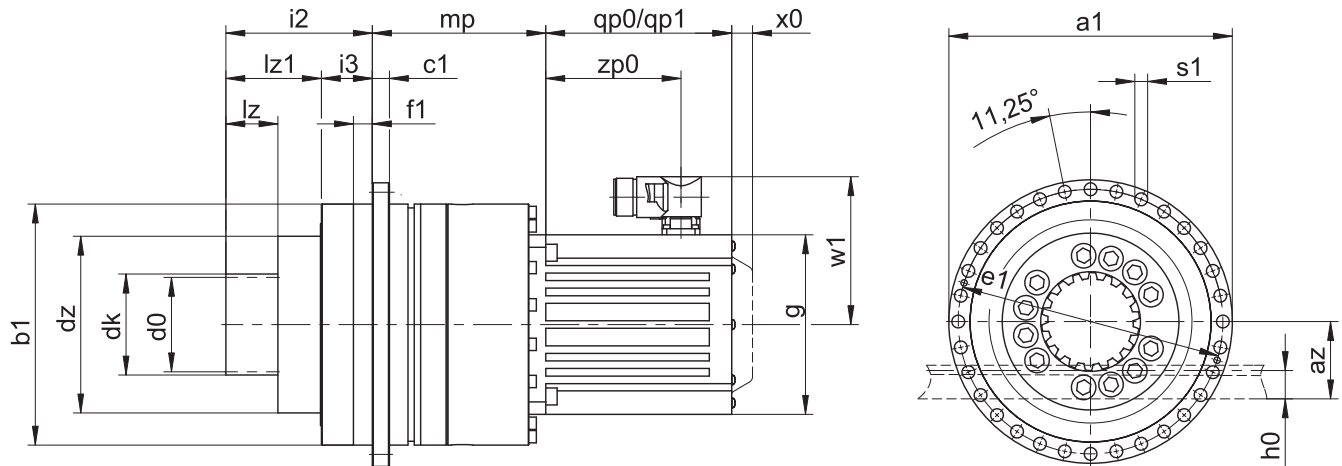
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

### Dimensions of gear units

| Type         | mn | Øa1 | az    | Øb1               | c1 | Ød0    | Ødk   | Ødz | Øe1 | f1 | h0 | i2  | i3 | lz | lz1 | Øs1  | x   |
|--------------|----|-----|-------|-------------------|----|--------|-------|-----|-----|----|----|-----|----|----|-----|------|-----|
| ZTR519SPHV9_ | 5  | 300 | 84.40 | 255 <sub>h7</sub> | 18 | 100.80 | 110.8 | 187 | 280 | 20 | 34 | 155 | 54 | 55 | 101 | 13.5 | 0.0 |
| ZTR616SPHV9_ | 6  | 300 | 93.93 | 255 <sub>h7</sub> | 18 | 101.86 | 113.9 | 187 | 280 | 20 | 43 | 165 | 54 | 65 | 111 | 13.5 | 0.0 |

### Dimensions of motors

| Type   | □g  | qp0 | qp1 | w1  | x0 | zp0 |
|--------|-----|-----|-----|-----|----|-----|
| EZ701U | 145 | 102 | 161 | 115 | 22 | 64  |
| EZ702U | 145 | 127 | 186 | 115 | 22 | 89  |
| EZ703U | 145 | 152 | 211 | 115 | 22 | 114 |
| EZ705U | 145 | 207 | 266 | 134 | 22 | 165 |

### Dimensions of geared motors

| Type        | EZ7<br>mp |
|-------------|-----------|
| ZTR_PHV943_ | 174       |

## 6.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |    |   |    |   |     |   |   |   |   |   |   |   |      |       |
|---|----|---|----|---|-----|---|---|---|---|---|---|---|------|-------|
| Z | TR | 6 | 16 | S | PHV | 9 | 4 | 3 | S | F | S | S | 0910 | EZ703 |
|   |    |   |    |   |     |   |   |   |   |   |   |   |      | U     |

### Explanation

| Code   | Designation                          | Design                          |
|--------|--------------------------------------|---------------------------------|
| Z      | Type                                 | Rack and pinion drive           |
| TR     | Design                               | Screwed flange pinion           |
| 6      | Module                               | $m_n = 6$ (example)             |
| 16     | Number of teeth                      | $z = 16$ (example)              |
| S      | Toothing                             | Helical (left-hand 19° 31' 42") |
| PHV    | Type                                 | Planetary gear unit             |
| 9      | Size                                 | 9 (example)                     |
| 4      | Generation                           | Generation 4                    |
| 3      | Stages                               | Three-stage                     |
| S      | Housing                              | Standard                        |
| F      | Shaft                                | Flange shaft                    |
| S      | Bearing                              | Standard bearing                |
| V      |                                      | Reinforced bearing (PH3 – PH5)  |
| S      | Backlash                             | Standard                        |
| R      |                                      | Reduced (PHV9)                  |
| 0910   | Transmission ratio ( $i \times 10$ ) | $i = 91$ (example)              |
| EZ703U | Motor                                | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

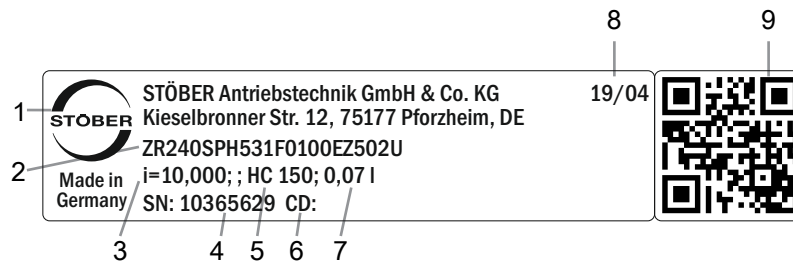
- A detailed type designation of the motor, see chapter [\[ 13\]](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [\[ 6.6.2\]](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 6.5.1\]](#).

## 6.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 6.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 6.5 Product description

### 6.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

Motor adapter



Catalog ID 443137\_en

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 6.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 6.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 6.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 6.5.4.1 Rack and pinion drive lubrication

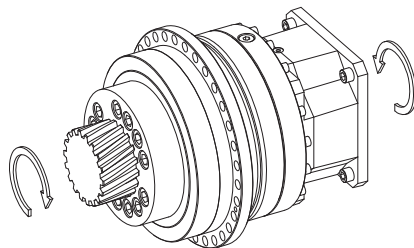
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 6.5.5 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | $\leq 90$ °C          |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 6.5.6 Direction of rotation

The input and output rotate in the same direction.



<sup>1</sup> Observe the protection class of all the components.

## 6.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

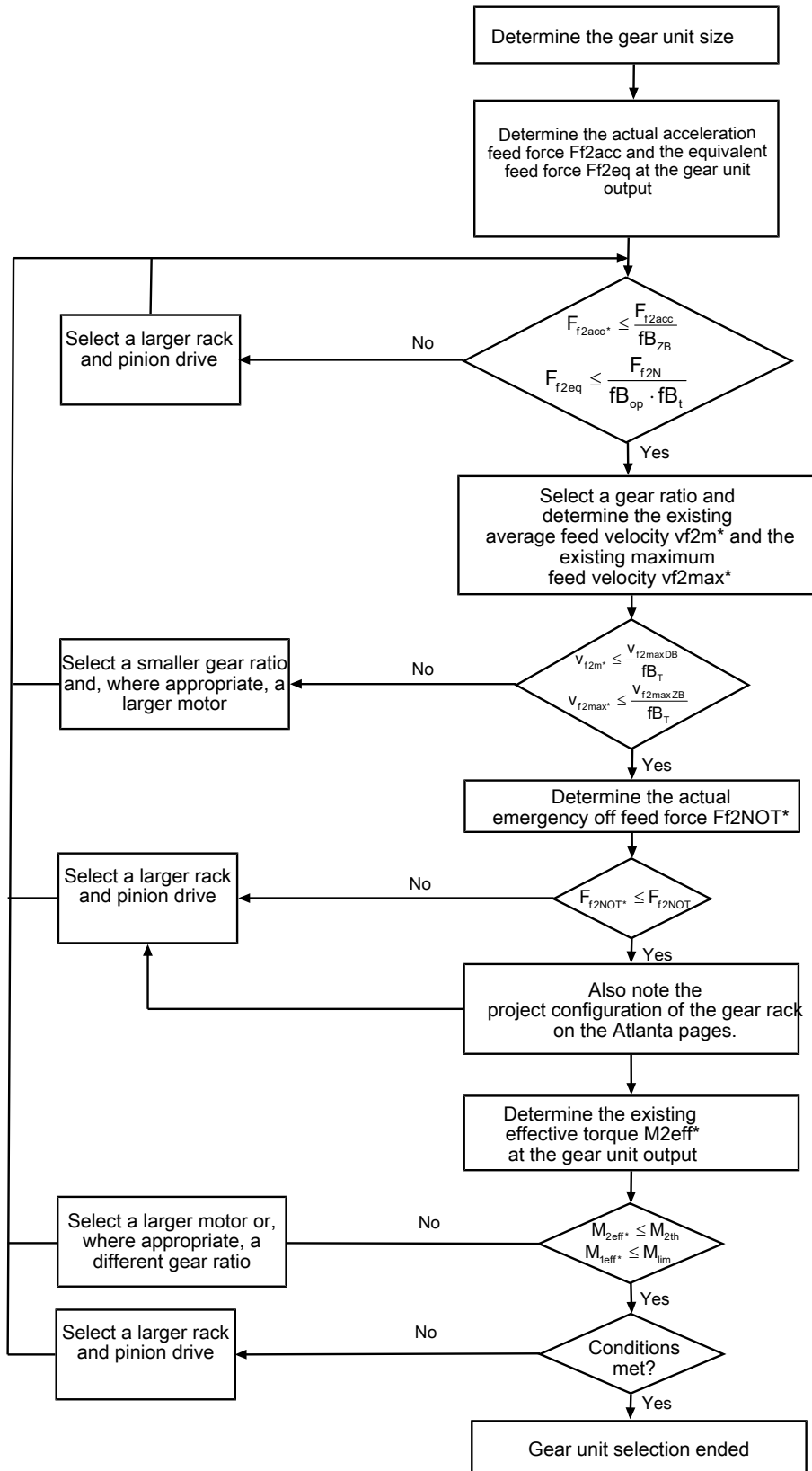
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).



### 6.6.1 Drive selection

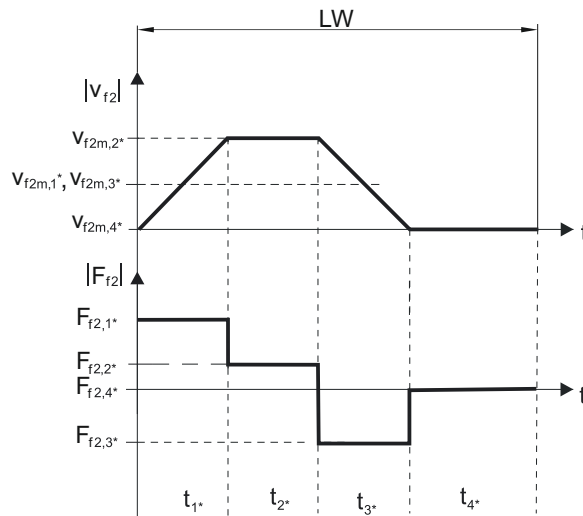


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

### Example of cyclic operation

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:



#### Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

#### Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

#### Calculation of the actual emergency off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

#### Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

#### Calculation of the thermal limit torque

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

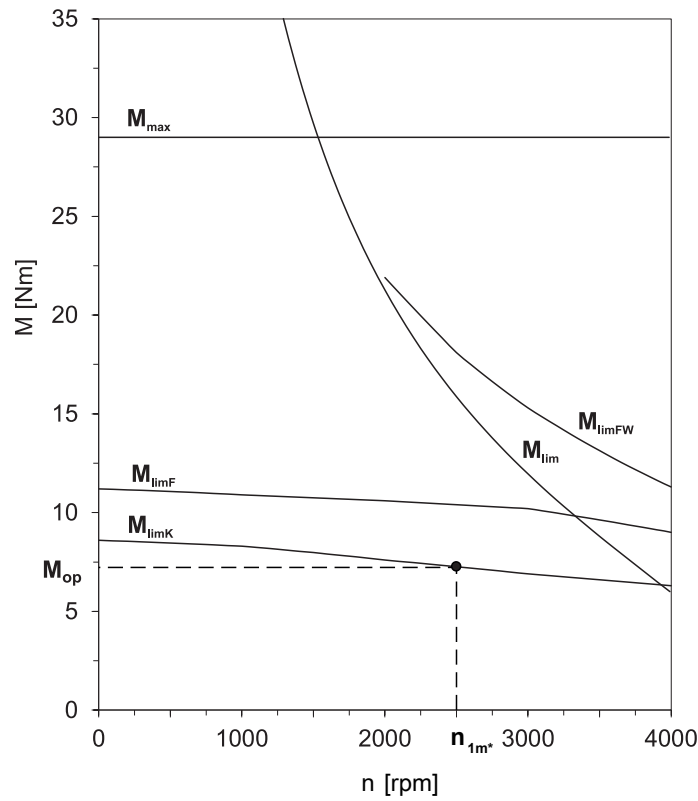
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



**Calculation of the actual effective torque**

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

**Operating factors**

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

**6.6.2 Recommendation for radial shaft seal rings**

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

**6.7 Additional documentation**

Additional documentation related to the product can be found at <http://www.stoeber.de/en/downloads/>

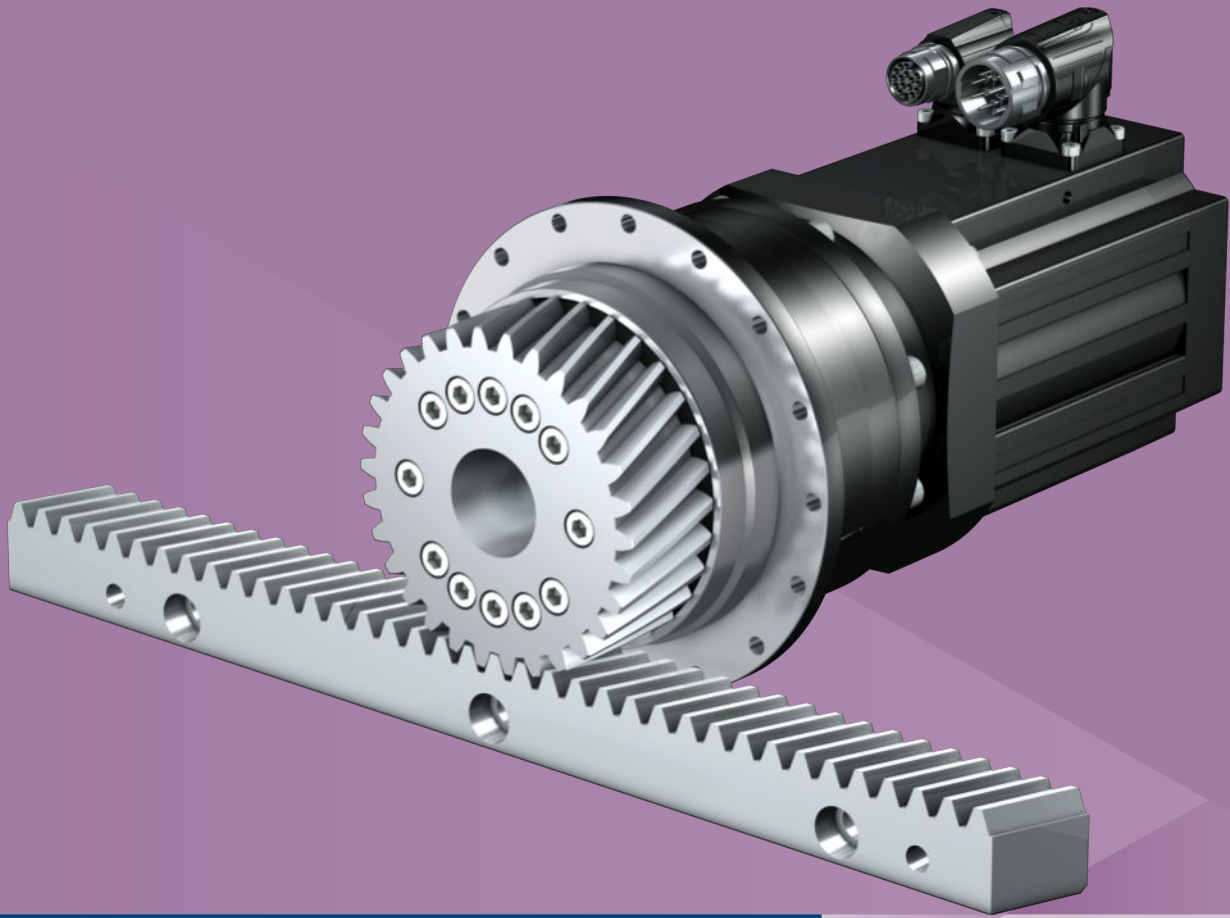
Enter the ID of the documentation in the Search term field.

| Documentation   | ID        |
|---|-----------|
| Operating manual gear units, geared motors PHV94 – PHV104 | 443355_en |
| Operating manual for EZ synchronous servo motors          | 443032_en |
| Operating manual for gear racks (Atlanta)                 | 442455    |

# 7 ZRPH rack and pinion drives

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## 7 Rack and pinion drives

# ZRPH

### 7.1 Overview

High-performance precision planetary geared motors with screwed pinion

#### Features

|   |              |
|---|--------------|
| Power density   | ★★★★☆        |
| Linear clearance  | ★★★★★        |
| Price category  | €€€          |
| Smooth operation  | ★★★★☆        |
| Linear rigidity   | ★★★★☆        |
| Mass moment of inertia                                    | ★★★★☆        |
| Ready-to-install drive solution                           | ✓            |
| Pinion gearing quality 5 (DIN 3962)                       | ✓            |
| Helical gearing   | ✓            |
| Case-hardened and smoothed                                | ✓            |
| Reinforced output bearing (PH3 – PH5)                     | ✓ (optional) |
| Compact and highly dynamic due to direct motor attachment | ✓            |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                       |
|-------------|-----------------------|
| $m_n$       | 2 – 4 mm              |
| $z$         | 30 – 40               |
| $F_{f2acc}$ | 0.93 – 16 kN          |
| $v_{f2N}$   | 0.16 – 6 m/s          |
| $\Delta s$  | 10 – 56 $\mu\text{m}$ |

## 7.2 Selection table

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 7.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For rack and pinion drives with reduced backlash or reinforced bearings (PH3 – PH5), higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR2PH4 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 4,9</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.16   | 1.7               | 1.8                | 0.6      | 1.8 | ZR233SPH432_0700 EZ301U | 4.5                 | 6.4                 | 158                | 70.00 | 0.24                   | 0.42                   | 31                 | 10                       | 42                  | 2             | 33 | 70.0          |
| 0.16   | 3.0               | 3.1                | 1.0      | 1.0 | ZR233SPH432_0700 EZ302U | 4.5                 | 6.4                 | 158                | 70.00 | 0.24                   | 0.42                   | 31                 | 10                       | 42                  | 2             | 33 | 70.0          |
| 0.22   | 1.2               | 1.3                | 0.7      | 2.5 | ZR233SPH432_0500 EZ301U | 3.7                 | 6.4                 | 130                | 50.00 | 0.33                   | 0.59                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.22   | 2.1               | 2.2                | 1.2      | 1.4 | ZR233SPH432_0500 EZ302U | 4.5                 | 6.4                 | 159                | 50.00 | 0.33                   | 0.59                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.22   | 2.7               | 2.9                | 1.6      | 1.1 | ZR233SPH432_0500 EZ303U | 4.5                 | 6.4                 | 159                | 50.00 | 0.33                   | 0.59                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.28   | 1.0               | 1.0                | 0.8      | 2.9 | ZR233SPH432_0400 EZ301U | 3.0                 | 6.4                 | 104                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.28   | 1.7               | 1.8                | 1.4      | 1.7 | ZR233SPH432_0400 EZ302U | 4.4                 | 6.4                 | 155                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.28   | 2.2               | 2.3                | 1.9      | 1.3 | ZR233SPH432_0400 EZ303U | 4.4                 | 6.4                 | 155                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.31   | 0.9               | 0.9                | 0.9      | 3.3 | ZR233SPH432_0350 EZ301U | 2.6                 | 6.4                 | 91                 | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.31   | 1.5               | 1.6                | 1.5      | 1.9 | ZR233SPH432_0350 EZ302U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.31   | 1.9               | 2.0                | 1.9      | 1.5 | ZR233SPH432_0350 EZ303U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.31   | 2.6               | 2.8                | 2.6      | 1.1 | ZR233SPH432_0350 EZ401U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.39   | 0.7               | 0.7                | 1.1      | 3.9 | ZR233SPH432_0280 EZ301U | 2.1                 | 6.4                 | 73                 | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.39   | 1.2               | 1.2                | 1.9      | 2.3 | ZR233SPH432_0280 EZ302U | 3.7                 | 6.4                 | 130                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.39   | 1.5               | 1.6                | 2.4      | 1.7 | ZR233SPH432_0280 EZ303U | 4.6                 | 6.4                 | 160                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.39   | 2.1               | 2.2                | 3.3      | 1.3 | ZR233SPH432_0280 EZ401U | 4.6                 | 6.4                 | 160                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.44   | 0.6               | 0.6                | 1.1      | 4.2 | ZR233SPH432_0250 EZ301U | 1.9                 | 6.4                 | 65                 | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.44   | 1.1               | 1.1                | 1.9      | 2.4 | ZR233SPH432_0250 EZ302U | 3.3                 | 6.4                 | 116                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.44   | 1.4               | 1.5                | 2.4      | 1.9 | ZR233SPH432_0250 EZ303U | 4.6                 | 6.4                 | 161                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.44   | 1.9               | 2.0                | 3.3      | 1.4 | ZR233SPH432_0250 EZ401U | 4.6                 | 6.4                 | 161                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.55   | 0.5               | 0.5                | 1.3      | 4.8 | ZR233SPH432_0200 EZ301U | 1.5                 | 6.4                 | 52                 | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.55   | 0.8               | 0.9                | 2.2      | 2.8 | ZR233SPH432_0200 EZ302U | 2.7                 | 6.4                 | 93                 | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.55   | 1.1               | 1.2                | 2.9      | 2.2 | ZR233SPH432_0200 EZ303U | 3.7                 | 6.4                 | 130                | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.55   | 1.5               | 1.6                | 3.9      | 1.6 | ZR233SPH432_0200 EZ401U | 4.3                 | 6.4                 | 150                | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.69   | 0.7               | 0.7                | 2.6      | 3.3 | ZR233SPH432_0160 EZ302U | 2.1                 | 6.4                 | 74                 | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.69   | 0.9               | 0.9                | 3.4      | 2.5 | ZR233SPH432_0160 EZ303U | 3.0                 | 6.4                 | 104                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.69   | 1.2               | 1.3                | 4.6      | 1.9 | ZR233SPH432_0160 EZ401U | 3.6                 | 6.4                 | 126                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.69   | 2.0               | 2.2                | 7.6      | 1.1 | ZR233SPH432_0160 EZ402U | 4.6                 | 6.4                 | 160                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.10   | 0.8               | 0.8                | 2.4      | 2.2 | ZR233SPH431_0100 EZ401U | 2.3                 | 6.4                 | 82                 | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 1.10   | 1.2               | 1.3                | 3.7      | 1.4 | ZR233SPH431_0100 EZ501U | 3.3                 | 6.4                 | 115                | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 1.10   | 1.3               | 1.4                | 4.1      | 1.3 | ZR233SPH431_0100 EZ402U | 3.3                 | 6.4                 | 115                | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 1.57   | 0.5               | 0.6                | 3.0      | 3.1 | ZR233SPH431_0070 EZ401U | 1.6                 | 6.4                 | 57                 | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.57   | 0.8               | 0.9                | 4.6      | 2.0 | ZR233SPH431_0070 EZ501U | 3.1                 | 6.4                 | 108                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.57   | 0.9               | 1.0                | 5.0      | 1.9 | ZR233SPH431_0070 EZ402U | 3.1                 | 6.4                 | 108                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.57   | 1.3               | 1.7                | 7.4      | 1.3 | ZR233SPH431_0070 EZ404U | 4.6                 | 6.4                 | 160                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.57   | 1.4               | 1.5                | 7.9      | 1.2 | ZR233SPH431_0070 EZ502U | 4.6                 | 6.4                 | 160                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 2.20   | 0.4               | 0.4                | 4.5      | 3.9 | ZR233SPH431_0050 EZ401U | 1.2                 | 6.4                 | 41                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.20   | 0.6               | 0.6                | 6.9      | 2.6 | ZR233SPH431_0050 EZ501U | 2.2                 | 6.4                 | 77                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.20   | 0.6               | 0.7                | 7.5      | 2.3 | ZR233SPH431_0050 EZ402U | 2.2                 | 6.4                 | 77                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.20   | 0.9               | 1.2                | 11       | 1.6 | ZR233SPH431_0050 EZ404U | 4.0                 | 6.4                 | 139                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.20   | 1.0               | 1.1                | 12       | 1.5 | ZR233SPH431_0050 EZ502U | 4.2                 | 6.4                 | 149                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.20   | 1.3               | 1.5                | 16       | 1.1 | ZR233SPH431_0050 EZ503U | 4.9                 | 6.4                 | 172                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 2.75   | 0.3               | 0.3                | 5.9      | 4.5 | ZR233SPH431_0040 EZ401U | 0.9                 | 6.4                 | 33                 | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| 2.75   | 0.5               | 0.5                | 9.0      | 3.0 | ZR233SPH431_0040 EZ501U | 1.8                 | 6.4                 | 61                 | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| 2.75   | 0.5               | 0.6                | 9.8      | 2.7 | ZR233SPH431_0040 EZ402U | 1.8                 | 6.4                 | 61                 | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| 2.75   | 0.8               | 0.9                | 14       | 1.8 | ZR233SPH431_0040 EZ404U | 3.2                 | 6.4                 | 111                | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |

7.2 Selection table 7 ZRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR2PH4 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 4,9</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 2.75   | 0.8               | 0.9                | 15       | 1.7 | ZR233SPH431_0040 EZ502U | 3.4                 | 6.4                 | 119                | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| 2.75   | 1.1               | 1.2                | 20       | 1.3 | ZR233SPH431_0040 EZ503U | 3.9                 | 6.4                 | 136                | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| <b>ZR2PH4 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 4,9</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 3.30   | 1.3               | 2.1                | 17       | 1.0 | ZR233SPH431_0050 EZ505U | 4.9                 | 6.4                 | 172                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.13   | 1.0               | 1.7                | 23       | 1.2 | ZR233SPH431_0040 EZ505U | 3.9                 | 6.4                 | 136                | 4.000 | 2.38                   | 4.58                   | 31                 | 10                       | 50                  | 2             | 33 | 70.0          |
| <b>ZR2PH4 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 4,9</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.31   | 1.7               | 1.8                | 0.7      | 1.5 | ZR233SPH432_0700 EZ301U | 4.5                 | 6.4                 | 158                | 70.00 | 0.24                   | 0.42                   | 31                 | 10                       | 42                  | 2             | 33 | 70.0          |
| 0.44   | 1.2               | 1.3                | 0.9      | 2.1 | ZR233SPH432_0500 EZ301U | 3.7                 | 6.4                 | 130                | 50.00 | 0.33                   | 0.59                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.44   | 2.0               | 2.2                | 1.5      | 1.2 | ZR233SPH432_0500 EZ302U | 4.5                 | 6.4                 | 159                | 50.00 | 0.33                   | 0.59                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.55   | 0.9               | 1.0                | 1.0      | 2.4 | ZR233SPH432_0400 EZ301U | 3.0                 | 6.4                 | 104                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.55   | 1.6               | 1.8                | 1.7      | 1.4 | ZR233SPH432_0400 EZ302U | 4.4                 | 6.4                 | 155                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.55   | 2.1               | 2.4                | 2.2      | 1.1 | ZR233SPH432_0400 EZ303U | 4.4                 | 6.4                 | 155                | 40.00 | 0.41                   | 0.73                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 0.63   | 0.8               | 0.9                | 1.0      | 2.8 | ZR233SPH432_0350 EZ301U | 2.6                 | 6.4                 | 91                 | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.63   | 1.4               | 1.6                | 1.7      | 1.6 | ZR233SPH432_0350 EZ302U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.63   | 1.8               | 2.1                | 2.3      | 1.3 | ZR233SPH432_0350 EZ303U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.63   | 2.1               | 2.6                | 2.7      | 1.1 | ZR233SPH432_0350 EZ401U | 4.6                 | 6.4                 | 160                | 35.00 | 0.47                   | 0.84                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.79   | 0.7               | 0.7                | 1.2      | 3.2 | ZR233SPH432_0280 EZ301U | 2.1                 | 6.4                 | 73                 | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.79   | 1.1               | 1.2                | 2.0      | 1.9 | ZR233SPH432_0280 EZ302U | 3.7                 | 6.4                 | 130                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.79   | 1.5               | 1.7                | 2.6      | 1.5 | ZR233SPH432_0280 EZ303U | 4.6                 | 6.4                 | 160                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.79   | 1.7               | 2.1                | 3.0      | 1.2 | ZR233SPH432_0280 EZ401U | 4.6                 | 6.4                 | 160                | 28.00 | 0.59                   | 1.05                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 0.88   | 0.6               | 0.6                | 1.2      | 3.5 | ZR233SPH432_0250 EZ301U | 1.9                 | 6.4                 | 65                 | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.88   | 1.0               | 1.1                | 2.1      | 2.0 | ZR233SPH432_0250 EZ302U | 3.3                 | 6.4                 | 116                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.88   | 1.3               | 1.5                | 2.7      | 1.6 | ZR233SPH432_0250 EZ303U | 4.6                 | 6.4                 | 161                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 0.88   | 1.5               | 1.9                | 3.2      | 1.3 | ZR233SPH432_0250 EZ401U | 4.6                 | 6.4                 | 161                | 25.00 | 0.66                   | 1.17                   | 31                 | 10                       | 46                  | 2             | 33 | 70.0          |
| 1.10   | 0.5               | 0.5                | 1.4      | 4.0 | ZR233SPH432_0200 EZ301U | 1.5                 | 6.4                 | 52                 | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 1.10   | 0.8               | 0.9                | 2.3      | 2.4 | ZR233SPH432_0200 EZ302U | 2.7                 | 6.4                 | 93                 | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 1.10   | 1.0               | 1.2                | 3.0      | 1.8 | ZR233SPH432_0200 EZ303U | 3.7                 | 6.4                 | 130                | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 1.10   | 1.2               | 1.5                | 3.5      | 1.6 | ZR233SPH432_0200 EZ401U | 4.3                 | 6.4                 | 150                | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 1.10   | 1.9               | 2.6                | 5.4      | 1.0 | ZR233SPH432_0200 EZ402U | 4.3                 | 6.4                 | 150                | 20.00 | 0.73                   | 1.47                   | 31                 | 10                       | 45                  | 2             | 33 | 70.0          |
| 1.38   | 0.4               | 0.4                | 1.7      | 4.6 | ZR233SPH432_0160 EZ301U | 1.2                 | 6.4                 | 42                 | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.38   | 0.6               | 0.7                | 2.8      | 2.8 | ZR233SPH432_0160 EZ302U | 2.1                 | 6.4                 | 74                 | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.38   | 0.8               | 1.0                | 3.6      | 2.1 | ZR233SPH432_0160 EZ303U | 3.0                 | 6.4                 | 104                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.38   | 1.0               | 1.2                | 4.3      | 1.8 | ZR233SPH432_0160 EZ401U | 3.6                 | 6.4                 | 126                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 1.38   | 1.5               | 2.1                | 6.5      | 1.2 | ZR233SPH432_0160 EZ402U | 4.6                 | 6.4                 | 160                | 16.00 | 0.92                   | 1.83                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 2.20   | 0.6               | 0.8                | 2.5      | 2.1 | ZR233SPH431_0100 EZ401U | 2.3                 | 6.4                 | 82                 | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 2.20   | 0.9               | 1.2                | 3.7      | 1.4 | ZR233SPH431_0100 EZ501U | 3.3                 | 6.4                 | 115                | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 2.20   | 1.0               | 1.3                | 3.8      | 1.4 | ZR233SPH431_0100 EZ402U | 3.3                 | 6.4                 | 115                | 10.00 | 1.28                   | 2.57                   | 31                 | 10                       | 36                  | 2             | 33 | 70.0          |
| 3.14   | 0.4               | 0.5                | 3.1      | 3.0 | ZR233SPH431_0070 EZ401U | 1.6                 | 6.4                 | 57                 | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 3.14   | 0.7               | 0.8                | 4.6      | 2.0 | ZR233SPH431_0070 EZ501U | 3.1                 | 6.4                 | 108                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 3.14   | 0.7               | 0.9                | 4.7      | 2.0 | ZR233SPH431_0070 EZ402U | 3.1                 | 6.4                 | 108                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 3.14   | 1.0               | 1.5                | 7.0      | 1.3 | ZR233SPH431_0070 EZ502U | 4.6                 | 6.4                 | 160                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 3.14   | 1.1               | 1.6                | 7.8      | 1.2 | ZR233SPH431_0070 EZ404U | 4.6                 | 6.4                 | 160                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 3.14   | 1.2               | 2.0                | 8.4      | 1.1 | ZR233SPH431_0070 EZ503U | 4.6                 | 6.4                 | 160                | 7.000 | 1.68                   | 3.14                   | 31                 | 10                       | 44                  | 2             | 33 | 70.0          |
| 4.40   | 0.3               | 0.4                | 4.6      | 3.8 | ZR233SPH431_0050 EZ401U | 1.2                 | 6.4                 | 41                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.40   | 0.5               | 0.6                | 6.9      | 2.6 | ZR233SPH431_0050 EZ501U | 2.2                 | 6.4                 | 77                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.40   | 0.5               | 0.7                | 7.1      | 2.5 | ZR233SPH431_0050 EZ402U | 2.2                 | 6.4                 | 77                 | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.40   | 0.7               | 1.1                | 10       | 1.7 | ZR233SPH431_0050 EZ502U | 4.2                 | 6.4                 | 149                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.40   | 0.8               | 1.2                | 12       | 1.5 | ZR233SPH431_0050 EZ404U | 4.0                 | 6.4                 | 139                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| 4.40   | 0.8               | 1.5                | 13       | 1.4 | ZR233SPH431_0050 EZ503U | 4.9                 | 6.4                 | 172                | 5.000 | 2.20                   | 4.40                   | 31                 | 10                       | 48                  | 2             | 33 | 70.0          |
| <b>ZR2PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 8,1</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.19   | 4.3               | 4.6                | 0.8      | 1.2 | ZR240SPH532_0700 EZ401U | 8.1                 | 10                  | 345                | 70.00 | 0.25                   | 0.51                   | 37                 | 12                       | 69                  | 2             | 40 | 84.9          |
| 0.27   | 3.1               | 3.3                | 1.0      | 1.5 | ZR240SPH532_0500 EZ401U | 8.1                 | 10                  | 345                | 50.00 | 0.36                   | 0.71                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.33   | 2.5               | 2.6                | 1.4      | 1.8 | ZR240SPH532_0400 EZ401U | 7.5                 | 10                  | 316                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.33   | 3.8               | 4.1                | 2.1      | 1.1 | ZR240SPH532_0400 EZ501U | 8.1                 | 10                  | 345                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.33   | 4.1               | 4.6                | 2.3      | 1.0 | ZR240SPH532_0400 EZ402U | 8.1                 | 10                  | 345                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.38   | 2.1               | 2.3                | 1.2      | 1.9 | ZR240SPH532_0350 EZ401U | 6.5                 | 10                  | 277                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.38   | 3.3               | 3.6                | 1.8      | 1.2 | ZR240SPH532_0350 EZ501U | 8.1                 | 10                  | 345                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.38   | 3.6               | 4.0                | 2.0      | 1.1 | ZR240SPH532_0350 EZ402U | 8.1                 | 10                  | 345                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.48   | 1.7               | 1.8                | 1.4      | 2.2 | ZR240SPH532_0280 EZ401U | 5.2                 | 10                  | 221                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.48   | 2.6               | 2.9                | 2.2      | 1.4 | ZR240SPH532_0280 EZ501U | 8.1                 | 10                  | 345                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.48   | 2.9               | 3.2                | 2.4      | 1.3 | ZR240SPH532_0280 EZ402U | 8.1                 | 10                  | 345                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.53   | 1.5               | 1.6                | 1.4      | 2.4 | ZR240SPH532_0250 EZ401U | 4.7                 | 10                  | 198                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.53   | 2.4               | 2.6                | 2.2      | 1.6 | ZR240SPH532_0250 EZ501U | 8.1                 | 10                  | 345                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.53   | 2.6               | 2.8                | 2.4      | 1.4 | ZR240SPH532_0250 EZ402U | 8.1                 | 10                  | 345                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.67   | 1.2               | 1.3                | 1.6      | 2.8 | ZR240SPH532_0200 EZ401U | 3.7                 | 10                  | 158                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.67   | 1.9               | 2.1                | 2.5      | 1.8 | ZR240SPH532_0200 EZ501U | 7.0                 | 10                  | 298                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |



| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR2PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 8,1</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.67  | 2.1               | 2.3                | 2.7      | 1.7 | ZR240SPH532_0200 EZ402U | 7.0                 | 10                  | 298                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.67  | 3.0               | 3.8                | 4.0      | 1.1 | ZR240SPH532_0200 EZ404U | 8.1                 | 10                  | 345                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.67  | 3.2               | 3.5                | 4.3      | 1.1 | ZR240SPH532_0200 EZ502U | 8.1                 | 10                  | 345                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.83  | 1.0               | 1.1                | 2.0      | 3.2 | ZR240SPH532_0160 EZ401U | 3.0                 | 10                  | 126                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 0.83  | 1.5               | 1.6                | 3.0      | 2.1 | ZR240SPH532_0160 EZ501U | 5.6                 | 10                  | 238                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 0.83  | 1.6               | 1.8                | 3.3      | 1.9 | ZR240SPH532_0160 EZ402U | 5.6                 | 10                  | 238                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 0.83  | 2.4               | 3.0                | 4.9      | 1.3 | ZR240SPH532_0160 EZ404U | 8.1                 | 10                  | 345                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 0.83  | 2.6               | 2.8                | 5.2      | 1.2 | ZR240SPH532_0160 EZ502U | 8.1                 | 10                  | 345                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 1.33  | 1.0               | 1.1                | 1.7      | 2.8 | ZR240SPH531_0100 EZ501U | 3.6                 | 10                  | 154                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 1.33  | 1.7               | 1.8                | 3.0      | 1.6 | ZR240SPH531_0100 EZ502U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 1.33  | 1.7               | 1.9                | 3.0      | 1.6 | ZR240SPH531_0100 EZ701U | 4.5                 | 10                  | 192                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 1.33  | 2.2               | 2.5                | 3.9      | 1.2 | ZR240SPH531_0100 EZ503U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 1.91  | 0.7               | 0.7                | 2.1      | 3.5 | ZR240SPH531_0070 EZ501U | 2.5                 | 10                  | 108                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 1.91  | 1.2               | 1.3                | 3.6      | 2.1 | ZR240SPH531_0070 EZ502U | 4.9                 | 10                  | 208                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 1.91  | 1.2               | 1.3                | 3.6      | 2.1 | ZR240SPH531_0070 EZ701U | 3.2                 | 10                  | 134                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 1.91  | 1.5               | 1.8                | 4.7      | 1.6 | ZR240SPH531_0070 EZ503U | 6.8                 | 10                  | 289                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 1.91  | 1.9               | 2.3                | 5.8      | 1.3 | ZR240SPH531_0070 EZ702U | 6.5                 | 10                  | 276                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 1.91  | 2.1               | 2.5                | 6.5      | 1.1 | ZR240SPH531_0070 EZ505U | 8.1                 | 10                  | 345                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 2.67  | 0.5               | 0.5                | 3.1      | 4.4 | ZR240SPH531_0050 EZ501U | 1.8                 | 10                  | 77                 | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 0.8               | 0.9                | 5.3      | 2.6 | ZR240SPH531_0050 EZ502U | 3.5                 | 10                  | 149                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 0.8               | 0.9                | 5.3      | 2.6 | ZR240SPH531_0050 EZ701U | 2.3                 | 10                  | 96                 | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 1.1               | 1.3                | 7.0      | 2.0 | ZR240SPH531_0050 EZ503U | 4.9                 | 10                  | 206                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 1.4               | 1.6                | 8.6      | 1.6 | ZR240SPH531_0050 EZ702U | 4.6                 | 10                  | 197                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 1.5               | 1.8                | 9.7      | 1.4 | ZR240SPH531_0050 EZ505U | 7.6                 | 10                  | 322                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 2.67  | 1.9               | 2.4                | 12       | 1.2 | ZR240SPH531_0050 EZ703U | 7.4                 | 10                  | 312                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 3.33  | 0.7               | 0.7                | 7.0      | 3.0 | ZR240SPH531_0040 EZ502U | 2.8                 | 10                  | 119                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 0.7               | 0.8                | 7.0      | 3.0 | ZR240SPH531_0040 EZ701U | 1.8                 | 10                  | 77                 | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 0.9               | 1.0                | 9.1      | 2.3 | ZR240SPH531_0040 EZ503U | 3.9                 | 10                  | 165                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 1.1               | 1.3                | 11       | 1.8 | ZR240SPH531_0040 EZ702U | 3.7                 | 10                  | 157                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 1.2               | 1.4                | 13       | 1.6 | ZR240SPH531_0040 EZ505U | 6.1                 | 10                  | 257                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 1.5               | 1.9                | 16       | 1.3 | ZR240SPH531_0040 EZ703U | 5.9                 | 10                  | 250                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 3.33  | 1.9               | 2.7                | 20       | 1.0 | ZR240SPH531_0040 EZ705U | 8.1                 | 10                  | 345                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| <b>ZR2PH5 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 8,1</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 2.00  | 2.1               | 3.5                | 4.4      | 1.1 | ZR240SPH531_0100 EZ505U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 2.86  | 1.5               | 2.4                | 5.2      | 1.4 | ZR240SPH531_0070 EZ505U | 8.1                 | 10                  | 345                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 2.86  | 1.9               | 3.2                | 6.7      | 1.1 | ZR240SPH531_0070 EZ703U | 8.1                 | 10                  | 345                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 4.00  | 1.1               | 1.7                | 7.8      | 1.8 | ZR240SPH531_0050 EZ505U | 7.6                 | 10                  | 322                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 4.00  | 1.4               | 2.3                | 10       | 1.4 | ZR240SPH531_0050 EZ703U | 7.4                 | 10                  | 312                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 4.00  | 1.9               | 3.4                | 14       | 1.0 | ZR240SPH531_0050 EZ705U | 8.1                 | 10                  | 345                | 5.000 | 2.22                   | 4.89                   | 37                 | 12                       | 80                  | 2             | 40 | 84.9          |
| 5.00  | 0.9               | 1.4                | 10       | 2.0 | ZR240SPH531_0040 EZ505U | 6.1                 | 10                  | 257                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 5.00  | 1.1               | 1.8                | 13       | 1.6 | ZR240SPH531_0040 EZ703U | 5.9                 | 10                  | 250                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| 5.00  | 1.5               | 2.7                | 18       | 1.2 | ZR240SPH531_0040 EZ705U | 8.1                 | 10                  | 345                | 4.000 | 2.44                   | 5.56                   | 37                 | 12                       | 81                  | 2             | 40 | 84.9          |
| <b>ZR2PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 8,1</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.38  | 3.5               | 4.3                | 0.9      | 1.2 | ZR240SPH532_0700 EZ401U | 8.1                 | 10                  | 345                | 70.00 | 0.25                   | 0.51                   | 37                 | 12                       | 69                  | 2             | 40 | 84.9          |
| 0.53  | 2.5               | 3.1                | 1.0      | 1.5 | ZR240SPH532_0500 EZ401U | 8.1                 | 10                  | 345                | 50.00 | 0.36                   | 0.71                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.67  | 2.0               | 2.5                | 1.4      | 1.7 | ZR240SPH532_0400 EZ401U | 7.5                 | 10                  | 316                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.67  | 3.0               | 3.9                | 2.1      | 1.1 | ZR240SPH532_0400 EZ501U | 8.1                 | 10                  | 345                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.67  | 3.1               | 4.3                | 2.2      | 1.1 | ZR240SPH532_0400 EZ402U | 8.1                 | 10                  | 345                | 40.00 | 0.44                   | 0.89                   | 37                 | 12                       | 70                  | 2             | 40 | 84.9          |
| 0.76  | 1.8               | 2.1                | 1.2      | 1.9 | ZR240SPH532_0350 EZ401U | 6.5                 | 10                  | 277                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.76  | 2.6               | 3.4                | 1.8      | 1.3 | ZR240SPH532_0350 EZ501U | 8.1                 | 10                  | 345                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.76  | 2.7               | 3.8                | 1.8      | 1.2 | ZR240SPH532_0350 EZ402U | 8.1                 | 10                  | 345                | 35.00 | 0.51                   | 1.02                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 0.95  | 1.4               | 1.7                | 1.4      | 2.2 | ZR240SPH532_0280 EZ401U | 5.2                 | 10                  | 221                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.95  | 2.1               | 2.7                | 2.1      | 1.5 | ZR240SPH532_0280 EZ501U | 8.1                 | 10                  | 345                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 0.95  | 2.1               | 3.0                | 2.1      | 1.4 | ZR240SPH532_0280 EZ402U | 8.1                 | 10                  | 345                | 28.00 | 0.64                   | 1.27                   | 37                 | 12                       | 73                  | 2             | 40 | 84.9          |
| 1.07  | 1.3               | 1.5                | 1.4      | 2.3 | ZR240SPH532_0250 EZ401U | 4.7                 | 10                  | 198                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.07  | 1.9               | 2.4                | 2.1      | 1.6 | ZR240SPH532_0250 EZ501U | 8.1                 | 10                  | 345                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.07  | 1.9               | 2.7                | 2.2      | 1.5 | ZR240SPH532_0250 EZ402U | 8.1                 | 10                  | 345                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.07  | 2.8               | 4.3                | 3.2      | 1.0 | ZR240SPH532_0250 EZ502U | 8.1                 | 10                  | 345                | 25.00 | 0.66                   | 1.33                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.33  | 1.0               | 1.2                | 1.6      | 2.7 | ZR240SPH532_0200 EZ401U | 3.7                 | 10                  | 158                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.33  | 1.5               | 1.9                | 2.4      | 1.8 | ZR240SPH532_0200 EZ501U | 7.0                 | 10                  | 298                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.33  | 1.5               | 2.1                | 2.4      | 1.8 | ZR240SPH532_0200 EZ402U | 7.0                 | 10                  | 298                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.33  | 2.3               | 3.4                | 3.6      | 1.2 | ZR240SPH532_0200 EZ502U | 8.1                 | 10                  | 345                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.33  | 2.5               | 3.7                | 4.0      | 1.1 | ZR240SPH532_0200 EZ404U | 8.1                 | 10                  | 345                | 20.00 | 0.78                   | 1.56                   | 37                 | 12                       | 75                  | 2             | 40 | 84.9          |
| 1.67  | 0.8               | 1.0                | 1.9      | 3.1 | ZR240SPH532_0160 EZ401U | 3.0                 | 10                  | 126                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 1.67  | 1.2               | 1.5                | 2.8      | 2.1 | ZR240SPH532_0160 EZ501U | 5.6                 | 10                  | 238                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 1.67  | 1.2               | 1.7                | 2.9      | 2.1 | ZR240SPH532_0160 EZ402U | 5.6                 | 10                  | 238                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |

7.2 Selection table 7 ZRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR2PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 8,1</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.67  | 1.8               | 2.7                | 4.3      | 1.4 | ZR240SPH532_0160 EZ502U | 8.1                 | 10                  | 345                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 1.67  | 2.0               | 2.9                | 4.8      | 1.2 | ZR240SPH532_0160 EZ404U | 8.1                 | 10                  | 345                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 1.67  | 2.2               | 3.7                | 5.2      | 1.2 | ZR240SPH532_0160 EZ503U | 8.1                 | 10                  | 345                | 16.00 | 0.97                   | 1.94                   | 37                 | 12                       | 74                  | 2             | 40 | 84.9          |
| 2.67  | 0.8               | 1.0                | 1.7      | 2.8 | ZR240SPH531_0100 EZ501U | 3.6                 | 10                  | 154                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 2.67  | 1.2               | 1.8                | 2.6      | 1.8 | ZR240SPH531_0100 EZ502U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 2.67  | 1.2               | 1.8                | 2.6      | 1.8 | ZR240SPH531_0100 EZ701U | 4.5                 | 10                  | 192                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 2.67  | 1.4               | 2.4                | 3.1      | 1.5 | ZR240SPH531_0100 EZ503U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 2.67  | 1.6               | 3.2                | 3.7      | 1.3 | ZR240SPH531_0100 EZ702U | 6.8                 | 10                  | 288                | 10.00 | 1.47                   | 2.89                   | 37                 | 12                       | 59                  | 2             | 40 | 84.9          |
| 3.81  | 0.5               | 0.7                | 2.1      | 3.6 | ZR240SPH531_0070 EZ501U | 2.5                 | 10                  | 108                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 3.81  | 0.8               | 1.2                | 3.2      | 2.3 | ZR240SPH531_0070 EZ502U | 4.9                 | 10                  | 208                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 3.81  | 0.8               | 1.3                | 3.2      | 2.3 | ZR240SPH531_0070 EZ701U | 3.2                 | 10                  | 134                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 3.81  | 1.0               | 1.7                | 3.8      | 1.9 | ZR240SPH531_0070 EZ503U | 6.8                 | 10                  | 289                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| 3.81  | 1.1               | 2.3                | 4.4      | 1.7 | ZR240SPH531_0070 EZ702U | 6.5                 | 10                  | 276                | 7.000 | 1.91                   | 3.81                   | 37                 | 12                       | 71                  | 2             | 40 | 84.9          |
| <b>ZR3PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 7,7</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.21  | 3.8               | 4.1                | 0.8      | 1.3 | ZR330SPH532_0700 EZ401U | 7.7                 | 9.6                 | 368                | 70.00 | 0.29                   | 0.57                   | 42                 | 14                       | 55                  | 3             | 30 | 95.5          |
| 0.30  | 2.7               | 2.9                | 1.0      | 1.7 | ZR330SPH532_0500 EZ401U | 7.7                 | 9.6                 | 368                | 50.00 | 0.40                   | 0.80                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.30  | 4.2               | 4.6                | 1.6      | 1.1 | ZR330SPH532_0500 EZ501U | 7.7                 | 9.6                 | 368                | 50.00 | 0.40                   | 0.80                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.38  | 2.2               | 2.3                | 1.4      | 1.9 | ZR330SPH532_0400 EZ401U | 6.6                 | 9.6                 | 316                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.38  | 3.4               | 3.7                | 2.1      | 1.3 | ZR330SPH532_0400 EZ501U | 7.4                 | 9.6                 | 355                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.38  | 3.7               | 4.1                | 2.3      | 1.2 | ZR330SPH532_0400 EZ402U | 7.4                 | 9.6                 | 355                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.43  | 1.9               | 2.0                | 1.2      | 2.1 | ZR330SPH532_0350 EZ401U | 5.8                 | 9.6                 | 277                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.43  | 2.9               | 3.2                | 1.8      | 1.4 | ZR330SPH532_0350 EZ501U | 7.7                 | 9.6                 | 368                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.43  | 3.2               | 3.5                | 2.0      | 1.3 | ZR330SPH532_0350 EZ402U | 7.7                 | 9.6                 | 368                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.54  | 1.5               | 1.6                | 1.4      | 2.5 | ZR330SPH532_0280 EZ401U | 4.6                 | 9.6                 | 221                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.54  | 2.3               | 2.6                | 2.2      | 1.6 | ZR330SPH532_0280 EZ501U | 7.4                 | 9.6                 | 355                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.54  | 2.6               | 2.8                | 2.4      | 1.5 | ZR330SPH532_0280 EZ402U | 7.4                 | 9.6                 | 355                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.60  | 1.4               | 1.5                | 1.4      | 2.6 | ZR330SPH532_0250 EZ401U | 4.1                 | 9.6                 | 198                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.60  | 2.1               | 2.3                | 2.2      | 1.7 | ZR330SPH532_0250 EZ501U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.60  | 2.3               | 2.5                | 2.4      | 1.6 | ZR330SPH532_0250 EZ402U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.60  | 3.4               | 4.2                | 3.5      | 1.1 | ZR330SPH532_0250 EZ404U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.60  | 3.6               | 3.9                | 3.7      | 1.0 | ZR330SPH532_0250 EZ502U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.75  | 1.1               | 1.2                | 1.6      | 3.1 | ZR330SPH532_0200 EZ401U | 3.3                 | 9.6                 | 158                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.75  | 1.7               | 1.8                | 2.5      | 2.0 | ZR330SPH532_0200 EZ501U | 6.2                 | 9.6                 | 298                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.75  | 1.8               | 2.0                | 2.7      | 1.8 | ZR330SPH532_0200 EZ402U | 6.2                 | 9.6                 | 298                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.75  | 2.7               | 3.4                | 4.0      | 1.2 | ZR330SPH532_0200 EZ404U | 7.7                 | 9.6                 | 368                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.75  | 2.9               | 3.1                | 4.3      | 1.2 | ZR330SPH532_0200 EZ502U | 7.7                 | 9.6                 | 368                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.94  | 0.9               | 0.9                | 2.0      | 3.6 | ZR330SPH532_0160 EZ401U | 2.6                 | 9.6                 | 126                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 0.94  | 1.3               | 1.5                | 3.0      | 2.3 | ZR330SPH532_0160 EZ501U | 5.0                 | 9.6                 | 238                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 0.94  | 1.5               | 1.6                | 3.3      | 2.1 | ZR330SPH532_0160 EZ402U | 5.0                 | 9.6                 | 238                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 0.94  | 2.2               | 2.7                | 4.9      | 1.4 | ZR330SPH532_0160 EZ404U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 0.94  | 2.3               | 2.5                | 5.2      | 1.3 | ZR330SPH532_0160 EZ502U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 0.94  | 3.0               | 3.5                | 6.9      | 1.0 | ZR330SPH532_0160 EZ503U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.50  | 0.9               | 0.9                | 1.7      | 3.1 | ZR330SPH531_0100 EZ501U | 3.2                 | 9.6                 | 154                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 1.50  | 1.5               | 1.6                | 3.0      | 1.8 | ZR330SPH531_0100 EZ502U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 1.50  | 1.5               | 1.7                | 3.0      | 1.8 | ZR330SPH531_0100 EZ701U | 4.0                 | 9.6                 | 192                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 1.50  | 2.0               | 2.2                | 3.9      | 1.4 | ZR330SPH531_0100 EZ503U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 1.50  | 2.4               | 2.9                | 4.8      | 1.1 | ZR330SPH531_0100 EZ702U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 2.14  | 0.6               | 0.7                | 2.1      | 3.9 | ZR330SPH531_0070 EZ501U | 2.3                 | 9.6                 | 108                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 1.0               | 1.1                | 3.6      | 2.3 | ZR330SPH531_0070 EZ502U | 4.4                 | 9.6                 | 208                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 1.0               | 1.2                | 3.6      | 2.3 | ZR330SPH531_0070 EZ701U | 2.8                 | 9.6                 | 134                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 1.4               | 1.6                | 4.7      | 1.7 | ZR330SPH531_0070 EZ503U | 6.1                 | 9.6                 | 289                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 1.7               | 2.0                | 5.8      | 1.4 | ZR330SPH531_0070 EZ702U | 5.8                 | 9.6                 | 276                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 1.9               | 2.3                | 6.5      | 1.2 | ZR330SPH531_0070 EZ505U | 7.7                 | 9.6                 | 368                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 2.14  | 2.3               | 2.9                | 7.9      | 1.0 | ZR330SPH531_0070 EZ703U | 7.7                 | 9.6                 | 368                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 3.00  | 0.4               | 0.5                | 3.1      | 4.9 | ZR330SPH531_0050 EZ501U | 1.6                 | 9.6                 | 77                 | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 0.7               | 0.8                | 5.3      | 2.8 | ZR330SPH531_0050 EZ502U | 3.1                 | 9.6                 | 149                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 0.7               | 0.8                | 5.3      | 2.8 | ZR330SPH531_0050 EZ701U | 2.0                 | 9.6                 | 96                 | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 1.0               | 1.1                | 7.0      | 2.2 | ZR330SPH531_0050 EZ503U | 4.3                 | 9.6                 | 206                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 1.2               | 1.4                | 8.6      | 1.7 | ZR330SPH531_0050 EZ702U | 4.1                 | 9.6                 | 197                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 1.4               | 1.6                | 9.7      | 1.6 | ZR330SPH531_0050 EZ505U | 6.7                 | 9.6                 | 322                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.00  | 1.7               | 2.1                | 12       | 1.3 | ZR330SPH531_0050 EZ703U | 6.5                 | 9.6                 | 312                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 3.75  | 0.6               | 0.6                | 7.0      | 3.3 | ZR330SPH531_0040 EZ502U | 2.5                 | 9.5                 | 119                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 3.75  | 0.6               | 0.7                | 7.0      | 3.3 | ZR330SPH531_0040 EZ701U | 1.6                 | 9.6                 | 77                 | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 3.75  | 0.8               | 0.9                | 9.1      | 2.5 | ZR330SPH531_0040 EZ503U | 3.5                 | 9.5                 | 165                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 3.75  | 1.0               | 1.2                | 11       | 2.0 | ZR330SPH531_0040 EZ702U | 3.3                 | 9.6                 | 157                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 3.75  | 1.1               | 1.3                | 13       | 1.8 | ZR330SPH531_0040 EZ505U | 5.4                 | 9.5                 | 257                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR3PH5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 7,7</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 3.75  | 1.3               | 1.7                | 16       | 1.5 | ZR330SPH531_0040 EZ703U | 5.2                 | 9.6                 | 250                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 3.75  | 1.7               | 2.4                | 20       | 1.1 | ZR330SPH531_0040 EZ705U | 7.4                 | 9.6                 | 355                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| <b>ZR3PH5 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 7,7</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 2.25  | 1.9               | 3.1                | 4.4      | 1.2 | ZR330SPH531_0100 EZ505U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 3.21  | 1.3               | 2.2                | 5.2      | 1.5 | ZR330SPH531_0070 EZ505U | 7.7                 | 9.6                 | 368                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 3.21  | 1.7               | 2.8                | 6.7      | 1.2 | ZR330SPH531_0070 EZ703U | 7.7                 | 9.6                 | 368                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 4.50  | 1.0               | 1.5                | 7.8      | 1.9 | ZR330SPH531_0050 EZ505U | 6.7                 | 9.6                 | 322                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 4.50  | 1.2               | 2.0                | 10       | 1.5 | ZR330SPH531_0050 EZ703U | 6.5                 | 9.6                 | 312                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 4.50  | 1.6               | 3.0                | 14       | 1.1 | ZR330SPH531_0050 EZ705U | 7.7                 | 9.6                 | 368                | 5.000 | 2.50                   | 5.50                   | 42                 | 14                       | 64                  | 3             | 30 | 95.5          |
| 5.63  | 0.8               | 1.2                | 10       | 2.2 | ZR330SPH531_0040 EZ505U | 5.4                 | 9.5                 | 257                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 5.63  | 1.0               | 1.6                | 13       | 1.8 | ZR330SPH531_0040 EZ703U | 5.2                 | 9.6                 | 250                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| 5.63  | 1.3               | 2.4                | 18       | 1.3 | ZR330SPH531_0040 EZ705U | 7.4                 | 9.6                 | 355                | 4.000 | 2.75                   | 6.25                   | 42                 | 14                       | 65                  | 3             | 30 | 95.5          |
| <b>ZR3PH5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 7,7</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.43  | 3.1               | 3.8                | 0.9      | 1.3 | ZR330SPH532_0700 EZ401U | 7.7                 | 9.6                 | 368                | 70.00 | 0.29                   | 0.57                   | 42                 | 14                       | 55                  | 3             | 30 | 95.5          |
| 0.60  | 2.2               | 2.7                | 1.0      | 1.6 | ZR330SPH532_0500 EZ401U | 7.7                 | 9.6                 | 368                | 50.00 | 0.40                   | 0.80                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.60  | 3.3               | 4.3                | 1.6      | 1.1 | ZR330SPH532_0500 EZ501U | 7.7                 | 9.6                 | 368                | 50.00 | 0.40                   | 0.80                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.60  | 3.4               | 4.8                | 1.6      | 1.1 | ZR330SPH532_0500 EZ402U | 7.7                 | 9.6                 | 368                | 50.00 | 0.40                   | 0.80                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 0.75  | 1.8               | 2.2                | 1.4      | 1.9 | ZR330SPH532_0400 EZ401U | 6.6                 | 9.6                 | 316                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.75  | 2.6               | 3.4                | 2.1      | 1.3 | ZR330SPH532_0400 EZ501U | 7.4                 | 9.6                 | 355                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.75  | 2.7               | 3.8                | 2.2      | 1.2 | ZR330SPH532_0400 EZ402U | 7.4                 | 9.6                 | 355                | 40.00 | 0.50                   | 1.00                   | 42                 | 14                       | 56                  | 3             | 30 | 95.5          |
| 0.86  | 1.6               | 1.9                | 1.2      | 2.0 | ZR330SPH532_0350 EZ401U | 5.8                 | 9.6                 | 277                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.86  | 2.3               | 3.0                | 1.8      | 1.4 | ZR330SPH532_0350 EZ501U | 7.7                 | 9.6                 | 368                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 0.86  | 2.4               | 3.3                | 1.8      | 1.3 | ZR330SPH532_0350 EZ402U | 7.7                 | 9.6                 | 368                | 35.00 | 0.57                   | 1.14                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.07  | 1.3               | 1.5                | 1.4      | 2.4 | ZR330SPH532_0280 EZ401U | 4.6                 | 9.6                 | 221                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 1.07  | 1.9               | 2.4                | 2.1      | 1.6 | ZR330SPH532_0280 EZ501U | 7.4                 | 9.6                 | 355                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 1.07  | 1.9               | 2.7                | 2.1      | 1.6 | ZR330SPH532_0280 EZ402U | 7.4                 | 9.6                 | 355                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 1.07  | 2.8               | 4.3                | 3.2      | 1.0 | ZR330SPH532_0280 EZ502U | 7.4                 | 9.6                 | 355                | 28.00 | 0.71                   | 1.43                   | 42                 | 14                       | 58                  | 3             | 30 | 95.5          |
| 1.20  | 1.1               | 1.4                | 1.4      | 2.6 | ZR330SPH532_0250 EZ401U | 4.1                 | 9.6                 | 198                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.20  | 1.7               | 2.1                | 2.1      | 1.7 | ZR330SPH532_0250 EZ501U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.20  | 1.7               | 2.4                | 2.2      | 1.7 | ZR330SPH532_0250 EZ402U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.20  | 2.5               | 3.8                | 3.2      | 1.1 | ZR330SPH532_0250 EZ502U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.20  | 2.8               | 4.1                | 3.6      | 1.0 | ZR330SPH532_0250 EZ404U | 7.7                 | 9.6                 | 368                | 25.00 | 0.74                   | 1.50                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 0.9               | 1.1                | 1.6      | 3.0 | ZR330SPH532_0200 EZ401U | 3.3                 | 9.6                 | 158                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 1.3               | 1.7                | 2.4      | 2.0 | ZR330SPH532_0200 EZ501U | 6.2                 | 9.6                 | 298                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 1.4               | 1.9                | 2.4      | 1.9 | ZR330SPH532_0200 EZ402U | 6.2                 | 9.6                 | 298                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 2.0               | 3.0                | 3.6      | 1.3 | ZR330SPH532_0200 EZ502U | 7.7                 | 9.6                 | 368                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 2.3               | 3.3                | 4.0      | 1.2 | ZR330SPH532_0200 EZ404U | 7.7                 | 9.6                 | 368                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.50  | 2.4               | 4.1                | 4.3      | 1.1 | ZR330SPH532_0200 EZ503U | 7.7                 | 9.6                 | 368                | 20.00 | 0.88                   | 1.75                   | 42                 | 14                       | 60                  | 3             | 30 | 95.5          |
| 1.88  | 0.7               | 0.9                | 1.9      | 3.4 | ZR330SPH532_0160 EZ401U | 2.6                 | 9.6                 | 126                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.88  | 1.1               | 1.4                | 2.8      | 2.3 | ZR330SPH532_0160 EZ501U | 5.0                 | 9.6                 | 238                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.88  | 1.1               | 1.5                | 2.9      | 2.3 | ZR330SPH532_0160 EZ402U | 5.0                 | 9.6                 | 238                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.88  | 1.6               | 2.4                | 4.3      | 1.5 | ZR330SPH532_0160 EZ502U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.88  | 1.8               | 2.6                | 4.8      | 1.4 | ZR330SPH532_0160 EZ404U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 1.88  | 1.9               | 3.3                | 5.2      | 1.3 | ZR330SPH532_0160 EZ503U | 7.4                 | 9.6                 | 355                | 16.00 | 1.09                   | 2.19                   | 42                 | 14                       | 59                  | 3             | 30 | 95.5          |
| 3.00  | 0.7               | 0.9                | 1.7      | 3.1 | ZR330SPH531_0100 EZ501U | 3.2                 | 9.6                 | 154                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 3.00  | 1.0               | 1.6                | 2.6      | 2.0 | ZR330SPH531_0100 EZ502U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 3.00  | 1.0               | 1.6                | 2.6      | 2.0 | ZR330SPH531_0100 EZ701U | 4.0                 | 9.6                 | 192                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 3.00  | 1.2               | 2.1                | 3.1      | 1.7 | ZR330SPH531_0100 EZ503U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 3.00  | 1.4               | 2.9                | 3.7      | 1.5 | ZR330SPH531_0100 EZ702U | 6.0                 | 9.6                 | 288                | 10.00 | 1.65                   | 3.25                   | 42                 | 14                       | 47                  | 3             | 30 | 95.5          |
| 4.29  | 0.5               | 0.6                | 2.1      | 3.9 | ZR330SPH531_0070 EZ501U | 2.3                 | 9.6                 | 108                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 4.29  | 0.7               | 1.1                | 3.2      | 2.6 | ZR330SPH531_0070 EZ502U | 4.4                 | 9.6                 | 208                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 4.29  | 0.7               | 1.1                | 3.2      | 2.6 | ZR330SPH531_0070 EZ701U | 2.8                 | 9.6                 | 134                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 4.29  | 0.9               | 1.5                | 3.8      | 2.1 | ZR330SPH531_0070 EZ503U | 6.1                 | 9.6                 | 289                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| 4.29  | 1.0               | 2.0                | 4.4      | 1.8 | ZR330SPH531_0070 EZ702U | 5.8                 | 9.6                 | 276                | 7.000 | 2.14                   | 4.29                   | 42                 | 14                       | 57                  | 3             | 30 | 95.5          |
| <b>ZR3PH7 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN))</b>  |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.67  | 5.3               | 8.0                | 11       | 1.4 | ZR335SPH731_0070 EZ805U | 16                  | 19                  | 869                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.33  | 3.8               | 5.7                | 16       | 1.7 | ZR335SPH731_0050 EZ805U | 16                  | 19                  | 869                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 2.92  | 3.0               | 4.6                | 21       | 2.0 | ZR335SPH731_0040 EZ805U | 14                  | 19                  | 787                | 4.000 | 2.77                   | 5.83                   | 49                 | 16                       | 113                 | 3             | 35 | 111.4         |
| <b>ZR3PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN))</b>  |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.25  | 5.0               | 5.5                | 0.7      | 2.0 | ZR335SPH732_0700 EZ501U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.25  | 8.6               | 9.3                | 1.2      | 1.2 | ZR335SPH732_0700 EZ502U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.25  | 8.6               | 9.7                | 1.2      | 1.2 | ZR335SPH732_0700 EZ701U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.29  | 4.4               | 4.8                | 0.7      | 2.0 | ZR340SPH732_0700 EZ501U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.29  | 7.6               | 8.2                | 1.2      | 1.2 | ZR340SPH732_0700 EZ502U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.29  | 7.6               | 8.5                | 1.2      | 1.2 | ZR340SPH732_0700 EZ701U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.35  | 3.6               | 3.9                | 0.9      | 2.8 | ZR335SPH732_0500 EZ501U | 13                  | 19                  | 744                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |

7.2 Selection table 7 ZRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR3PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.35   | 6.2               | 6.7                | 1.5      | 1.6 | ZR335SPH732_0500 EZ502U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.35   | 6.2               | 6.9                | 1.5      | 1.6 | ZR335SPH732_0500 EZ701U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.35   | 8.1               | 9.3                | 1.9      | 1.2 | ZR335SPH732_0500 EZ503U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.40   | 3.1               | 3.4                | 0.9      | 2.8 | ZR340SPH732_0500 EZ501U | 12                  | 17                  | 744                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.40   | 5.4               | 5.8                | 1.5      | 1.6 | ZR340SPH732_0500 EZ502U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.40   | 5.4               | 6.1                | 1.5      | 1.6 | ZR340SPH732_0500 EZ701U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.40   | 7.1               | 8.1                | 1.9      | 1.2 | ZR340SPH732_0500 EZ503U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.44   | 2.9               | 3.1                | 1.1      | 3.0 | ZR335SPH732_0400 EZ501U | 11                  | 19                  | 595                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.44   | 4.9               | 5.3                | 1.9      | 1.7 | ZR335SPH732_0400 EZ502U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.44   | 4.9               | 5.5                | 1.9      | 1.7 | ZR335SPH732_0400 EZ701U | 13                  | 19                  | 744                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.44   | 6.5               | 7.4                | 2.5      | 1.3 | ZR335SPH732_0400 EZ503U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.44   | 8.0               | 9.6                | 3.1      | 1.1 | ZR335SPH732_0400 EZ702U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 2.5               | 2.7                | 1.1      | 3.0 | ZR340SPH732_0400 EZ501U | 9.3                 | 17                  | 595                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 2.5               | 2.7                | 1.1      | 3.9 | ZR335SPH732_0350 EZ501U | 9.3                 | 19                  | 521                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 4.3               | 4.7                | 1.8      | 2.2 | ZR335SPH732_0350 EZ502U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 4.3               | 4.7                | 1.9      | 1.7 | ZR340SPH732_0400 EZ502U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 4.3               | 4.8                | 1.8      | 2.2 | ZR335SPH732_0350 EZ701U | 12                  | 19                  | 651                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 4.3               | 4.8                | 1.9      | 1.7 | ZR340SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 4.3               | 4.8                | 1.9      | 1.7 | ZR340SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 5.7               | 6.5                | 2.5      | 1.3 | ZR340SPH732_0400 EZ503U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 5.7               | 6.5                | 2.4      | 1.7 | ZR335SPH732_0350 EZ503U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 7.0               | 8.4                | 2.9      | 1.4 | ZR335SPH732_0350 EZ702U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 7.0               | 8.4                | 3.1      | 1.1 | ZR340SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 7.0               | 8.4                | 2.9      | 1.4 | ZR335SPH732_0350 EZ702U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 7.0               | 8.4                | 3.1      | 1.1 | ZR340SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 0.50   | 7.9               | 9.3                | 3.3      | 1.2 | ZR335SPH732_0350 EZ505U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.50   | 9.6               | 12                 | 4.0      | 1.0 | ZR335SPH732_0350 EZ703U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.57   | 2.2               | 2.4                | 1.1      | 3.9 | ZR340SPH732_0350 EZ501U | 8.2                 | 17                  | 521                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 3.8               | 4.1                | 1.8      | 2.2 | ZR340SPH732_0350 EZ502U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 3.8               | 4.2                | 1.8      | 2.2 | ZR340SPH732_0350 EZ701U | 10                  | 17                  | 651                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 5.0               | 5.7                | 2.4      | 1.7 | ZR340SPH732_0350 EZ503U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 6.1               | 7.4                | 2.9      | 1.4 | ZR340SPH732_0350 EZ702U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 6.9               | 8.2                | 3.3      | 1.2 | ZR340SPH732_0350 EZ505U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.57   | 8.4               | 11                 | 4.0      | 1.0 | ZR340SPH732_0350 EZ703U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.63   | 2.0               | 2.2                | 1.2      | 4.8 | ZR335SPH732_0280 EZ501U | 7.5                 | 19                  | 417                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 3.5               | 3.7                | 2.0      | 2.8 | ZR335SPH732_0280 EZ502U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 3.5               | 3.9                | 2.0      | 2.8 | ZR335SPH732_0280 EZ701U | 9.3                 | 19                  | 521                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 4.5               | 5.2                | 2.7      | 2.1 | ZR335SPH732_0280 EZ503U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 5.6               | 6.7                | 3.3      | 1.7 | ZR335SPH732_0280 EZ702U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 6.3               | 7.5                | 3.7      | 1.5 | ZR335SPH732_0280 EZ505U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.63   | 7.7               | 9.7                | 4.5      | 1.3 | ZR335SPH732_0280 EZ703U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.70   | 3.1               | 3.3                | 2.3      | 2.9 | ZR335SPH732_0250 EZ502U | 13                  | 19                  | 721                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 3.1               | 3.5                | 2.3      | 2.9 | ZR335SPH732_0250 EZ701U | 8.3                 | 19                  | 465                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 4.0               | 4.6                | 3.0      | 2.2 | ZR335SPH732_0250 EZ503U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 5.0               | 6.0                | 3.8      | 1.8 | ZR335SPH732_0250 EZ702U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 5.6               | 6.7                | 4.2      | 1.6 | ZR335SPH732_0250 EZ505U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 6.9               | 8.7                | 5.2      | 1.3 | ZR335SPH732_0250 EZ703U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.70   | 8.9               | 13                 | 6.7      | 1.0 | ZR335SPH732_0250 EZ705U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 0.71   | 1.8               | 1.9                | 1.2      | 4.8 | ZR340SPH732_0280 EZ501U | 6.5                 | 17                  | 417                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 3.0               | 3.3                | 2.0      | 2.8 | ZR340SPH732_0280 EZ502U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 3.0               | 3.4                | 2.0      | 2.8 | ZR340SPH732_0280 EZ701U | 8.2                 | 17                  | 521                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 4.0               | 4.5                | 2.7      | 2.1 | ZR340SPH732_0280 EZ503U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 4.9               | 5.9                | 3.3      | 1.7 | ZR340SPH732_0280 EZ702U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 5.5               | 6.5                | 3.7      | 1.5 | ZR340SPH732_0280 EZ505U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.71   | 6.7               | 8.5                | 4.5      | 1.3 | ZR340SPH732_0280 EZ703U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 0.80   | 2.7               | 2.9                | 2.3      | 2.9 | ZR340SPH732_0250 EZ502U | 11                  | 17                  | 721                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 2.7               | 3.0                | 2.3      | 2.9 | ZR340SPH732_0250 EZ701U | 7.3                 | 17                  | 465                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 3.5               | 4.1                | 3.0      | 2.2 | ZR340SPH732_0250 EZ503U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 4.4               | 5.3                | 3.8      | 1.8 | ZR340SPH732_0250 EZ702U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 4.9               | 5.8                | 4.2      | 1.6 | ZR340SPH732_0250 EZ505U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 6.0               | 7.6                | 5.2      | 1.3 | ZR340SPH732_0250 EZ703U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.80   | 7.8               | 11                 | 6.7      | 1.0 | ZR340SPH732_0250 EZ705U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.88   | 2.5               | 2.7                | 2.8      | 3.3 | ZR335SPH732_0200 EZ502U | 10                  | 19                  | 577                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 0.88   | 2.5               | 2.8                | 2.8      | 3.3 | ZR335SPH732_0200 EZ701U | 6.7                 | 19                  | 372                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 0.88   | 3.2               | 3.7                | 3.7      | 2.6 | ZR335SPH732_0200 EZ503U | 14                  | 19                  | 800                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 0.88   | 4.0               | 4.8                | 4.6      | 2.1 | ZR335SPH732_0200 EZ702U | 14                  | 19                  | 763                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |



| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR3PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.88  | 4.5               | 5.3                | 5.1      | 1.8 | ZR335SPH732_0200 EZ505U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 0.88  | 5.5               | 6.9                | 6.3      | 1.5 | ZR335SPH732_0200 EZ703U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 0.88  | 7.1               | 10                 | 8.1      | 1.2 | ZR335SPH732_0200 EZ705U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.00  | 2.2               | 2.3                | 2.8      | 3.3 | ZR340SPH732_0200 EZ502U | 9.1                 | 17                  | 577                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 2.2               | 2.4                | 2.8      | 3.3 | ZR340SPH732_0200 EZ701U | 5.8                 | 17                  | 372                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 2.8               | 3.2                | 3.7      | 2.6 | ZR340SPH732_0200 EZ503U | 13                  | 17                  | 800                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 3.5               | 4.2                | 4.6      | 2.1 | ZR340SPH732_0200 EZ702U | 12                  | 17                  | 763                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 3.9               | 4.7                | 5.1      | 1.8 | ZR340SPH732_0200 EZ505U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 4.8               | 6.1                | 6.3      | 1.5 | ZR340SPH732_0200 EZ703U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.00  | 6.2               | 8.8                | 8.1      | 1.2 | ZR340SPH732_0200 EZ705U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.09  | 2.0               | 2.1                | 3.2      | 4.1 | ZR335SPH732_0160 EZ502U | 8.3                 | 19                  | 461                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 2.0               | 2.2                | 3.2      | 4.1 | ZR335SPH732_0160 EZ701U | 5.3                 | 19                  | 298                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 2.6               | 3.0                | 4.2      | 3.1 | ZR335SPH732_0160 EZ503U | 11                  | 19                  | 640                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 3.2               | 3.8                | 5.2      | 2.5 | ZR335SPH732_0160 EZ702U | 11                  | 19                  | 610                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 3.6               | 4.3                | 5.9      | 2.2 | ZR335SPH732_0160 EZ505U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 4.4               | 5.6                | 7.2      | 1.8 | ZR335SPH732_0160 EZ703U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.09  | 5.7               | 8.1                | 9.2      | 1.4 | ZR335SPH732_0160 EZ705U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.25  | 1.7               | 1.9                | 3.2      | 4.1 | ZR340SPH732_0160 EZ502U | 7.2                 | 17                  | 461                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 1.7               | 1.9                | 3.2      | 4.1 | ZR340SPH732_0160 EZ701U | 4.7                 | 17                  | 298                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 2.3               | 2.6                | 4.2      | 3.1 | ZR340SPH732_0160 EZ503U | 10                  | 17                  | 640                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 2.8               | 3.4                | 5.2      | 2.5 | ZR340SPH732_0160 EZ702U | 9.6                 | 17                  | 610                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 3.2               | 3.7                | 5.9      | 2.2 | ZR340SPH732_0160 EZ505U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 3.9               | 4.9                | 7.2      | 1.8 | ZR340SPH732_0160 EZ703U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.25  | 5.0               | 7.1                | 9.2      | 1.4 | ZR340SPH732_0160 EZ705U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.75  | 1.3               | 1.4                | 1.8      | 3.9 | ZR335SPH731_0100 EZ701U | 3.4                 | 19                  | 192                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 1.75  | 2.1               | 2.5                | 3.0      | 2.4 | ZR335SPH731_0100 EZ702U | 7.1                 | 19                  | 394                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 1.75  | 2.8               | 3.6                | 4.1      | 1.8 | ZR335SPH731_0100 EZ703U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 1.75  | 3.7               | 5.2                | 5.3      | 1.4 | ZR335SPH731_0100 EZ705U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 1.75  | 3.8               | 6.4                | 5.5      | 1.3 | ZR335SPH731_0100 EZ802U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 1.75  | 4.6               | 8.3                | 6.6      | 1.1 | ZR335SPH731_0100 EZ803U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 2.00  | 1.1               | 1.3                | 1.8      | 3.9 | ZR340SPH731_0100 EZ701U | 3.0                 | 17                  | 192                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.00  | 1.8               | 2.2                | 3.0      | 2.4 | ZR340SPH731_0100 EZ702U | 6.2                 | 17                  | 394                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.00  | 2.5               | 3.1                | 4.1      | 1.8 | ZR340SPH731_0100 EZ703U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.00  | 3.2               | 4.6                | 5.3      | 1.4 | ZR340SPH731_0100 EZ705U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.00  | 3.4               | 5.6                | 5.5      | 1.3 | ZR340SPH731_0100 EZ802U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.00  | 4.0               | 7.3                | 6.6      | 1.1 | ZR340SPH731_0100 EZ803U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 2.50  | 1.4               | 1.7                | 3.3      | 4.4 | ZR335SPH731_0070 EZ702U | 4.9                 | 19                  | 276                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.50  | 2.0               | 2.5                | 4.5      | 3.2 | ZR335SPH731_0070 EZ703U | 7.8                 | 19                  | 437                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.50  | 2.6               | 3.6                | 5.9      | 2.5 | ZR335SPH731_0070 EZ705U | 13                  | 19                  | 699                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.50  | 2.7               | 4.5                | 6.1      | 2.4 | ZR335SPH731_0070 EZ802U | 12                  | 19                  | 672                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.50  | 3.2               | 5.8                | 7.3      | 2.0 | ZR335SPH731_0070 EZ803U | 16                  | 19                  | 869                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 2.86  | 1.3               | 1.5                | 3.3      | 4.8 | ZR340SPH731_0070 EZ702U | 4.3                 | 17                  | 276                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 2.86  | 1.7               | 2.2                | 4.5      | 3.5 | ZR340SPH731_0070 EZ703U | 6.9                 | 17                  | 437                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 2.86  | 2.2               | 3.2                | 5.9      | 2.7 | ZR340SPH731_0070 EZ705U | 11                  | 17                  | 699                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 2.86  | 2.4               | 3.9                | 6.1      | 2.6 | ZR340SPH731_0070 EZ802U | 11                  | 17                  | 672                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 2.86  | 2.8               | 5.1                | 7.3      | 2.2 | ZR340SPH731_0070 EZ803U | 14                  | 17                  | 869                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 3.50  | 1.4               | 1.8                | 6.8      | 4.0 | ZR335SPH731_0050 EZ703U | 5.6                 | 19                  | 312                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 3.50  | 1.8               | 2.6                | 8.8      | 3.1 | ZR335SPH731_0050 EZ705U | 9.0                 | 19                  | 499                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 3.50  | 1.9               | 3.2                | 9.2      | 3.0 | ZR335SPH731_0050 EZ802U | 8.6                 | 19                  | 480                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 3.50  | 2.3               | 4.2                | 11       | 2.5 | ZR335SPH731_0050 EZ803U | 12                  | 19                  | 696                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 4.00  | 1.2               | 1.6                | 6.8      | 4.5 | ZR340SPH731_0050 EZ703U | 4.9                 | 17                  | 312                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 93                  | 3             | 40 | 127.3         |
| 4.00  | 1.6               | 2.3                | 8.8      | 3.5 | ZR340SPH731_0050 EZ705U | 7.8                 | 17                  | 499                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 93                  | 3             | 40 | 127.3         |
| 4.00  | 1.7               | 2.8                | 9.2      | 3.3 | ZR340SPH731_0050 EZ802U | 7.5                 | 17                  | 480                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 93                  | 3             | 40 | 127.3         |
| 4.00  | 2.0               | 3.6                | 11       | 2.8 | ZR340SPH731_0050 EZ803U | 11                  | 17                  | 696                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 93                  | 3             | 40 | 127.3         |
| 4.38  | 1.1               | 1.4                | 8.9      | 4.6 | ZR335SPH731_0040 EZ703U | 4.5                 | 16                  | 250                | 4.000 | 2.77                   | 5.83                   | 49                 | 16                       | 113                 | 3             | 35 | 111.4         |
| 4.38  | 1.5               | 2.1                | 11       | 3.6 | ZR335SPH731_0040 EZ705U | 7.2                 | 16                  | 399                | 4.000 | 2.77                   | 5.83                   | 49                 | 16                       | 113                 | 3             | 35 | 111.4         |
| 4.38  | 1.5               | 2.6                | 12       | 3.4 | ZR335SPH731_0040 EZ802U | 6.9                 | 19                  | 384                | 4.000 | 2.77                   | 5.83                   | 49                 | 16                       | 113                 | 3             | 35 | 111.4         |
| 4.38  | 1.8               | 3.3                | 14       | 2.9 | ZR335SPH731_0040 EZ803U | 10                  | 19                  | 557                | 4.000 | 2.77                   | 5.83                   | 49                 | 16                       | 113                 | 3             | 35 | 111.4         |
| 5.00  | 1.3               | 1.8                | 11       | 4.1 | ZR340SPH731_0040 EZ705U | 6.3                 | 14                  | 399                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 100                 | 3             | 40 | 127.3         |
| 5.00  | 1.3               | 2.2                | 12       | 3.9 | ZR340SPH731_0040 EZ802U | 6.0                 | 17                  | 384                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 100                 | 3             | 40 | 127.3         |
| 5.00  | 1.6               | 2.9                | 14       | 3.2 | ZR340SPH731_0040 EZ803U | 8.7                 | 17                  | 557                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 100                 | 3             | 40 | 127.3         |
| <b>ZR3PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 16</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.53  | 7.9               | 13                 | 2.2      | 1.1 | ZR335SPH732_0500 EZ505U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.66  | 6.3               | 10                 | 2.8      | 1.2 | ZR335SPH732_0400 EZ505U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.75  | 5.6               | 8.9                | 2.6      | 1.6 | ZR335SPH732_0350 EZ505U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.75  | 5.6               | 8.9                | 2.8      | 1.2 | ZR340SPH732_0400 EZ505U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |

7.2 Selection table 7 ZRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR3PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 16</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.75  | 7.1               | 12                 | 3.3      | 1.2 | ZR335SPH732_0350 EZ703U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.86  | 4.9               | 7.8                | 2.6      | 1.6 | ZR340SPH732_0350 EZ505U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.86  | 6.2               | 10                 | 3.3      | 1.2 | ZR340SPH732_0350 EZ703U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 0.94  | 4.4               | 7.2                | 2.9      | 2.0 | ZR335SPH732_0280 EZ505U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.94  | 5.7               | 9.3                | 3.7      | 1.5 | ZR335SPH732_0280 EZ703U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 0.94  | 7.7               | 14                 | 5.0      | 1.1 | ZR335SPH732_0280 EZ705U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.05  | 4.0               | 6.4                | 3.2      | 2.1 | ZR335SPH732_0250 EZ505U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.05  | 5.1               | 8.3                | 4.1      | 1.6 | ZR335SPH732_0250 EZ703U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.05  | 6.8               | 13                 | 5.6      | 1.2 | ZR335SPH732_0250 EZ705U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.07  | 3.9               | 6.3                | 2.9      | 2.0 | ZR340SPH732_0280 EZ505U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.07  | 4.9               | 8.2                | 3.7      | 1.5 | ZR340SPH732_0280 EZ703U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.07  | 6.7               | 12                 | 5.0      | 1.1 | ZR340SPH732_0280 EZ705U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.20  | 3.5               | 5.6                | 3.2      | 2.1 | ZR340SPH732_0250 EZ505U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.20  | 4.4               | 7.3                | 4.1      | 1.6 | ZR340SPH732_0250 EZ703U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.20  | 6.0               | 11                 | 5.6      | 1.2 | ZR340SPH732_0250 EZ705U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.31  | 3.2               | 5.1                | 3.7      | 2.5 | ZR335SPH732_0200 EZ505U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.31  | 4.0               | 6.7                | 4.7      | 2.0 | ZR335SPH732_0200 EZ703U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.31  | 5.5               | 10                 | 6.4      | 1.4 | ZR335SPH732_0200 EZ705U | 14                  | 19                  | 805                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.50  | 2.8               | 4.5                | 3.7      | 2.6 | ZR340SPH732_0200 EZ505U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.50  | 3.5               | 5.8                | 4.7      | 2.0 | ZR340SPH732_0200 EZ703U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.50  | 4.8               | 8.8                | 6.4      | 1.5 | ZR340SPH732_0200 EZ705U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 1.64  | 2.5               | 4.1                | 4.1      | 2.9 | ZR335SPH732_0160 EZ505U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.64  | 3.2               | 5.3                | 5.3      | 2.3 | ZR335SPH732_0160 EZ703U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.64  | 4.4               | 8.0                | 7.1      | 1.7 | ZR335SPH732_0160 EZ705U | 13                  | 19                  | 740                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 1.88  | 2.2               | 3.6                | 4.1      | 3.2 | ZR340SPH732_0160 EZ505U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.88  | 2.8               | 4.7                | 5.3      | 2.5 | ZR340SPH732_0160 EZ703U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 1.88  | 3.8               | 7.0                | 7.1      | 1.8 | ZR340SPH732_0160 EZ705U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 2.63  | 1.8               | 5.9                | 3.0      | 2.4 | ZR335SPH731_0100 EZ802U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 2.63  | 2.1               | 3.4                | 3.4      | 2.1 | ZR335SPH731_0100 EZ703U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 2.63  | 2.8               | 5.2                | 4.7      | 1.5 | ZR335SPH731_0100 EZ705U | 10                  | 19                  | 575                | 10.00 | 1.46                   | 2.92                   | 49                 | 16                       | 81                  | 3             | 35 | 111.4         |
| 3.00  | 1.6               | 5.2                | 3.0      | 2.4 | ZR340SPH731_0100 EZ802U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 3.00  | 1.8               | 3.0                | 3.4      | 2.1 | ZR340SPH731_0100 EZ703U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 3.00  | 2.5               | 4.5                | 4.7      | 1.5 | ZR340SPH731_0100 EZ705U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 69                  | 3             | 40 | 127.3         |
| 3.75  | 1.3               | 4.2                | 3.3      | 4.4 | ZR335SPH731_0070 EZ802U | 12                  | 19                  | 672                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 3.75  | 1.5               | 2.4                | 3.8      | 3.8 | ZR335SPH731_0070 EZ703U | 7.8                 | 19                  | 437                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 3.75  | 2.0               | 3.6                | 5.2      | 2.8 | ZR335SPH731_0070 EZ705U | 13                  | 19                  | 699                | 7.000 | 2.08                   | 4.17                   | 49                 | 16                       | 94                  | 3             | 35 | 111.4         |
| 4.29  | 1.1               | 3.6                | 3.3      | 4.8 | ZR340SPH731_0070 EZ802U | 11                  | 17                  | 672                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 4.29  | 1.3               | 2.1                | 3.8      | 4.1 | ZR340SPH731_0070 EZ703U | 6.9                 | 17                  | 437                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 4.29  | 1.7               | 3.2                | 5.2      | 3.0 | ZR340SPH731_0070 EZ705U | 11                  | 17                  | 699                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 82                  | 3             | 40 | 127.3         |
| 5.25  | 1.0               | 1.7                | 5.7      | 4.8 | ZR335SPH731_0050 EZ703U | 5.6                 | 19                  | 312                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 5.25  | 1.4               | 2.6                | 7.7      | 3.5 | ZR335SPH731_0050 EZ705U | 9.0                 | 19                  | 499                | 5.000 | 2.57                   | 5.83                   | 49                 | 16                       | 106                 | 3             | 35 | 111.4         |
| 6.00  | 1.2               | 2.3                | 7.7      | 4.0 | ZR340SPH731_0050 EZ705U | 7.8                 | 17                  | 499                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 93                  | 3             | 40 | 127.3         |
| <b>ZR3PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN)</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.50  | 4.0               | 5.1                | 0.7      | 2.0 | ZR335SPH732_0700 EZ501U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.50  | 6.1               | 9.1                | 1.1      | 1.3 | ZR335SPH732_0700 EZ502U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.50  | 6.1               | 9.2                | 1.1      | 1.3 | ZR335SPH732_0700 EZ701U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.50  | 7.2               | 12                 | 1.3      | 1.1 | ZR335SPH732_0700 EZ503U | 15                  | 19                  | 809                | 70.00 | 0.31                   | 0.58                   | 49                 | 16                       | 91                  | 3             | 35 | 111.4         |
| 0.57  | 3.5               | 4.5                | 0.7      | 2.0 | ZR340SPH732_0700 EZ501U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.57  | 5.3               | 8.0                | 1.1      | 1.3 | ZR340SPH732_0700 EZ502U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.57  | 5.3               | 8.1                | 1.1      | 1.3 | ZR340SPH732_0700 EZ701U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.57  | 6.3               | 11                 | 1.3      | 1.1 | ZR340SPH732_0700 EZ503U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 78                  | 3             | 40 | 127.3         |
| 0.70  | 2.8               | 3.7                | 0.9      | 2.8 | ZR335SPH732_0500 EZ501U | 13                  | 19                  | 744                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.70  | 4.3               | 6.5                | 1.3      | 1.8 | ZR335SPH732_0500 EZ502U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.70  | 4.3               | 6.6                | 1.3      | 1.8 | ZR335SPH732_0500 EZ701U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.70  | 5.2               | 8.8                | 1.6      | 1.5 | ZR335SPH732_0500 EZ503U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.70  | 6.0               | 12                 | 1.8      | 1.3 | ZR335SPH732_0500 EZ702U | 15                  | 19                  | 830                | 50.00 | 0.43                   | 0.82                   | 49                 | 16                       | 97                  | 3             | 35 | 111.4         |
| 0.80  | 2.5               | 3.2                | 0.9      | 2.8 | ZR340SPH732_0500 EZ501U | 12                  | 17                  | 744                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.80  | 3.8               | 5.7                | 1.3      | 1.8 | ZR340SPH732_0500 EZ502U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.80  | 3.8               | 5.8                | 1.3      | 1.8 | ZR340SPH732_0500 EZ701U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.80  | 4.5               | 7.7                | 1.6      | 1.5 | ZR340SPH732_0500 EZ503U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.80  | 5.3               | 10                 | 1.8      | 1.3 | ZR340SPH732_0500 EZ702U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 85                  | 3             | 40 | 127.3         |
| 0.88  | 2.3               | 2.9                | 1.1      | 3.0 | ZR335SPH732_0400 EZ501U | 11                  | 19                  | 595                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.88  | 3.5               | 5.2                | 1.7      | 1.9 | ZR335SPH732_0400 EZ502U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.88  | 3.5               | 5.3                | 1.7      | 1.9 | ZR335SPH732_0400 EZ701U | 13                  | 19                  | 744                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.88  | 4.1               | 7.1                | 2.0      | 1.6 | ZR335SPH732_0400 EZ503U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 0.88  | 4.8               | 9.5                | 2.4      | 1.4 | ZR335SPH732_0400 EZ702U | 14                  | 19                  | 770                | 40.00 | 0.54                   | 1.02                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR3PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 16</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.00   | 2.0               | 2.6                | 1.1      | 3.0 | ZR340SPH732_0400 EZ501U | 9.3                 | 17                  | 595                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 2.0               | 2.6                | 1.0      | 4.0 | ZR335SPH732_0350 EZ501U | 9.3                 | 19                  | 521                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.00   | 3.0               | 4.6                | 1.6      | 2.6 | ZR335SPH732_0350 EZ502U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.00   | 3.0               | 4.6                | 1.7      | 1.9 | ZR340SPH732_0400 EZ502U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 3.0               | 4.6                | 1.7      | 1.9 | ZR340SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 3.0               | 4.6                | 1.6      | 2.6 | ZR335SPH732_0350 EZ701U | 12                  | 19                  | 651                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.00   | 3.0               | 4.6                | 1.7      | 1.9 | ZR340SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 3.6               | 6.2                | 1.9      | 2.2 | ZR335SPH732_0350 EZ503U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.00   | 3.6               | 6.2                | 2.0      | 1.6 | ZR340SPH732_0400 EZ503U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 4.2               | 8.4                | 2.4      | 1.4 | ZR340SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 4.2               | 8.4                | 2.2      | 1.9 | ZR335SPH732_0350 EZ702U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.00   | 4.2               | 8.4                | 2.4      | 1.4 | ZR340SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 86                  | 3             | 40 | 127.3         |
| 1.00   | 4.2               | 8.4                | 2.2      | 1.9 | ZR335SPH732_0350 EZ702U | 16                  | 19                  | 866                | 35.00 | 0.62                   | 1.17                   | 49                 | 16                       | 99                  | 3             | 35 | 111.4         |
| 1.14   | 1.7               | 2.2                | 1.0      | 4.0 | ZR340SPH732_0350 EZ501U | 8.2                 | 17                  | 521                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.14   | 2.7               | 4.0                | 1.6      | 2.6 | ZR340SPH732_0350 EZ502U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.14   | 2.7               | 4.0                | 1.6      | 2.6 | ZR340SPH732_0350 EZ701U | 10                  | 17                  | 651                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.14   | 3.2               | 5.4                | 1.9      | 2.2 | ZR340SPH732_0350 EZ503U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.14   | 3.7               | 7.3                | 2.2      | 1.9 | ZR340SPH732_0350 EZ702U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.25   | 1.6               | 2.1                | 1.1      | 5.0 | ZR335SPH732_0280 EZ501U | 7.5                 | 19                  | 417                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.25   | 2.4               | 3.6                | 1.7      | 3.2 | ZR335SPH732_0280 EZ502U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.25   | 2.4               | 3.7                | 1.7      | 3.2 | ZR335SPH732_0280 EZ701U | 9.3                 | 19                  | 521                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.25   | 2.9               | 5.0                | 2.1      | 2.7 | ZR335SPH732_0280 EZ503U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.25   | 3.4               | 6.7                | 2.4      | 2.3 | ZR335SPH732_0280 EZ702U | 14                  | 19                  | 770                | 28.00 | 0.77                   | 1.46                   | 49                 | 16                       | 102                 | 3             | 35 | 111.4         |
| 1.40   | 2.2               | 3.3                | 2.0      | 3.4 | ZR335SPH732_0250 EZ502U | 13                  | 19                  | 721                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.40   | 2.2               | 3.3                | 2.0      | 3.4 | ZR335SPH732_0250 EZ701U | 8.3                 | 19                  | 465                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.40   | 2.6               | 4.4                | 2.3      | 2.9 | ZR335SPH732_0250 EZ503U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.40   | 3.0               | 6.0                | 2.7      | 2.5 | ZR335SPH732_0250 EZ702U | 16                  | 19                  | 866                | 25.00 | 0.82                   | 1.63                   | 49                 | 16                       | 100                 | 3             | 35 | 111.4         |
| 1.43   | 1.4               | 1.8                | 1.1      | 5.0 | ZR340SPH732_0280 EZ501U | 6.5                 | 17                  | 417                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.43   | 2.1               | 3.2                | 1.7      | 3.2 | ZR340SPH732_0280 EZ502U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.43   | 2.1               | 3.2                | 1.7      | 3.2 | ZR340SPH732_0280 EZ701U | 8.2                 | 17                  | 521                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.43   | 2.5               | 4.3                | 2.1      | 2.7 | ZR340SPH732_0280 EZ503U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.43   | 2.9               | 5.8                | 2.4      | 2.3 | ZR340SPH732_0280 EZ702U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 90                  | 3             | 40 | 127.3         |
| 1.60   | 1.9               | 2.8                | 2.0      | 3.4 | ZR340SPH732_0250 EZ502U | 11                  | 17                  | 721                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.60   | 1.9               | 2.9                | 2.0      | 3.4 | ZR340SPH732_0250 EZ701U | 7.3                 | 17                  | 465                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.60   | 2.3               | 3.9                | 2.3      | 2.9 | ZR340SPH732_0250 EZ503U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.60   | 2.6               | 5.2                | 2.7      | 2.5 | ZR340SPH732_0250 EZ702U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 87                  | 3             | 40 | 127.3         |
| 1.75   | 1.7               | 2.6                | 2.2      | 4.1 | ZR335SPH732_0200 EZ502U | 10                  | 19                  | 577                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.75   | 1.7               | 2.6                | 2.2      | 4.1 | ZR335SPH732_0200 EZ701U | 6.7                 | 19                  | 372                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.75   | 2.1               | 3.5                | 2.6      | 3.5 | ZR335SPH732_0200 EZ503U | 14                  | 19                  | 800                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 1.75   | 2.4               | 4.8                | 3.1      | 3.0 | ZR335SPH732_0200 EZ702U | 14                  | 19                  | 763                | 20.00 | 0.88                   | 1.75                   | 49                 | 16                       | 101                 | 3             | 35 | 111.4         |
| 2.00   | 1.5               | 2.3                | 2.2      | 4.2 | ZR340SPH732_0200 EZ502U | 9.1                 | 17                  | 577                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 2.00   | 1.5               | 2.3                | 2.2      | 4.2 | ZR340SPH732_0200 EZ701U | 5.8                 | 17                  | 372                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 2.00   | 1.8               | 3.1                | 2.6      | 3.6 | ZR340SPH732_0200 EZ503U | 13                  | 17                  | 800                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 2.00   | 2.1               | 4.2                | 3.1      | 3.1 | ZR340SPH732_0200 EZ702U | 12                  | 17                  | 763                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 88                  | 3             | 40 | 127.3         |
| 2.19   | 1.4               | 2.1                | 2.5      | 4.8 | ZR335SPH732_0160 EZ502U | 8.3                 | 19                  | 461                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 2.19   | 1.4               | 2.1                | 2.5      | 4.8 | ZR335SPH732_0160 EZ701U | 5.3                 | 19                  | 298                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 2.19   | 1.7               | 2.8                | 3.0      | 4.0 | ZR335SPH732_0160 EZ503U | 11                  | 19                  | 640                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 2.19   | 1.9               | 3.8                | 3.4      | 3.5 | ZR335SPH732_0160 EZ702U | 11                  | 19                  | 610                | 16.00 | 1.09                   | 2.19                   | 49                 | 16                       | 104                 | 3             | 35 | 111.4         |
| 2.50   | 1.4               | 2.5                | 3.0      | 4.4 | ZR340SPH732_0160 EZ503U | 10                  | 17                  | 640                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| 2.50   | 1.7               | 3.3                | 3.4      | 3.8 | ZR340SPH732_0160 EZ702U | 9.6                 | 17                  | 610                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 92                  | 3             | 40 | 127.3         |
| <b>ZR4PH7 (<math>n_{1N} = 2000</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.91   | 4.6               | 7.0                | 11       | 1.5 | ZR430SPH731_0070 EZ805U | 14                  | 17                  | 869                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 2.67   | 3.3               | 5.0                | 16       | 1.9 | ZR430SPH731_0050 EZ805U | 14                  | 17                  | 882                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| 3.33   | 2.6               | 4.0                | 21       | 2.2 | ZR430SPH731_0040 EZ805U | 12                  | 17                  | 787                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 98                  | 4             | 30 | 127.3         |
| <b>ZR4PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.29   | 4.4               | 4.8                | 0.7      | 2.0 | ZR430SPH732_0700 EZ501U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.29   | 7.6               | 8.2                | 1.2      | 1.2 | ZR430SPH732_0700 EZ502U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.29   | 7.6               | 8.5                | 1.2      | 1.2 | ZR430SPH732_0700 EZ701U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.40   | 3.1               | 3.4                | 0.9      | 2.8 | ZR430SPH732_0500 EZ501U | 12                  | 17                  | 744                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.40   | 5.4               | 5.8                | 1.5      | 1.6 | ZR430SPH732_0500 EZ502U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.40   | 5.4               | 6.1                | 1.5      | 1.6 | ZR430SPH732_0500 EZ701U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.40   | 7.1               | 8.1                | 1.9      | 1.2 | ZR430SPH732_0500 EZ503U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.50   | 2.5               | 2.7                | 1.1      | 3.0 | ZR430SPH732_0400 EZ501U | 9.3                 | 17                  | 595                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.50   | 4.3               | 4.7                | 1.9      | 1.7 | ZR430SPH732_0400 EZ502U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.50   | 4.3               | 4.8                | 1.9      | 1.7 | ZR430SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.50   | 5.7               | 6.5                | 2.5      | 1.3 | ZR430SPH732_0400 EZ503U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |

7.2 Selection table 7 ZRPH rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR4PH7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.50   | 7.0               | 8.4                | 3.1      | 1.1 | ZR430SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 2.2               | 2.4                | 1.1      | 3.9 | ZR430SPH732_0350 EZ501U | 8.2                 | 17                  | 521                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 3.8               | 4.1                | 1.8      | 2.2 | ZR430SPH732_0350 EZ502U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 3.8               | 4.2                | 1.8      | 2.2 | ZR430SPH732_0350 EZ701U | 10                  | 17                  | 651                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 5.0               | 5.7                | 2.4      | 1.7 | ZR430SPH732_0350 EZ503U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 6.1               | 7.4                | 2.9      | 1.4 | ZR430SPH732_0350 EZ702U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 6.9               | 8.2                | 3.3      | 1.2 | ZR430SPH732_0350 EZ505U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.57   | 8.4               | 11                 | 4.0      | 1.0 | ZR430SPH732_0350 EZ703U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.71   | 1.8               | 1.9                | 1.2      | 4.8 | ZR430SPH732_0280 EZ501U | 6.5                 | 17                  | 417                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 3.0               | 3.3                | 2.0      | 2.8 | ZR430SPH732_0280 EZ502U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 3.0               | 3.4                | 2.0      | 2.8 | ZR430SPH732_0280 EZ701U | 8.2                 | 17                  | 521                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 4.0               | 4.5                | 2.7      | 2.1 | ZR430SPH732_0280 EZ503U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 4.9               | 5.9                | 3.3      | 1.7 | ZR430SPH732_0280 EZ702U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 5.5               | 6.5                | 3.7      | 1.5 | ZR430SPH732_0280 EZ505U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.71   | 6.7               | 8.5                | 4.5      | 1.3 | ZR430SPH732_0280 EZ703U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 0.80   | 2.7               | 2.9                | 2.3      | 2.9 | ZR430SPH732_0250 EZ502U | 11                  | 17                  | 721                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 2.7               | 3.0                | 2.3      | 2.9 | ZR430SPH732_0250 EZ701U | 7.3                 | 17                  | 465                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 3.5               | 4.1                | 3.0      | 2.2 | ZR430SPH732_0250 EZ503U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 4.4               | 5.3                | 3.8      | 1.8 | ZR430SPH732_0250 EZ702U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 4.9               | 5.8                | 4.2      | 1.6 | ZR430SPH732_0250 EZ505U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 6.0               | 7.6                | 5.2      | 1.3 | ZR430SPH732_0250 EZ703U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 0.80   | 7.8               | 11                 | 6.7      | 1.0 | ZR430SPH732_0250 EZ705U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 2.2               | 2.3                | 2.8      | 3.3 | ZR430SPH732_0200 EZ502U | 9.1                 | 17                  | 577                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 2.2               | 2.4                | 2.8      | 3.3 | ZR430SPH732_0200 EZ701U | 5.8                 | 17                  | 372                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 2.8               | 3.2                | 3.7      | 2.6 | ZR430SPH732_0200 EZ503U | 13                  | 17                  | 800                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 3.5               | 4.2                | 4.6      | 2.1 | ZR430SPH732_0200 EZ702U | 12                  | 17                  | 763                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 3.9               | 4.7                | 5.1      | 1.8 | ZR430SPH732_0200 EZ505U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 4.8               | 6.1                | 6.3      | 1.5 | ZR430SPH732_0200 EZ703U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.00   | 6.2               | 8.8                | 8.1      | 1.2 | ZR430SPH732_0200 EZ705U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.25   | 1.7               | 1.9                | 3.2      | 4.1 | ZR430SPH732_0160 EZ502U | 7.2                 | 17                  | 461                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 1.7               | 1.9                | 3.2      | 4.1 | ZR430SPH732_0160 EZ701U | 4.7                 | 17                  | 298                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 2.3               | 2.6                | 4.2      | 3.1 | ZR430SPH732_0160 EZ503U | 10                  | 17                  | 640                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 2.8               | 3.4                | 5.2      | 2.5 | ZR430SPH732_0160 EZ702U | 9.6                 | 17                  | 610                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 3.2               | 3.7                | 5.9      | 2.2 | ZR430SPH732_0160 EZ505U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 3.9               | 4.9                | 7.2      | 1.8 | ZR430SPH732_0160 EZ703U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.25   | 5.0               | 7.1                | 9.2      | 1.4 | ZR430SPH732_0160 EZ705U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 2.00   | 1.1               | 1.3                | 1.8      | 3.9 | ZR430SPH731_0100 EZ701U | 3.0                 | 17                  | 192                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.00   | 1.8               | 2.2                | 3.0      | 2.4 | ZR430SPH731_0100 EZ702U | 6.2                 | 17                  | 394                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.00   | 2.5               | 3.1                | 4.1      | 1.8 | ZR430SPH731_0100 EZ703U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.00   | 3.2               | 4.6                | 5.3      | 1.4 | ZR430SPH731_0100 EZ705U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.00   | 3.4               | 5.6                | 5.5      | 1.3 | ZR430SPH731_0100 EZ802U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.00   | 4.0               | 7.3                | 6.6      | 1.1 | ZR430SPH731_0100 EZ803U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 2.86   | 1.3               | 1.5                | 3.3      | 4.8 | ZR430SPH731_0070 EZ702U | 4.3                 | 17                  | 276                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 2.86   | 1.7               | 2.2                | 4.5      | 3.5 | ZR430SPH731_0070 EZ703U | 6.9                 | 17                  | 437                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 2.86   | 2.2               | 3.2                | 5.9      | 2.7 | ZR430SPH731_0070 EZ705U | 11                  | 17                  | 699                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 2.86   | 2.4               | 3.9                | 6.1      | 2.6 | ZR430SPH731_0070 EZ802U | 11                  | 17                  | 672                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 2.86   | 2.8               | 5.1                | 7.3      | 2.2 | ZR430SPH731_0070 EZ803U | 14                  | 17                  | 869                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 4.00   | 1.2               | 1.6                | 6.8      | 4.4 | ZR430SPH731_0050 EZ703U | 4.9                 | 17                  | 312                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| 4.00   | 1.6               | 2.3                | 8.8      | 3.4 | ZR430SPH731_0050 EZ705U | 7.8                 | 17                  | 499                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| 4.00   | 1.7               | 2.8                | 9.2      | 3.3 | ZR430SPH731_0050 EZ802U | 7.5                 | 17                  | 480                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| 4.00   | 2.0               | 3.6                | 11       | 2.7 | ZR430SPH731_0050 EZ803U | 11                  | 17                  | 696                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| 5.00   | 1.3               | 1.8                | 11       | 4.0 | ZR430SPH731_0040 EZ705U | 6.3                 | 14                  | 399                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 98                  | 4             | 30 | 127.3         |
| 5.00   | 1.3               | 2.2                | 12       | 3.8 | ZR430SPH731_0040 EZ802U | 6.0                 | 17                  | 384                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 98                  | 4             | 30 | 127.3         |
| 5.00   | 1.6               | 2.9                | 14       | 3.2 | ZR430SPH731_0040 EZ803U | 8.7                 | 17                  | 557                | 4.000 | 3.17                   | 6.67                   | 56                 | 19                       | 98                  | 4             | 30 | 127.3         |
| <b>ZR4PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.60   | 6.9               | 11                 | 2.2      | 1.1 | ZR430SPH732_0500 EZ505U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.75   | 5.6               | 8.9                | 2.8      | 1.2 | ZR430SPH732_0400 EZ505U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.86   | 4.9               | 7.8                | 2.6      | 1.6 | ZR430SPH732_0350 EZ505U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 0.86   | 6.2               | 10                 | 3.3      | 1.2 | ZR430SPH732_0350 EZ703U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.07   | 3.9               | 6.3                | 2.9      | 2.0 | ZR430SPH732_0280 EZ505U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.07   | 4.9               | 8.2                | 3.7      | 1.5 | ZR430SPH732_0280 EZ703U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.07   | 6.7               | 12                 | 5.0      | 1.1 | ZR430SPH732_0280 EZ705U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.20   | 3.5               | 5.6                | 3.2      | 2.1 | ZR430SPH732_0250 EZ505U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.20   | 4.4               | 7.3                | 4.1      | 1.6 | ZR430SPH732_0250 EZ703U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.20   | 6.0               | 11                 | 5.6      | 1.2 | ZR430SPH732_0250 EZ705U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.50   | 2.8               | 4.5                | 3.7      | 2.6 | ZR430SPH732_0200 EZ505U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |



| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT}$<br>[kN] | $M_{2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|---------------------|---------------------|--------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZR4PH7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 1.50   | 3.5               | 5.8                | 4.7      | 2.0 | ZR430SPH732_0200 EZ703U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.50   | 4.8               | 8.8                | 6.4      | 1.5 | ZR430SPH732_0200 EZ705U | 13                  | 17                  | 805                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.88   | 2.2               | 3.6                | 4.1      | 3.2 | ZR430SPH732_0160 EZ505U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.88   | 2.8               | 4.7                | 5.3      | 2.5 | ZR430SPH732_0160 EZ703U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 1.88   | 3.8               | 7.0                | 7.1      | 1.8 | ZR430SPH732_0160 EZ705U | 12                  | 17                  | 740                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 3.00   | 1.6               | 5.2                | 3.0      | 2.4 | ZR430SPH731_0100 EZ802U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 3.00   | 1.8               | 3.0                | 3.4      | 2.1 | ZR430SPH731_0100 EZ703U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 3.00   | 2.5               | 4.5                | 4.7      | 1.5 | ZR430SPH731_0100 EZ705U | 9.0                 | 17                  | 575                | 10.00 | 1.67                   | 3.33                   | 56                 | 19                       | 68                  | 4             | 30 | 127.3         |
| 4.29   | 1.1               | 3.6                | 3.3      | 4.8 | ZR430SPH731_0070 EZ802U | 11                  | 17                  | 672                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 4.29   | 1.3               | 2.1                | 3.8      | 4.1 | ZR430SPH731_0070 EZ703U | 6.9                 | 17                  | 437                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 4.29   | 1.7               | 3.2                | 5.2      | 3.0 | ZR430SPH731_0070 EZ705U | 11                  | 17                  | 699                | 7.000 | 2.38                   | 4.76                   | 56                 | 19                       | 80                  | 4             | 30 | 127.3         |
| 6.00   | 1.2               | 2.3                | 7.7      | 3.9 | ZR430SPH731_0050 EZ705U | 7.8                 | 17                  | 499                | 5.000 | 2.93                   | 6.67                   | 56                 | 19                       | 91                  | 4             | 30 | 127.3         |
| <b>ZR4PH7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 14</math> kN))</b> |                   |                    |          |     |                         |                     |                     |                    |       |                        |                        |                    |                          |                     |               |    |               |
| 0.57   | 3.5               | 4.5                | 0.7      | 2.0 | ZR430SPH732_0700 EZ501U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.57   | 5.3               | 8.0                | 1.1      | 1.3 | ZR430SPH732_0700 EZ502U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.57   | 5.3               | 8.1                | 1.1      | 1.3 | ZR430SPH732_0700 EZ701U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.57   | 6.3               | 11                 | 1.3      | 1.1 | ZR430SPH732_0700 EZ503U | 13                  | 17                  | 809                | 70.00 | 0.35                   | 0.67                   | 56                 | 19                       | 77                  | 4             | 30 | 127.3         |
| 0.80   | 2.5               | 3.2                | 0.9      | 2.8 | ZR430SPH732_0500 EZ501U | 12                  | 17                  | 744                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.80   | 3.8               | 5.7                | 1.3      | 1.8 | ZR430SPH732_0500 EZ502U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.80   | 3.8               | 5.8                | 1.3      | 1.8 | ZR430SPH732_0500 EZ701U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.80   | 4.5               | 7.7                | 1.6      | 1.5 | ZR430SPH732_0500 EZ503U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 0.80   | 5.3               | 10                 | 1.8      | 1.3 | ZR430SPH732_0500 EZ702U | 13                  | 17                  | 830                | 50.00 | 0.49                   | 0.93                   | 56                 | 19                       | 83                  | 4             | 30 | 127.3         |
| 1.00   | 2.0               | 2.6                | 1.1      | 3.0 | ZR430SPH732_0400 EZ501U | 9.3                 | 17                  | 595                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.00   | 3.0               | 4.6                | 1.7      | 1.9 | ZR430SPH732_0400 EZ502U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.00   | 3.0               | 4.6                | 1.7      | 1.9 | ZR430SPH732_0400 EZ701U | 12                  | 17                  | 744                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.00   | 3.6               | 6.2                | 2.0      | 1.6 | ZR430SPH732_0400 EZ503U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.00   | 4.2               | 8.4                | 2.4      | 1.4 | ZR430SPH732_0400 EZ702U | 12                  | 17                  | 770                | 40.00 | 0.62                   | 1.17                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.14   | 1.7               | 2.2                | 1.0      | 4.0 | ZR430SPH732_0350 EZ501U | 8.2                 | 17                  | 521                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.14   | 2.7               | 4.0                | 1.6      | 2.6 | ZR430SPH732_0350 EZ502U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.14   | 2.7               | 4.0                | 1.6      | 2.6 | ZR430SPH732_0350 EZ701U | 10                  | 17                  | 651                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.14   | 3.2               | 5.4                | 1.9      | 2.2 | ZR430SPH732_0350 EZ503U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.14   | 3.7               | 7.3                | 2.2      | 1.9 | ZR430SPH732_0350 EZ702U | 14                  | 17                  | 866                | 35.00 | 0.71                   | 1.33                   | 56                 | 19                       | 85                  | 4             | 30 | 127.3         |
| 1.43   | 1.4               | 1.8                | 1.1      | 5.0 | ZR430SPH732_0280 EZ501U | 6.5                 | 17                  | 417                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.43   | 2.1               | 3.2                | 1.7      | 3.2 | ZR430SPH732_0280 EZ502U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.43   | 2.1               | 3.2                | 1.7      | 3.2 | ZR430SPH732_0280 EZ701U | 8.2                 | 17                  | 521                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.43   | 2.5               | 4.3                | 2.1      | 2.7 | ZR430SPH732_0280 EZ503U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.43   | 2.9               | 5.8                | 2.4      | 2.3 | ZR430SPH732_0280 EZ702U | 12                  | 17                  | 770                | 28.00 | 0.88                   | 1.67                   | 56                 | 19                       | 88                  | 4             | 30 | 127.3         |
| 1.60   | 1.9               | 2.8                | 2.0      | 3.4 | ZR430SPH732_0250 EZ502U | 11                  | 17                  | 721                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.60   | 1.9               | 2.9                | 2.0      | 3.4 | ZR430SPH732_0250 EZ701U | 7.3                 | 17                  | 465                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.60   | 2.3               | 3.9                | 2.3      | 2.9 | ZR430SPH732_0250 EZ503U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 1.60   | 2.6               | 5.2                | 2.7      | 2.5 | ZR430SPH732_0250 EZ702U | 14                  | 17                  | 866                | 25.00 | 0.93                   | 1.87                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 2.00   | 1.5               | 2.3                | 2.2      | 4.2 | ZR430SPH732_0200 EZ502U | 9.1                 | 17                  | 577                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 2.00   | 1.5               | 2.3                | 2.2      | 4.2 | ZR430SPH732_0200 EZ701U | 5.8                 | 17                  | 372                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 2.00   | 1.8               | 3.1                | 2.6      | 3.6 | ZR430SPH732_0200 EZ503U | 13                  | 17                  | 800                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 2.00   | 2.1               | 4.2                | 3.1      | 3.1 | ZR430SPH732_0200 EZ702U | 12                  | 17                  | 763                | 20.00 | 1.00                   | 2.00                   | 56                 | 19                       | 86                  | 4             | 30 | 127.3         |
| 2.50   | 1.4               | 2.5                | 3.0      | 4.4 | ZR430SPH732_0160 EZ503U | 10                  | 17                  | 640                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |
| 2.50   | 1.7               | 3.3                | 3.4      | 3.8 | ZR430SPH732_0160 EZ702U | 9.6                 | 17                  | 610                | 16.00 | 1.25                   | 2.50                   | 56                 | 19                       | 90                  | 4             | 30 | 127.3         |

## 7.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

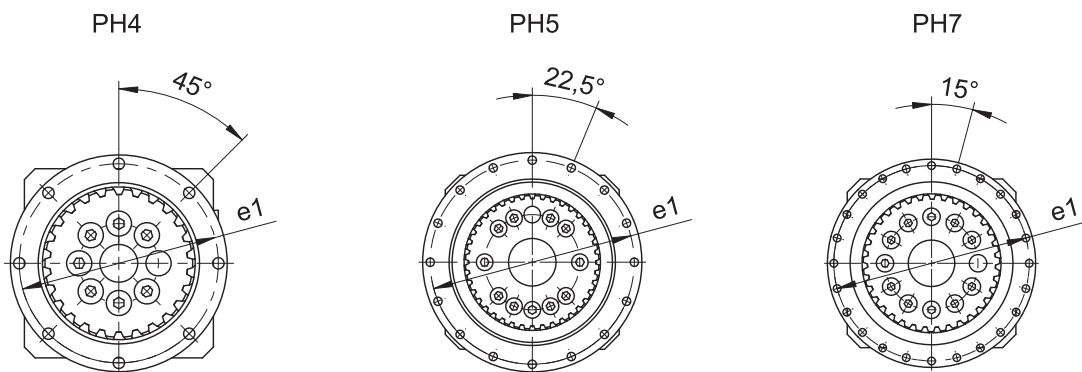
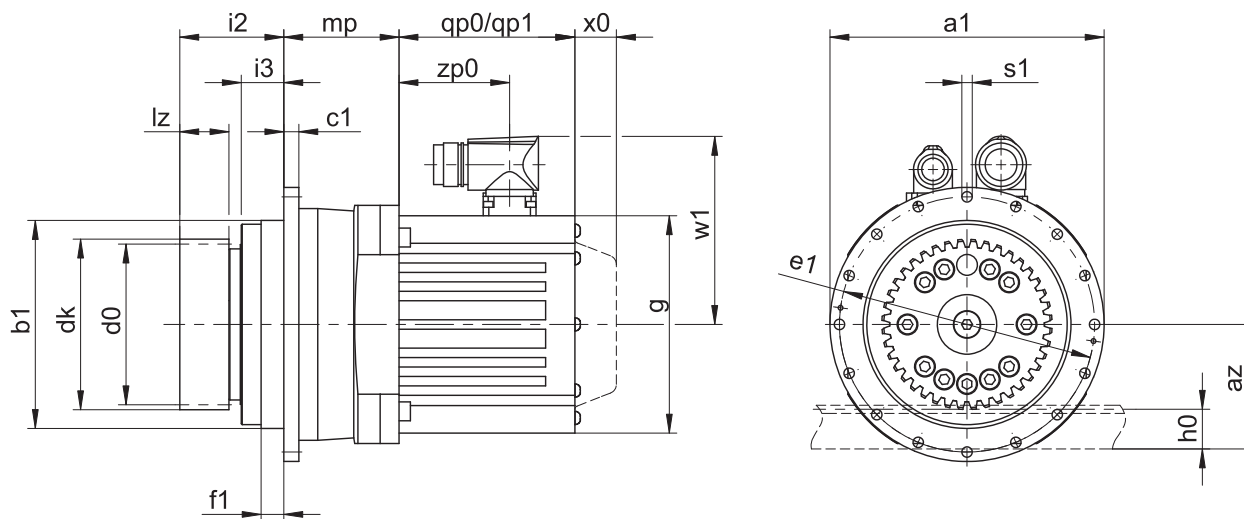
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4]

### Dimensions of gear units

| Type       | mn | Øa1               | az    | Øb1               | c1 | Ød0    | Ødk   | Øe1 | f1 | h0 | i2   | i3   | lz | Øs1 | x    |
|------------|----|-------------------|-------|-------------------|----|--------|-------|-----|----|----|------|------|----|-----|------|
| ZR233SPH4_ | 2  | 118 <sub>h7</sub> | 57.80 | 90 <sub>h7</sub>  | 7  | 70.03  | 75.0  | 109 | 10 | 22 | 56.0 | 23.5 | 26 | 5.5 | 0.39 |
| ZR240SPH5_ | 2  | 145 <sub>h7</sub> | 65.20 | 110 <sub>h7</sub> | 8  | 84.88  | 90.0  | 135 | 12 | 22 | 55.0 | 22.5 | 26 | 5.5 | 0.38 |
| ZR330SPH5_ | 3  | 145 <sub>h7</sub> | 73.75 | 110 <sub>h7</sub> | 8  | 95.49  | 101.5 | 135 | 12 | 26 | 64.0 | 22.5 | 35 | 5.5 | 0.00 |
| ZR335SPH7_ | 3  | 179 <sub>h7</sub> | 82.80 | 140 <sub>h7</sub> | 10 | 111.41 | 119.0 | 168 | 12 | 26 | 69.0 | 31.5 | 31 | 6.6 | 0.37 |
| ZR340SPH7_ | 3  | 179 <sub>h7</sub> | 90.80 | 140 <sub>h7</sub> | 10 | 127.32 | 135.0 | 168 | 12 | 26 | 69.0 | 31.5 | 31 | 6.6 | 0.38 |
| ZR430SPH7_ | 4  | 179 <sub>h7</sub> | 98.66 | 140 <sub>h7</sub> | 10 | 127.32 | 135.3 | 168 | 12 | 35 | 83.0 | 31.5 | 45 | 6.6 | 0.00 |

## Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |
| EZ803U | 190 | 238 | 315.0 | 156.5 | 22 | 184.0 |
| EZ805U | 190 | 320 | 397.0 | 156.5 | 22 | 266.0 |

## Dimensions of geared motors

| Type      | EZ3<br>mp | EZ4<br>mp | EZ5<br>mp | EZ7<br>mp | EZ8<br>mp |
|-----------|-----------|-----------|-----------|-----------|-----------|
| ZR_PH431_ | –         | 54.5      | 54.0      | –         | –         |
| ZR_PH432_ | 99.0      | 95.5      | –         | –         | –         |
| ZR_PH531_ | –         | –         | 61.0      | 64.0      | –         |
| ZR_PH532_ | –         | 103.0     | 102.5     | –         | –         |
| ZR_PH731_ | –         | –         | –         | 71.0      | 81.0      |
| ZR_PH732_ | –         | –         | 119.0     | 122.0     | –         |

## 7.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |    |   |   |   |   |   |   |   |      |        |
|---|---|---|----|---|----|---|---|---|---|---|---|---|------|--------|
| Z | R | 3 | 30 | S | PH | 5 | 3 | 2 | S | F | S | S | 0280 | EZ501U |
|---|---|---|----|---|----|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design                          |
|--------|--------------------------------------|---------------------------------|
| Z      | Type                                 | Rack and pinion drive           |
| R      | Design                               | Screwed pinion                  |
| 3      | Module                               | $m_n = 3$ (example)             |
| 30     | Number of teeth                      | $z = 30$ (example)              |
| S      | Toothing                             | Helical (left-hand 19° 31' 42") |
| PH     | Type                                 | Planetary gear unit             |
| 5      | Size                                 | 5 (example)                     |
| 3      | Generation                           | Generation 3                    |
| 1      | Stages                               | Single-stage                    |
| 2      |                                      | Two-stage                       |
| S      | Housing                              | Standard                        |
| F      | Shaft                                | Flange shaft                    |
| S      | Bearing                              | Standard bearing                |
| V      |                                      | Reinforced bearing (PH3 – PH5)  |
| S      | Backlash                             | Standard                        |
| R      |                                      | Reduced                         |
| 0280   | Transmission ratio ( $i \times 10$ ) | $i = 28$ (example)              |
| EZ501U | Motor                                | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

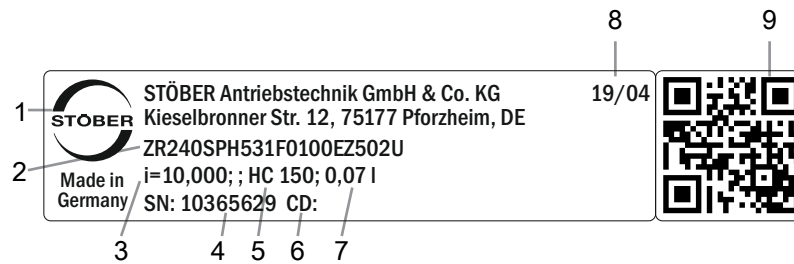
- A detailed type designation of the motor, see chapter [\[ 13\]](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [\[ 7.6.2\]](#)
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 7.5.1\]](#).

## 7.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 7.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

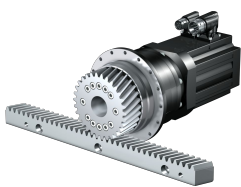
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 7.5 Product description

### 7.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



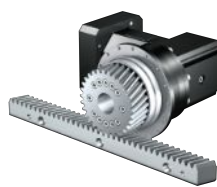
Catalog ID 443286\_en

Motor adapter



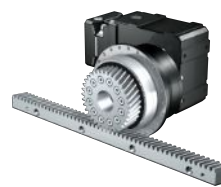
Catalog ID 443137\_en

KX right-angle input with MF motor adapter



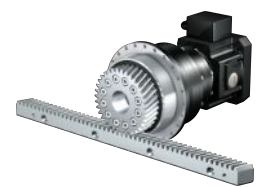
On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 7.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material           |
|-------------------|---------------------------|------------------------------|
| 2 – 4             | 6                         | 16MnCr5 inductively hardened |
| 5                 | 5                         | 16MnCr5 inductively hardened |
| 6 – 10            | 6                         | C45 inductively hardened     |

Also note the project configuration of the gear rack on the Atlanta pages.

## 7.5.3 Installation conditions

The torque and force values listed in this catalog are valid under the following conditions:

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 7.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 7.5.4.1 Rack and pinion drive lubrication

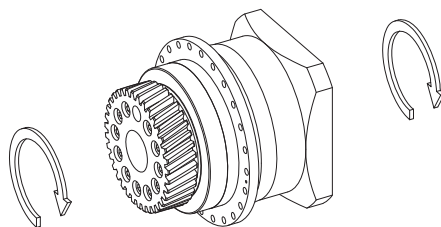
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 7.5.5 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | $\leq 90$ °C          |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 7.5.6 Direction of rotation

The input and output rotate in the same direction.



## 7.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

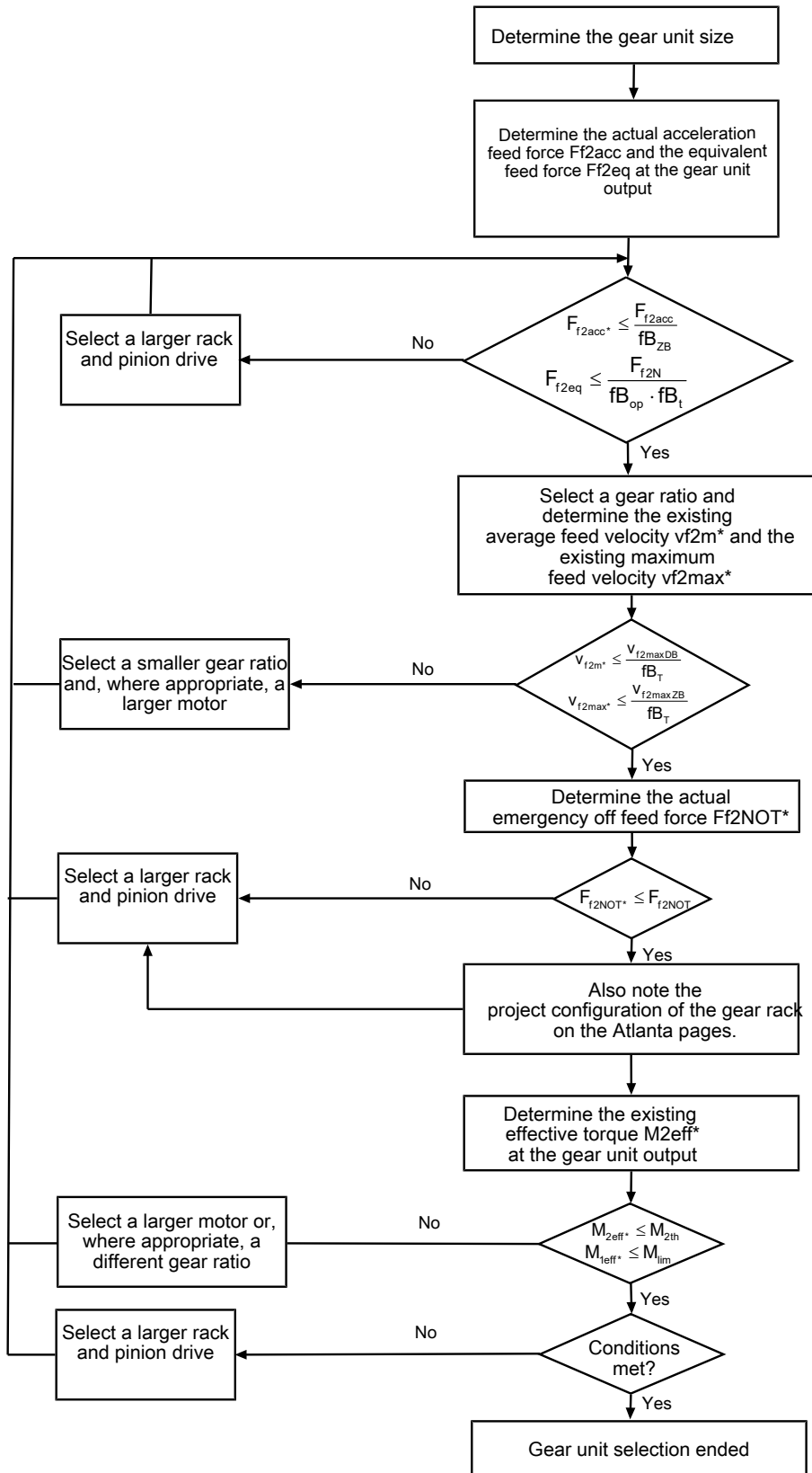
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 7.6.1 Drive selection



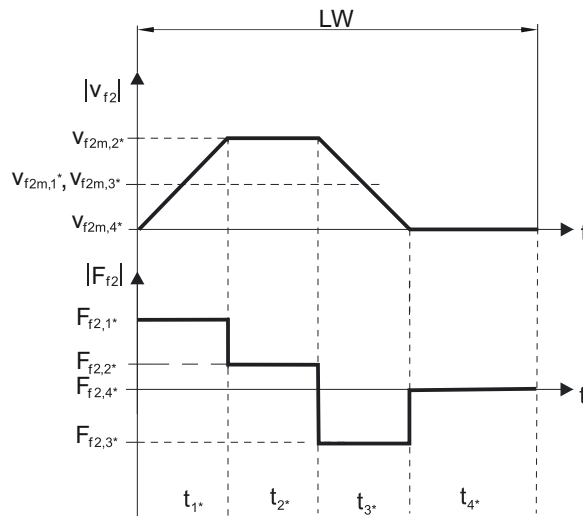
Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.



**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

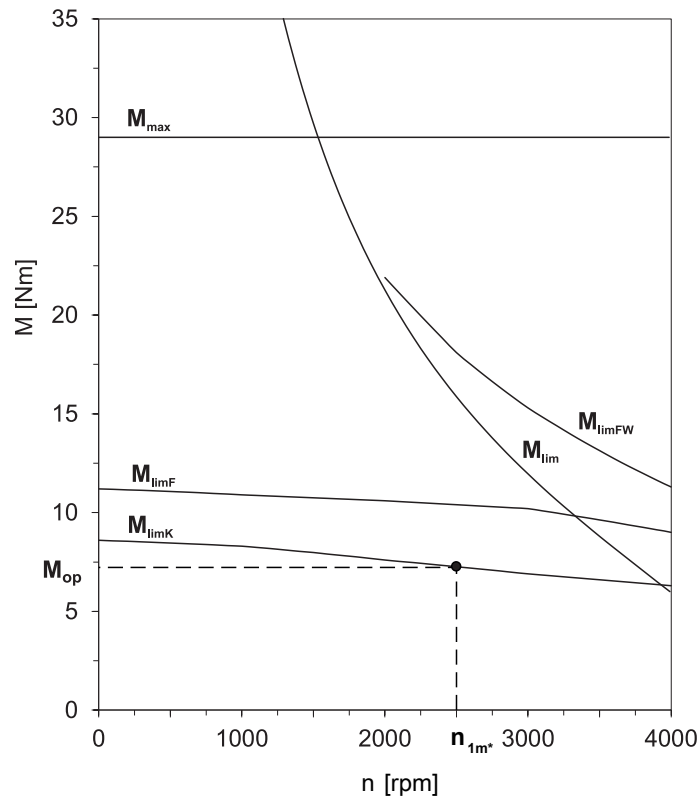
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [► 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | fB <sub>op</sub> |
|---------------------------------|-------------------------|------------------|
| Uniform continuous operation    |                         | 1.00             |
| Cyclic operation                |                         | 1.00             |
| Reversing load cyclic operation |                         | 1.00             |
| Run time                        |                         | fB <sub>t</sub>  |
| Daily runtime ≤ 8 h             |                         | 1.00             |
| Daily runtime ≤ 16 h            |                         | 1.15             |
| Daily runtime ≤ 24 h            |                         | 1.20             |
| Cyclic operation                |                         | fB <sub>zB</sub> |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00             |
| > 1000 load changes/hour (LW/h) |                         | 1.15             |
| Temperature                     |                         | fB <sub>T</sub>  |
| Motor cooling                   | Surrounding temperature |                  |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9              |
|                                 | ≤ 30 °C                 | 1.0              |
|                                 | ≤ 40 °C                 | 1.15             |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0              |
|                                 | ≤ 30 °C                 | 1.1              |
|                                 | ≤ 40 °C                 | 1.25             |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 7.6.2 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

## 7.7 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

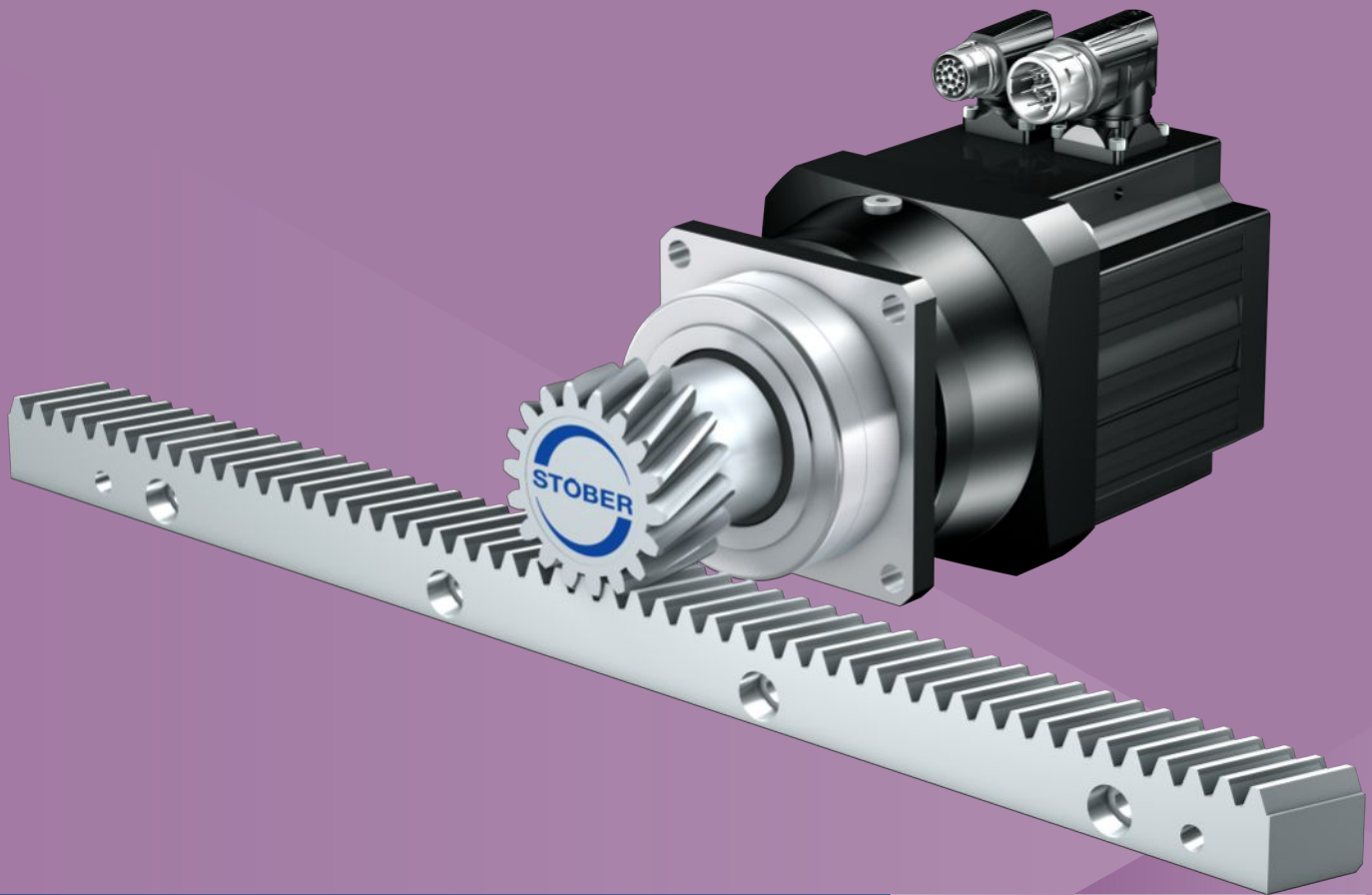
| Documentation  | ID        |
|--|-----------|
| Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104 | 443354_de |
| Operating manual for EZ synchronous servo motors                     | 443032_en |
| Operating manual for gear racks (Atlanta)                            | 442455    |



## 8 ZVP rack and pinion drives

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## 8 Rack and pinion drives

# ZVP

### 8.1 Overview

Precision planetary geared motors with plug-on pinion

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★☆ |
| Linear clearance  | ★★★★★ |
| Price category  | €€    |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★☆ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 6 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                      |
|-------------|----------------------|
| $m_n$       | 2 – 4 mm             |
| $z$         | 16 – 25              |
| $F_{f2acc}$ | 0.8 – 11 kN          |
| $v_{f2N}$   | 0.08 – 4.5 m/s       |
| $\Delta s$  | 8 – 44 $\mu\text{m}$ |

## 8.2 Selection table

The technical data specified in the selection tables applies to:

- Pinion position E with bearing design S (standard)
- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 8.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

Higher feed forces are possible for rack and pinion drives with reduced backlash, reinforced bearing D (axially reinforced) or pinion position S. You can find this and all other technical data, as well as other combinations of the pinion position and bearing design, at <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|---------------------|---------------|----|---------------|
| <b>ZV2P3 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 2,0</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                     |               |    |               |
| 0.17   | 1.7               | 1.7                | 1.5      | 1.0 | ZV216S_P332_0320 EZ301U | 2.0                  | 3.3                   | 34                   | 32.00 | 0.31                   | 0.44                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.19   | 1.5               | 1.5                | 1.8      | 1.1 | ZV216S_P332_0280 EZ301U | 2.0                  | 3.3                   | 34                   | 28.00 | 0.38                   | 0.51                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.21   | 1.3               | 1.3                | 1.7      | 1.3 | ZV216S_P332_0250 EZ301U | 2.0                  | 3.3                   | 34                   | 25.00 | 0.43                   | 0.57                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.27   | 1.0               | 1.1                | 1.9      | 1.6 | ZV216S_P332_0200 EZ301U | 2.0                  | 3.3                   | 34                   | 20.00 | 0.49                   | 0.71                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.33   | 0.8               | 0.9                | 2.4      | 2.0 | ZV216S_P332_0160 EZ301U | 2.0                  | 3.3                   | 34                   | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.33   | 1.4               | 1.5                | 4.0      | 1.2 | ZV216S_P332_0160 EZ302U | 2.0                  | 3.3                   | 34                   | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.44   | 0.6               | 0.6                | 4.1      | 2.7 | ZV216S_P332_0120 EZ301U | 1.9                  | 3.3                   | 32                   | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.44   | 1.1               | 1.1                | 7.0      | 1.6 | ZV216S_P332_0120 EZ302U | 2.0                  | 3.3                   | 34                   | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.44   | 1.4               | 1.5                | 9.1      | 1.2 | ZV216S_P332_0120 EZ303U | 2.0                  | 3.3                   | 34                   | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.53   | 0.5               | 0.5                | 0.5      | 3.1 | ZV216S_P331_0100 EZ301U | 1.6                  | 3.3                   | 27                   | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.53   | 0.9               | 1.0                | 0.9      | 1.8 | ZV216S_P331_0100 EZ302U | 2.0                  | 3.3                   | 34                   | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.53   | 1.2               | 1.3                | 1.1      | 1.4 | ZV216S_P331_0100 EZ303U | 2.0                  | 3.3                   | 34                   | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.53   | 1.6               | 1.7                | 1.5      | 1.0 | ZV216S_P331_0100 EZ401U | 2.0                  | 3.3                   | 34                   | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.67   | 0.4               | 0.4                | 0.5      | 3.9 | ZV216S_P331_0080 EZ301U | 1.3                  | 3.3                   | 22                   | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.67   | 0.7               | 0.8                | 0.9      | 2.3 | ZV216S_P331_0080 EZ302U | 2.0                  | 3.3                   | 34                   | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.67   | 0.9               | 1.0                | 1.2      | 1.8 | ZV216S_P331_0080 EZ303U | 2.0                  | 3.3                   | 34                   | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.67   | 1.3               | 1.4                | 1.6      | 1.3 | ZV216S_P331_0080 EZ401U | 2.0                  | 3.3                   | 34                   | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                  | 2             | 16 | 34.0          |
| 0.76   | 0.4               | 0.4                | 0.6      | 4.4 | ZV216S_P331_0070 EZ301U | 1.1                  | 3.3                   | 19                   | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 0.76   | 0.6               | 0.7                | 1.0      | 2.6 | ZV216S_P331_0070 EZ302U | 2.0                  | 3.3                   | 34                   | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 0.76   | 0.8               | 0.9                | 1.3      | 2.0 | ZV216S_P331_0070 EZ303U | 2.0                  | 3.3                   | 34                   | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 0.76   | 1.1               | 1.2                | 1.7      | 1.5 | ZV216S_P331_0070 EZ401U | 2.0                  | 3.3                   | 34                   | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.07   | 0.5               | 0.5                | 1.5      | 3.2 | ZV216S_P331_0050 EZ302U | 1.4                  | 3.3                   | 24                   | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.07   | 0.6               | 0.6                | 1.9      | 2.5 | ZV216S_P331_0050 EZ303U | 2.0                  | 3.3                   | 34                   | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.07   | 0.8               | 0.9                | 2.6      | 1.8 | ZV216S_P331_0050 EZ401U | 2.0                  | 3.3                   | 34                   | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.07   | 1.3               | 1.5                | 4.3      | 1.1 | ZV216S_P331_0050 EZ402U | 2.0                  | 3.3                   | 34                   | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.33   | 0.4               | 0.4                | 1.9      | 3.7 | ZV216S_P331_0040 EZ302U | 1.1                  | 3.3                   | 19                   | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.33   | 0.5               | 0.5                | 2.5      | 2.9 | ZV216S_P331_0040 EZ303U | 1.6                  | 3.3                   | 27                   | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.33   | 0.6               | 0.7                | 3.3      | 2.1 | ZV216S_P331_0040 EZ401U | 1.9                  | 3.3                   | 33                   | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.33   | 1.1               | 1.2                | 5.6      | 1.3 | ZV216S_P331_0040 EZ402U | 2.0                  | 3.3                   | 34                   | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.78   | 0.3               | 0.3                | 4.0      | 4.5 | ZV216S_P331_0030 EZ302U | 0.9                  | 3.3                   | 15                   | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.78   | 0.4               | 0.4                | 5.2      | 3.5 | ZV216S_P331_0030 EZ303U | 1.2                  | 3.3                   | 20                   | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.78   | 0.5               | 0.5                | 7.1      | 2.6 | ZV216S_P331_0030 EZ401U | 1.5                  | 3.3                   | 25                   | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| 1.78   | 0.8               | 0.9                | 12       | 1.5 | ZV216S_P331_0030 EZ402U | 2.0                  | 3.3                   | 34                   | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                  | 2             | 16 | 34.0          |
| <b>ZV2P3 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 2,0</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                     |               |    |               |
| 0.15   | 1.6               | 1.7                | 0.5      | 1.1 | ZV216S_P332_0700 EZ202U | 2.0                  | 3.3                   | 34                   | 70.00 | 0.15                   | 0.20                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.19   | 1.3               | 1.4                | 0.6      | 1.3 | ZV216S_P332_0560 EZ202U | 2.0                  | 3.3                   | 34                   | 56.00 | 0.19                   | 0.25                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.21   | 1.1               | 1.2                | 0.6      | 1.5 | ZV216S_P332_0500 EZ202U | 2.0                  | 3.3                   | 34                   | 50.00 | 0.21                   | 0.28                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.27   | 0.9               | 1.0                | 0.9      | 1.9 | ZV216S_P332_0400 EZ202U | 2.0                  | 3.3                   | 34                   | 40.00 | 0.27                   | 0.36                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.27   | 1.4               | 1.5                | 1.4      | 1.2 | ZV216S_P332_0400 EZ203U | 2.0                  | 3.3                   | 34                   | 40.00 | 0.27                   | 0.36                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.31   | 0.8               | 0.9                | 0.7      | 2.1 | ZV216S_P332_0350 EZ202U | 2.0                  | 3.3                   | 34                   | 35.00 | 0.31                   | 0.41                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.31   | 1.2               | 1.4                | 1.0      | 1.4 | ZV216S_P332_0350 EZ203U | 2.0                  | 3.3                   | 34                   | 35.00 | 0.31                   | 0.41                   | 25                 | 15                       | 16                  | 2             | 16 | 34.0          |
| 0.33   | 0.7               | 0.8                | 0.8      | 2.3 | ZV216S_P332_0320 EZ202U | 2.0                  | 3.3                   | 34                   | 32.00 | 0.31                   | 0.44                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.33   | 1.1               | 1.2                | 1.2      | 1.5 | ZV216S_P332_0320 EZ203U | 2.0                  | 3.3                   | 34                   | 32.00 | 0.31                   | 0.44                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |
| 0.33   | 1.6               | 1.7                | 1.8      | 1.0 | ZV216S_P332_0320 EZ301U | 2.0                  | 3.3                   | 34                   | 32.00 | 0.31                   | 0.44                   | 25                 | 15                       | 15                  | 2             | 16 | 34.0          |

8.2 Selection table 8 ZVP rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2acc}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV2P3 (<math>n_{f2N} = 6000</math> rpm, (<math>F_{f2acc,max} = 2,0</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |       |                        |                        |                    |                          |                    |               |    |               |
| 0.38  | 0.6               | 0.7                | 0.9      | 2.7 | ZV216S_P332_0280 EZ202U | 2.0                 | 3.3                   | 34                  | 28.00 | 0.38                   | 0.51                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.38  | 1.0               | 1.1                | 1.4      | 1.7 | ZV216S_P332_0280 EZ203U | 2.0                 | 3.3                   | 34                  | 28.00 | 0.38                   | 0.51                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.38  | 1.4               | 1.5                | 2.0      | 1.2 | ZV216S_P332_0280 EZ301U | 2.0                 | 3.3                   | 34                  | 28.00 | 0.38                   | 0.51                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.43  | 0.6               | 0.6                | 0.8      | 3.0 | ZV216S_P332_0250 EZ202U | 2.0                 | 3.3                   | 34                  | 25.00 | 0.43                   | 0.57                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.43  | 0.9               | 1.0                | 1.2      | 2.0 | ZV216S_P332_0250 EZ203U | 2.0                 | 3.3                   | 34                  | 25.00 | 0.43                   | 0.57                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.43  | 1.2               | 1.3                | 1.8      | 1.3 | ZV216S_P332_0250 EZ301U | 2.0                 | 3.3                   | 34                  | 25.00 | 0.43                   | 0.57                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.53  | 0.4               | 0.5                | 0.9      | 3.7 | ZV216S_P332_0200 EZ202U | 1.7                 | 3.3                   | 28                  | 20.00 | 0.49                   | 0.71                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.53  | 0.7               | 0.8                | 1.4      | 2.4 | ZV216S_P332_0200 EZ203U | 2.0                 | 3.3                   | 34                  | 20.00 | 0.49                   | 0.71                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.53  | 1.0               | 1.1                | 2.0      | 1.7 | ZV216S_P332_0200 EZ301U | 2.0                 | 3.3                   | 34                  | 20.00 | 0.49                   | 0.71                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.67  | 0.4               | 0.4                | 1.2      | 4.7 | ZV216S_P332_0160 EZ202U | 1.3                 | 3.3                   | 22                  | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.67  | 0.5               | 0.6                | 1.8      | 3.1 | ZV216S_P332_0160 EZ203U | 2.0                 | 3.3                   | 34                  | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.67  | 0.8               | 0.9                | 2.6      | 2.1 | ZV216S_P332_0160 EZ301U | 2.0                 | 3.3                   | 34                  | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.67  | 1.3               | 1.5                | 4.5      | 1.2 | ZV216S_P332_0160 EZ302U | 2.0                 | 3.3                   | 34                  | 16.00 | 0.61                   | 0.89                   | 25                 | 15                       | 16                 | 2             | 16 | 34.0          |
| 0.89  | 0.4               | 0.5                | 3.0      | 3.8 | ZV216S_P332_0120 EZ203U | 1.8                 | 3.3                   | 31                  | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                 | 2             | 16 | 34.0          |
| 0.89  | 0.6               | 0.6                | 4.3      | 2.6 | ZV216S_P332_0120 EZ301U | 1.9                 | 3.3                   | 32                  | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                 | 2             | 16 | 34.0          |
| 0.89  | 1.0               | 1.1                | 7.3      | 1.5 | ZV216S_P332_0120 EZ302U | 2.0                 | 3.3                   | 34                  | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                 | 2             | 16 | 34.0          |
| 0.89  | 1.3               | 1.5                | 9.5      | 1.2 | ZV216S_P332_0120 EZ303U | 2.0                 | 3.3                   | 34                  | 12.00 | 0.82                   | 1.19                   | 25                 | 15                       | 15                 | 2             | 16 | 34.0          |
| 1.07  | 0.5               | 0.5                | 0.6      | 2.6 | ZV216S_P331_0100 EZ301U | 1.6                 | 3.3                   | 27                  | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.07  | 0.9               | 1.0                | 1.0      | 1.6 | ZV216S_P331_0100 EZ302U | 2.0                 | 3.3                   | 34                  | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.07  | 1.1               | 1.3                | 1.4      | 1.2 | ZV216S_P331_0100 EZ303U | 2.0                 | 3.3                   | 34                  | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.07  | 1.3               | 1.6                | 1.6      | 1.0 | ZV216S_P331_0100 EZ401U | 2.0                 | 3.3                   | 34                  | 10.00 | 0.98                   | 1.42                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.33  | 0.4               | 0.4                | 0.7      | 3.3 | ZV216S_P331_0080 EZ301U | 1.3                 | 3.3                   | 22                  | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.33  | 0.7               | 0.8                | 1.1      | 2.0 | ZV216S_P331_0080 EZ302U | 2.0                 | 3.3                   | 34                  | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.33  | 0.9               | 1.0                | 1.4      | 1.5 | ZV216S_P331_0080 EZ303U | 2.0                 | 3.3                   | 34                  | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.33  | 1.1               | 1.3                | 1.7      | 1.3 | ZV216S_P331_0080 EZ401U | 2.0                 | 3.3                   | 34                  | 8.000 | 1.11                   | 1.78                   | 20                 | 10                       | 15                 | 2             | 16 | 34.0          |
| 1.52  | 0.4               | 0.4                | 0.7      | 3.6 | ZV216S_P331_0070 EZ301U | 1.1                 | 3.3                   | 19                  | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 1.52  | 0.6               | 0.7                | 1.2      | 2.2 | ZV216S_P331_0070 EZ302U | 2.0                 | 3.3                   | 34                  | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 1.52  | 0.8               | 0.9                | 1.5      | 1.7 | ZV216S_P331_0070 EZ303U | 2.0                 | 3.3                   | 34                  | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 1.52  | 0.9               | 1.1                | 1.8      | 1.4 | ZV216S_P331_0070 EZ401U | 2.0                 | 3.3                   | 34                  | 7.000 | 1.27                   | 2.03                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.13  | 0.3               | 0.3                | 1.0      | 4.5 | ZV216S_P331_0050 EZ301U | 0.8                 | 3.3                   | 14                  | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.13  | 0.4               | 0.5                | 1.7      | 2.7 | ZV216S_P331_0050 EZ302U | 1.4                 | 3.3                   | 24                  | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.13  | 0.6               | 0.6                | 2.3      | 2.1 | ZV216S_P331_0050 EZ303U | 2.0                 | 3.3                   | 34                  | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.13  | 0.7               | 0.8                | 2.6      | 1.8 | ZV216S_P331_0050 EZ401U | 2.0                 | 3.3                   | 34                  | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.13  | 1.0               | 1.4                | 4.0      | 1.2 | ZV216S_P331_0050 EZ402U | 2.0                 | 3.3                   | 34                  | 5.000 | 1.60                   | 2.84                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.67  | 0.3               | 0.4                | 2.3      | 3.1 | ZV216S_P331_0040 EZ302U | 1.1                 | 3.3                   | 19                  | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.67  | 0.4               | 0.5                | 3.0      | 2.4 | ZV216S_P331_0040 EZ303U | 1.6                 | 3.3                   | 27                  | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.67  | 0.5               | 0.6                | 3.5      | 2.0 | ZV216S_P331_0040 EZ401U | 1.9                 | 3.3                   | 33                  | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 2.67  | 0.8               | 1.1                | 5.3      | 1.3 | ZV216S_P331_0040 EZ402U | 2.0                 | 3.3                   | 34                  | 4.000 | 1.78                   | 3.56                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 3.56  | 0.3               | 0.3                | 4.8      | 3.8 | ZV216S_P331_0030 EZ302U | 0.9                 | 3.3                   | 15                  | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 3.56  | 0.3               | 0.4                | 6.2      | 2.9 | ZV216S_P331_0030 EZ303U | 1.2                 | 3.3                   | 20                  | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 3.56  | 0.4               | 0.5                | 7.3      | 2.5 | ZV216S_P331_0030 EZ401U | 1.5                 | 3.3                   | 25                  | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| 3.56  | 0.6               | 0.8                | 11       | 1.6 | ZV216S_P331_0030 EZ402U | 2.0                 | 3.3                   | 34                  | 3.000 | 2.07                   | 4.15                   | 20                 | 10                       | 16                 | 2             | 16 | 34.0          |
| <b>ZV2P4 (<math>n_{f2N} = 3000</math> rpm, (<math>F_{f2acc,max} = 4,1</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |       |                        |                        |                    |                          |                    |               |    |               |
| 0.10  | 2.9               | 3.0                | 0.6      | 1.1 | ZV220S_P432_0700 EZ301U | 4.1                 | 6.3                   | 88                  | 70.00 | 0.16                   | 0.25                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.12  | 2.3               | 2.4                | 0.7      | 1.4 | ZV220S_P432_0560 EZ301U | 4.1                 | 6.3                   | 88                  | 56.00 | 0.20                   | 0.32                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.13  | 2.1               | 2.1                | 0.7      | 1.5 | ZV220S_P432_0500 EZ301U | 4.1                 | 6.3                   | 88                  | 50.00 | 0.22                   | 0.36                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.17  | 1.7               | 1.7                | 0.9      | 1.9 | ZV220S_P432_0400 EZ301U | 4.1                 | 6.3                   | 88                  | 40.00 | 0.28                   | 0.44                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.17  | 2.8               | 3.0                | 1.5      | 1.1 | ZV220S_P432_0400 EZ302U | 4.1                 | 6.3                   | 88                  | 40.00 | 0.28                   | 0.44                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.19  | 1.5               | 1.5                | 0.8      | 2.2 | ZV220S_P432_0350 EZ301U | 4.1                 | 6.3                   | 88                  | 35.00 | 0.29                   | 0.51                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.19  | 2.5               | 2.6                | 1.3      | 1.3 | ZV220S_P432_0350 EZ302U | 4.1                 | 6.3                   | 88                  | 35.00 | 0.29                   | 0.51                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.21  | 1.3               | 1.4                | 0.9      | 2.4 | ZV220S_P432_0320 EZ301U | 4.0                 | 6.3                   | 85                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.21  | 2.3               | 2.4                | 1.6      | 1.4 | ZV220S_P432_0320 EZ302U | 4.1                 | 6.3                   | 88                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.21  | 3.0               | 3.1                | 2.1      | 1.1 | ZV220S_P432_0320 EZ303U | 4.1                 | 6.3                   | 88                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.24  | 1.2               | 1.2                | 0.9      | 2.7 | ZV220S_P432_0280 EZ301U | 3.5                 | 6.3                   | 74                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.24  | 2.0               | 2.1                | 1.6      | 1.6 | ZV220S_P432_0280 EZ302U | 4.1                 | 6.3                   | 88                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.24  | 2.6               | 2.7                | 2.1      | 1.2 | ZV220S_P432_0280 EZ303U | 4.1                 | 6.3                   | 88                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.27  | 1.0               | 1.1                | 1.0      | 3.0 | ZV220S_P432_0250 EZ301U | 3.1                 | 6.3                   | 67                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.27  | 1.8               | 1.9                | 1.6      | 1.8 | ZV220S_P432_0250 EZ302U | 4.1                 | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.27  | 2.3               | 2.5                | 2.1      | 1.4 | ZV220S_P432_0250 EZ303U | 4.1                 | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.27  | 3.1               | 3.4                | 2.9      | 1.0 | ZV220S_P432_0250 EZ401U | 4.1                 | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33  | 0.8               | 0.9                | 1.1      | 3.8 | ZV220S_P432_0200 EZ301U | 2.5                 | 6.3                   | 53                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33  | 1.4               | 1.5                | 1.9      | 2.2 | ZV220S_P432_0200 EZ302U | 4.1                 | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33  | 1.9               | 2.0                | 2.5      | 1.7 | ZV220S_P432_0200 EZ303U | 4.1                 | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33  | 2.5               | 2.7                | 3.4      | 1.3 | ZV220S_P432_0200 EZ401U | 4.1                 | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.42  | 0.7               | 0.7                | 1.3      | 4.6 | ZV220S_P432_0160 EZ301U | 2.0                 | 6.3                   | 43                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.42  | 1.1               | 1.2                | 2.3      | 2.7 | ZV220S_P432_0160 EZ302U | 3.6                 | 6.3                   | 76                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |



| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV2P4 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 4,1</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                     |       |                        |                        |                    |                          |                    |               |    |               |
| 0.42   | 1.5               | 1.6                | 3.0      | 2.1 | ZV220S_P432_0160 EZ303U | 4.1                  | 6.3                   | 88                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.42   | 2.0               | 2.1                | 4.0      | 1.5 | ZV220S_P432_0160 EZ401U | 4.1                  | 6.3                   | 88                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.56   | 0.9               | 0.9                | 3.9      | 3.2 | ZV220S_P432_0120 EZ302U | 2.7                  | 6.3                   | 57                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.56   | 1.1               | 1.2                | 5.1      | 2.5 | ZV220S_P432_0120 EZ303U | 3.8                  | 6.3                   | 80                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.56   | 1.5               | 1.6                | 6.9      | 1.8 | ZV220S_P432_0120 EZ401U | 4.1                  | 6.3                   | 88                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.56   | 2.5               | 2.8                | 12       | 1.1 | ZV220S_P432_0120 EZ402U | 4.1                  | 6.3                   | 88                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.67   | 1.3               | 1.4                | 0.9      | 2.0 | ZV220S_P431_0100 EZ401U | 3.9                  | 6.3                   | 82                  | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 0.67   | 2.0               | 2.1                | 1.4      | 1.3 | ZV220S_P431_0100 EZ501U | 4.1                  | 6.3                   | 88                  | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 0.67   | 2.1               | 2.4                | 1.5      | 1.2 | ZV220S_P431_0100 EZ402U | 4.1                  | 6.3                   | 88                  | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 0.83   | 1.0               | 1.1                | 1.0      | 2.4 | ZV220S_P431_0080 EZ401U | 3.1                  | 6.3                   | 66                  | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 0.83   | 1.6               | 1.7                | 1.5      | 1.5 | ZV220S_P431_0080 EZ501U | 4.1                  | 6.3                   | 88                  | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 0.83   | 1.7               | 1.9                | 1.7      | 1.4 | ZV220S_P431_0080 EZ402U | 4.1                  | 6.3                   | 88                  | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 0.95   | 0.9               | 1.0                | 1.1      | 2.6 | ZV220S_P431_0070 EZ401U | 2.7                  | 6.3                   | 58                  | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 0.95   | 1.4               | 1.5                | 1.7      | 1.7 | ZV220S_P431_0070 EZ501U | 4.1                  | 6.3                   | 88                  | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 0.95   | 1.5               | 1.7                | 1.9      | 1.5 | ZV220S_P431_0070 EZ402U | 4.1                  | 6.3                   | 88                  | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 0.95   | 2.2               | 2.8                | 2.7      | 1.0 | ZV220S_P431_0070 EZ404U | 4.1                  | 6.3                   | 88                  | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 1.33   | 0.6               | 0.7                | 1.7      | 3.2 | ZV220S_P431_0050 EZ401U | 1.9                  | 6.3                   | 41                  | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.33   | 1.0               | 1.1                | 2.5      | 2.1 | ZV220S_P431_0050 EZ501U | 3.7                  | 6.3                   | 78                  | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.33   | 1.1               | 1.2                | 2.8      | 1.9 | ZV220S_P431_0050 EZ402U | 3.7                  | 6.3                   | 78                  | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.33   | 1.6               | 2.0                | 4.1      | 1.3 | ZV220S_P431_0050 EZ404U | 4.1                  | 6.3                   | 88                  | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.33   | 1.7               | 1.8                | 4.4      | 1.2 | ZV220S_P431_0050 EZ502U | 4.1                  | 6.3                   | 88                  | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 0.5               | 0.5                | 2.2      | 3.7 | ZV220S_P431_0040 EZ401U | 1.6                  | 6.3                   | 33                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 0.8               | 0.9                | 3.3      | 2.4 | ZV220S_P431_0040 EZ501U | 2.9                  | 6.3                   | 62                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 0.9               | 1.0                | 3.6      | 2.2 | ZV220S_P431_0040 EZ402U | 2.9                  | 6.3                   | 62                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 1.3               | 1.6                | 5.3      | 1.5 | ZV220S_P431_0040 EZ404U | 4.1                  | 6.3                   | 88                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 1.4               | 1.5                | 5.7      | 1.4 | ZV220S_P431_0040 EZ502U | 4.1                  | 6.3                   | 88                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 1.67   | 1.8               | 2.0                | 7.5      | 1.1 | ZV220S_P431_0040 EZ503U | 4.1                  | 6.3                   | 88                  | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 0.4               | 0.4                | 5.2      | 4.5 | ZV220S_P431_0030 EZ401U | 1.2                  | 6.3                   | 25                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 0.6               | 0.6                | 8.0      | 3.0 | ZV220S_P431_0030 EZ501U | 2.2                  | 6.3                   | 47                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 0.6               | 0.7                | 8.7      | 2.7 | ZV220S_P431_0030 EZ402U | 2.2                  | 6.3                   | 47                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 0.9               | 1.2                | 13       | 1.8 | ZV220S_P431_0030 EZ404U | 4.0                  | 6.3                   | 84                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 1.0               | 1.1                | 14       | 1.7 | ZV220S_P431_0030 EZ502U | 4.1                  | 6.3                   | 88                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.22   | 1.3               | 1.5                | 18       | 1.3 | ZV220S_P431_0030 EZ503U | 4.1                  | 6.3                   | 88                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| <b>ZV2P4 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 4,1</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                     |       |                        |                        |                    |                          |                    |               |    |               |
| 3.33   | 1.3               | 2.1                | 20       | 1.2 | ZV220S_P431_0030 EZ505U | 4.1                  | 6.3                   | 88                  | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| <b>ZV2P4 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 4,1</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                     |       |                        |                        |                    |                          |                    |               |    |               |
| 0.19   | 2.8               | 3.0                | 0.6      | 1.1 | ZV220S_P432_0700 EZ301U | 4.1                  | 6.3                   | 88                  | 70.00 | 0.16                   | 0.25                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.24   | 2.2               | 2.4                | 0.8      | 1.4 | ZV220S_P432_0560 EZ301U | 4.1                  | 6.3                   | 88                  | 56.00 | 0.20                   | 0.32                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.27   | 2.0               | 2.1                | 0.8      | 1.6 | ZV220S_P432_0500 EZ301U | 4.1                  | 6.3                   | 88                  | 50.00 | 0.22                   | 0.36                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33   | 1.6               | 1.7                | 0.9      | 2.0 | ZV220S_P432_0400 EZ301U | 4.1                  | 6.3                   | 88                  | 40.00 | 0.28                   | 0.44                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.33   | 2.7               | 3.0                | 1.5      | 1.2 | ZV220S_P432_0400 EZ302U | 4.1                  | 6.3                   | 88                  | 40.00 | 0.28                   | 0.44                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.38   | 1.4               | 1.5                | 0.9      | 2.2 | ZV220S_P432_0350 EZ301U | 4.1                  | 6.3                   | 88                  | 35.00 | 0.29                   | 0.51                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.38   | 2.4               | 2.6                | 1.5      | 1.3 | ZV220S_P432_0350 EZ302U | 4.1                  | 6.3                   | 88                  | 35.00 | 0.29                   | 0.51                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.38   | 3.1               | 3.5                | 2.0      | 1.0 | ZV220S_P432_0350 EZ303U | 4.1                  | 6.3                   | 88                  | 35.00 | 0.29                   | 0.51                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.42   | 1.3               | 1.4                | 1.0      | 2.4 | ZV220S_P432_0320 EZ301U | 4.0                  | 6.3                   | 85                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.42   | 2.1               | 2.4                | 1.7      | 1.4 | ZV220S_P432_0320 EZ302U | 4.1                  | 6.3                   | 88                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.42   | 2.8               | 3.2                | 2.2      | 1.1 | ZV220S_P432_0320 EZ303U | 4.1                  | 6.3                   | 88                  | 32.00 | 0.28                   | 0.56                   | 31                 | 19                       | 24                 | 2             | 20 | 42.4          |
| 0.48   | 1.1               | 1.2                | 1.0      | 2.6 | ZV220S_P432_0280 EZ301U | 3.5                  | 6.3                   | 74                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.48   | 1.9               | 2.1                | 1.7      | 1.5 | ZV220S_P432_0280 EZ302U | 4.1                  | 6.3                   | 88                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.48   | 2.5               | 2.8                | 2.2      | 1.2 | ZV220S_P432_0280 EZ303U | 4.1                  | 6.3                   | 88                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.48   | 2.9               | 3.5                | 2.6      | 1.0 | ZV220S_P432_0280 EZ401U | 4.1                  | 6.3                   | 88                  | 28.00 | 0.36                   | 0.64                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.53   | 1.0               | 1.1                | 1.1      | 2.8 | ZV220S_P432_0250 EZ301U | 3.1                  | 6.3                   | 67                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.53   | 1.7               | 1.9                | 1.8      | 1.7 | ZV220S_P432_0250 EZ302U | 4.1                  | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.53   | 2.2               | 2.5                | 2.4      | 1.3 | ZV220S_P432_0250 EZ303U | 4.1                  | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.53   | 2.6               | 3.1                | 2.8      | 1.1 | ZV220S_P432_0250 EZ401U | 4.1                  | 6.3                   | 88                  | 25.00 | 0.40                   | 0.71                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.67   | 0.8               | 0.9                | 1.2      | 3.3 | ZV220S_P432_0200 EZ301U | 2.5                  | 6.3                   | 53                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.67   | 1.3               | 1.5                | 2.0      | 1.9 | ZV220S_P432_0200 EZ302U | 4.1                  | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.67   | 1.8               | 2.0                | 2.6      | 1.5 | ZV220S_P432_0200 EZ303U | 4.1                  | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.67   | 2.1               | 2.5                | 3.1      | 1.3 | ZV220S_P432_0200 EZ401U | 4.1                  | 6.3                   | 88                  | 20.00 | 0.44                   | 0.89                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.83   | 0.6               | 0.7                | 1.5      | 3.8 | ZV220S_P432_0160 EZ301U | 2.0                  | 6.3                   | 43                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.83   | 1.1               | 1.2                | 2.4      | 2.2 | ZV220S_P432_0160 EZ302U | 3.6                  | 6.3                   | 76                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.83   | 1.4               | 1.6                | 3.2      | 1.7 | ZV220S_P432_0160 EZ303U | 4.1                  | 6.3                   | 88                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 0.83   | 1.6               | 2.0                | 3.7      | 1.5 | ZV220S_P432_0160 EZ401U | 4.1                  | 6.3                   | 88                  | 16.00 | 0.56                   | 1.11                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 1.11   | 0.5               | 0.5                | 2.6      | 4.6 | ZV220S_P432_0120 EZ301U | 1.5                  | 6.3                   | 32                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 1.11   | 0.8               | 0.9                | 4.4      | 2.7 | ZV220S_P432_0120 EZ302U | 2.7                  | 6.3                   | 57                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 1.11   | 1.1               | 1.2                | 5.8      | 2.1 | ZV220S_P432_0120 EZ303U | 3.8                  | 6.3                   | 80                  | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |

8.2 Selection table 8 ZVP rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV2P4 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 4,1</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.11   | 1.2               | 1.5                | 6.8      | 1.8 | ZV220S_P432_0120 EZ401U | 4.1                  | 6.3                   | 88                   | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 1.11   | 1.9               | 2.6                | 10       | 1.2 | ZV220S_P432_0120 EZ402U | 4.1                  | 6.3                   | 88                   | 12.00 | 0.65                   | 1.30                   | 31                 | 19                       | 25                 | 2             | 20 | 42.4          |
| 1.33   | 1.1               | 1.3                | 0.9      | 2.0 | ZV220S_P431_0100 EZ401U | 3.9                  | 6.3                   | 82                   | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 1.33   | 1.6               | 2.0                | 1.4      | 1.3 | ZV220S_P431_0100 EZ501U | 4.1                  | 6.3                   | 88                   | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 1.33   | 1.6               | 2.2                | 1.4      | 1.3 | ZV220S_P431_0100 EZ402U | 4.1                  | 6.3                   | 88                   | 10.00 | 0.89                   | 1.78                   | 25                 | 12                       | 23                 | 2             | 20 | 42.4          |
| 1.67   | 0.8               | 1.0                | 1.0      | 2.0 | ZV220S_P431_0080 EZ401U | 3.1                  | 6.3                   | 66                   | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 1.67   | 1.2               | 1.6                | 1.5      | 1.5 | ZV220S_P431_0080 EZ501U | 4.1                  | 6.3                   | 88                   | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 1.67   | 1.3               | 1.8                | 1.6      | 1.5 | ZV220S_P431_0080 EZ402U | 4.1                  | 6.3                   | 88                   | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 1.67   | 1.9               | 2.9                | 2.3      | 1.0 | ZV220S_P431_0080 EZ502U | 4.1                  | 6.3                   | 88                   | 8.000 | 1.11                   | 2.22                   | 25                 | 12                       | 24                 | 2             | 20 | 42.4          |
| 1.91   | 0.7               | 0.9                | 1.1      | 2.5 | ZV220S_P431_0070 EZ401U | 2.7                  | 6.3                   | 58                   | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 1.91   | 1.1               | 1.4                | 1.7      | 1.7 | ZV220S_P431_0070 EZ501U | 4.1                  | 6.3                   | 88                   | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 1.91   | 1.1               | 1.6                | 1.7      | 1.6 | ZV220S_P431_0070 EZ402U | 4.1                  | 6.3                   | 88                   | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 1.91   | 1.7               | 2.5                | 2.6      | 1.1 | ZV220S_P431_0070 EZ502U | 4.1                  | 6.3                   | 88                   | 7.000 | 1.27                   | 2.54                   | 25                 | 12                       | 25                 | 2             | 20 | 42.4          |
| 2.67   | 0.5               | 0.6                | 1.7      | 3.1 | ZV220S_P431_0050 EZ401U | 1.9                  | 6.3                   | 41                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.67   | 0.8               | 1.0                | 2.5      | 2.1 | ZV220S_P431_0050 EZ501U | 3.7                  | 6.3                   | 78                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.67   | 0.8               | 1.1                | 2.6      | 2.0 | ZV220S_P431_0050 EZ402U | 3.7                  | 6.3                   | 78                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.67   | 1.2               | 1.8                | 3.9      | 1.4 | ZV220S_P431_0050 EZ502U | 4.1                  | 6.3                   | 88                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.67   | 1.3               | 1.9                | 4.3      | 1.2 | ZV220S_P431_0050 EZ404U | 4.1                  | 6.3                   | 88                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 2.67   | 1.4               | 2.4                | 4.6      | 1.2 | ZV220S_P431_0050 EZ503U | 4.1                  | 6.3                   | 88                   | 5.000 | 1.64                   | 3.11                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 0.4               | 0.5                | 2.2      | 3.6 | ZV220S_P431_0040 EZ401U | 1.6                  | 6.3                   | 33                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 0.6               | 0.8                | 3.3      | 2.4 | ZV220S_P431_0040 EZ501U | 2.9                  | 6.3                   | 62                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 0.6               | 0.9                | 3.4      | 2.4 | ZV220S_P431_0040 EZ402U | 2.9                  | 6.3                   | 62                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 1.0               | 1.4                | 5.1      | 1.6 | ZV220S_P431_0040 EZ502U | 4.1                  | 6.3                   | 88                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 1.1               | 1.5                | 5.6      | 1.4 | ZV220S_P431_0040 EZ404U | 4.1                  | 6.3                   | 88                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 3.33   | 1.1               | 1.9                | 6.0      | 1.3 | ZV220S_P431_0040 EZ503U | 4.1                  | 6.3                   | 88                   | 4.000 | 1.83                   | 3.61                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.3               | 0.4                | 5.4      | 4.4 | ZV220S_P431_0030 EZ401U | 1.2                  | 6.3                   | 25                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.5               | 0.6                | 7.9      | 3.0 | ZV220S_P431_0030 EZ501U | 2.2                  | 6.3                   | 47                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.5               | 0.7                | 8.2      | 2.9 | ZV220S_P431_0030 EZ402U | 2.2                  | 6.3                   | 47                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.7               | 1.1                | 12       | 1.9 | ZV220S_P431_0030 EZ502U | 4.1                  | 6.3                   | 88                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.8               | 1.2                | 14       | 1.7 | ZV220S_P431_0030 EZ404U | 4.0                  | 6.3                   | 84                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| 4.44   | 0.9               | 1.5                | 14       | 1.6 | ZV220S_P431_0030 EZ503U | 4.1                  | 6.3                   | 88                   | 3.000 | 2.22                   | 4.44                   | 25                 | 12                       | 26                 | 2             | 20 | 42.4          |
| <b>ZV2P5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 6,9</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.17   | 5.0               | 5.4                | 0.9      | 1.0 | ZV225S_P532_0500 EZ401U | 6.9                  | 10                    | 182                  | 50.00 | 0.22                   | 0.44                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.21   | 4.0               | 4.3                | 1.2      | 1.3 | ZV225S_P532_0400 EZ401U | 6.9                  | 10                    | 182                  | 40.00 | 0.28                   | 0.56                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.24   | 3.5               | 3.8                | 1.0      | 1.4 | ZV225S_P532_0350 EZ401U | 6.9                  | 10                    | 182                  | 35.00 | 0.32                   | 0.64                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.26   | 3.2               | 3.4                | 1.2      | 1.6 | ZV225S_P532_0320 EZ401U | 6.9                  | 10                    | 182                  | 32.00 | 0.30                   | 0.61                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.26   | 4.9               | 5.4                | 1.8      | 1.0 | ZV225S_P532_0320 EZ501U | 6.9                  | 10                    | 182                  | 32.00 | 0.30                   | 0.61                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.30   | 2.8               | 3.0                | 1.3      | 1.8 | ZV225S_P532_0280 EZ401U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.30   | 4.3               | 4.7                | 2.0      | 1.2 | ZV225S_P532_0280 EZ501U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.30   | 4.7               | 5.2                | 2.2      | 1.1 | ZV225S_P532_0280 EZ402U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.33   | 2.5               | 2.7                | 1.2      | 2.0 | ZV225S_P532_0250 EZ401U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.33   | 3.8               | 4.2                | 1.9      | 1.3 | ZV225S_P532_0250 EZ501U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.33   | 4.2               | 4.7                | 2.1      | 1.2 | ZV225S_P532_0250 EZ402U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.42   | 2.0               | 2.1                | 1.4      | 2.3 | ZV225S_P532_0200 EZ401U | 6.1                  | 10                    | 162                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.42   | 3.1               | 3.4                | 2.2      | 1.5 | ZV225S_P532_0200 EZ501U | 6.9                  | 10                    | 182                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.42   | 3.4               | 3.7                | 2.4      | 1.4 | ZV225S_P532_0200 EZ402U | 6.9                  | 10                    | 182                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 1.6               | 1.7                | 1.8      | 2.7 | ZV225S_P532_0160 EZ401U | 4.9                  | 10                    | 129                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 2.5               | 2.7                | 2.8      | 1.7 | ZV225S_P532_0160 EZ501U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 2.7               | 3.0                | 3.0      | 1.6 | ZV225S_P532_0160 EZ402U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 4.0               | 4.9                | 4.5      | 1.1 | ZV225S_P532_0160 EZ404U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 4.2               | 4.6                | 4.8      | 1.0 | ZV225S_P532_0160 EZ502U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.69   | 1.2               | 1.3                | 3.8      | 3.2 | ZV225S_P532_0120 EZ401U | 3.7                  | 10                    | 97                   | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.69   | 1.8               | 2.0                | 5.9      | 2.1 | ZV225S_P532_0120 EZ501U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.69   | 2.0               | 2.2                | 6.4      | 1.9 | ZV225S_P532_0120 EZ402U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.69   | 3.0               | 3.7                | 9.5      | 1.3 | ZV225S_P532_0120 EZ404U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.69   | 3.2               | 3.4                | 10       | 1.2 | ZV225S_P532_0120 EZ502U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.83   | 1.6               | 1.7                | 1.6      | 2.3 | ZV225S_P531_0100 EZ501U | 5.9                  | 10                    | 155                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 0.83   | 2.7               | 2.9                | 2.7      | 1.4 | ZV225S_P531_0100 EZ502U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 0.83   | 2.7               | 3.0                | 2.7      | 1.4 | ZV225S_P531_0100 EZ701U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 0.83   | 3.5               | 4.1                | 3.5      | 1.0 | ZV225S_P531_0100 EZ503U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.04   | 1.3               | 1.4                | 1.7      | 2.7 | ZV225S_P531_0080 EZ501U | 4.7                  | 10                    | 124                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.04   | 2.2               | 2.3                | 2.9      | 1.6 | ZV225S_P531_0080 EZ502U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.04   | 2.2               | 2.4                | 2.9      | 1.6 | ZV225S_P531_0080 EZ701U | 5.9                  | 10                    | 155                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.04   | 2.8               | 3.2                | 3.8      | 1.2 | ZV225S_P531_0080 EZ503U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.19   | 1.1               | 1.2                | 1.9      | 2.9 | ZV225S_P531_0070 EZ501U | 4.1                  | 10                    | 109                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 1.19   | 1.9               | 2.0                | 3.2      | 1.7 | ZV225S_P531_0070 EZ502U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV2P5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 6,9</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.19   | 1.9               | 2.1                | 3.2      | 1.7 | ZV225S_P531_0070 EZ701U | 5.1                  | 10                    | 136                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 1.19   | 2.5               | 2.8                | 4.2      | 1.3 | ZV225S_P531_0070 EZ503U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 1.19   | 3.1               | 3.7                | 5.2      | 1.1 | ZV225S_P531_0070 EZ702U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 1.67   | 0.8               | 0.9                | 2.8      | 3.7 | ZV225S_P531_0050 EZ501U | 2.9                  | 10                    | 78                   | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 1.67   | 1.4               | 1.5                | 4.8      | 2.1 | ZV225S_P531_0050 EZ502U | 5.7                  | 10                    | 150                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 1.67   | 1.4               | 1.5                | 4.8      | 2.1 | ZV225S_P531_0050 EZ701U | 3.7                  | 10                    | 97                   | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 1.67   | 1.8               | 2.0                | 6.3      | 1.6 | ZV225S_P531_0050 EZ503U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 1.67   | 2.2               | 2.6                | 7.8      | 1.3 | ZV225S_P531_0050 EZ702U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 1.67   | 2.5               | 2.9                | 8.8      | 1.2 | ZV225S_P531_0050 EZ505U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 0.6               | 0.7                | 3.7      | 4.3 | ZV225S_P531_0040 EZ501U | 2.3                  | 10                    | 62                   | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 1.1               | 1.2                | 6.3      | 2.5 | ZV225S_P531_0040 EZ502U | 4.5                  | 10                    | 120                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 1.1               | 1.2                | 6.3      | 2.5 | ZV225S_P531_0040 EZ701U | 2.9                  | 10                    | 78                   | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 1.4               | 1.6                | 8.3      | 1.9 | ZV225S_P531_0040 EZ503U | 6.3                  | 10                    | 167                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 1.8               | 2.1                | 10       | 1.5 | ZV225S_P531_0040 EZ702U | 6.0                  | 10                    | 159                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 2.0               | 2.3                | 11       | 1.4 | ZV225S_P531_0040 EZ505U | 6.9                  | 10                    | 182                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.08   | 2.4               | 3.0                | 14       | 1.1 | ZV225S_P531_0040 EZ703U | 6.9                  | 10                    | 182                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 0.8               | 0.9                | 16       | 3.0 | ZV225S_P531_0030 EZ502U | 3.4                  | 10                    | 90                   | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 0.8               | 0.9                | 16       | 3.0 | ZV225S_P531_0030 EZ701U | 2.2                  | 10                    | 58                   | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 1.1               | 1.2                | 20       | 2.3 | ZV225S_P531_0030 EZ503U | 4.7                  | 10                    | 125                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 1.3               | 1.6                | 25       | 1.9 | ZV225S_P531_0030 EZ702U | 4.5                  | 10                    | 119                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 1.5               | 1.8                | 28       | 1.7 | ZV225S_P531_0030 EZ505U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 1.8               | 2.3                | 35       | 1.4 | ZV225S_P531_0030 EZ703U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.78   | 2.3               | 3.3                | 45       | 1.0 | ZV225S_P531_0030 EZ705U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| <b>ZV2P5 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 6,9</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.56   | 2.8               | 4.5                | 4.2      | 1.1 | ZV225S_P531_0080 EZ505U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.79   | 2.4               | 3.9                | 4.7      | 1.2 | ZV225S_P531_0070 EZ505U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 2.50   | 1.7               | 2.8                | 7.1      | 1.5 | ZV225S_P531_0050 EZ505U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 2.50   | 2.2               | 3.7                | 9.0      | 1.1 | ZV225S_P531_0050 EZ703U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.13   | 1.4               | 2.2                | 9.3      | 1.7 | ZV225S_P531_0040 EZ505U | 6.9                  | 10                    | 182                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.13   | 1.8               | 2.9                | 12       | 1.3 | ZV225S_P531_0040 EZ703U | 6.9                  | 10                    | 182                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 1.0               | 1.7                | 23       | 2.1 | ZV225S_P531_0030 EZ505U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 1.3               | 2.2                | 29       | 1.6 | ZV225S_P531_0030 EZ703U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 1.8               | 3.3                | 40       | 1.2 | ZV225S_P531_0030 EZ705U | 6.9                  | 10                    | 182                  | 3.000 | 2.32                   | 4.63                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| <b>ZV2P5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,9</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.30   | 4.6               | 5.6                | 0.9      | 1.1 | ZV225S_P532_0560 EZ401U | 6.9                  | 10                    | 182                  | 56.00 | 0.20                   | 0.40                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.33   | 4.1               | 5.0                | 0.9      | 1.2 | ZV225S_P532_0500 EZ401U | 6.9                  | 10                    | 182                  | 50.00 | 0.22                   | 0.44                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.42   | 3.3               | 4.0                | 1.3      | 1.4 | ZV225S_P532_0400 EZ401U | 6.9                  | 10                    | 182                  | 40.00 | 0.28                   | 0.56                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.48   | 2.9               | 3.5                | 1.1      | 1.5 | ZV225S_P532_0350 EZ401U | 6.9                  | 10                    | 182                  | 35.00 | 0.32                   | 0.64                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.48   | 4.3               | 5.5                | 1.6      | 1.0 | ZV225S_P532_0350 EZ501U | 6.9                  | 10                    | 182                  | 35.00 | 0.32                   | 0.64                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.48   | 4.4               | 6.1                | 1.6      | 1.0 | ZV225S_P532_0350 EZ402U | 6.9                  | 10                    | 182                  | 35.00 | 0.32                   | 0.64                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.52   | 2.6               | 3.2                | 1.2      | 1.6 | ZV225S_P532_0320 EZ401U | 6.9                  | 10                    | 182                  | 32.00 | 0.30                   | 0.61                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.52   | 3.9               | 5.0                | 1.7      | 1.1 | ZV225S_P532_0320 EZ501U | 6.9                  | 10                    | 182                  | 32.00 | 0.30                   | 0.61                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.52   | 4.0               | 5.6                | 1.8      | 1.1 | ZV225S_P532_0320 EZ402U | 6.9                  | 10                    | 182                  | 32.00 | 0.30                   | 0.61                   | 31                 | 15                       | 34                 | 2             | 25 | 53.1          |
| 0.60   | 2.3               | 2.8                | 1.2      | 1.8 | ZV225S_P532_0280 EZ401U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.60   | 3.4               | 4.4                | 1.8      | 1.2 | ZV225S_P532_0280 EZ501U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.60   | 3.5               | 4.9                | 1.9      | 1.2 | ZV225S_P532_0280 EZ402U | 6.9                  | 10                    | 182                  | 28.00 | 0.40                   | 0.79                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.67   | 2.1               | 2.5                | 1.2      | 1.9 | ZV225S_P532_0250 EZ401U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.67   | 3.0               | 3.9                | 1.8      | 1.3 | ZV225S_P532_0250 EZ501U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.67   | 3.1               | 4.4                | 1.9      | 1.3 | ZV225S_P532_0250 EZ402U | 6.9                  | 10                    | 182                  | 25.00 | 0.41                   | 0.78                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.83   | 1.6               | 2.0                | 1.4      | 2.2 | ZV225S_P532_0200 EZ401U | 6.1                  | 10                    | 162                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.83   | 2.4               | 3.2                | 2.1      | 1.5 | ZV225S_P532_0200 EZ501U | 6.9                  | 10                    | 182                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 0.83   | 2.5               | 3.5                | 2.1      | 1.5 | ZV225S_P532_0200 EZ402U | 6.9                  | 10                    | 182                  | 20.00 | 0.49                   | 0.97                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.04   | 1.3               | 1.6                | 1.7      | 2.6 | ZV225S_P532_0160 EZ401U | 4.9                  | 10                    | 129                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.04   | 1.9               | 2.5                | 2.5      | 1.7 | ZV225S_P532_0160 EZ501U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.04   | 2.0               | 2.8                | 2.6      | 1.7 | ZV225S_P532_0160 EZ402U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.04   | 3.0               | 4.5                | 3.8      | 1.1 | ZV225S_P532_0160 EZ502U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.04   | 3.3               | 4.8                | 4.2      | 1.0 | ZV225S_P532_0160 EZ404U | 6.9                  | 10                    | 182                  | 16.00 | 0.61                   | 1.22                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 1.0               | 1.2                | 3.5      | 3.1 | ZV225S_P532_0120 EZ401U | 3.7                  | 10                    | 97                   | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 1.5               | 1.9                | 5.2      | 2.1 | ZV225S_P532_0120 EZ501U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 1.5               | 2.1                | 5.4      | 2.0 | ZV225S_P532_0120 EZ402U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 2.2               | 3.4                | 8.0      | 1.4 | ZV225S_P532_0120 EZ502U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 2.5               | 3.6                | 8.9      | 1.2 | ZV225S_P532_0120 EZ404U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.39   | 2.7               | 4.6                | 9.5      | 1.2 | ZV225S_P532_0120 EZ503U | 6.9                  | 10                    | 182                  | 12.00 | 0.69                   | 1.39                   | 31                 | 15                       | 36                 | 2             | 25 | 53.1          |
| 1.67   | 1.2               | 1.6                | 1.6      | 2.3 | ZV225S_P531_0100 EZ501U | 5.9                  | 10                    | 155                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.67   | 1.9               | 2.9                | 2.4      | 1.5 | ZV225S_P531_0100 EZ502U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.67   | 1.9               | 2.9                | 2.4      | 1.5 | ZV225S_P531_0100 EZ701U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |

8.2 Selection table 8 ZVP rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV2P5 (<math>n_{in} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,9</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.67   | 2.3               | 3.9                | 2.8      | 1.3 | ZV225S_P531_0100 EZ503U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 1.67   | 2.6               | 5.2                | 3.3      | 1.1 | ZV225S_P531_0100 EZ702U | 6.9                  | 10                    | 182                  | 10.00 | 1.03                   | 1.94                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.08   | 1.0               | 1.3                | 1.7      | 2.7 | ZV225S_P531_0080 EZ501U | 4.7                  | 10                    | 124                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.08   | 1.5               | 2.3                | 2.5      | 1.8 | ZV225S_P531_0080 EZ502U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.08   | 1.5               | 2.3                | 2.5      | 1.8 | ZV225S_P531_0080 EZ701U | 5.9                  | 10                    | 155                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.08   | 1.8               | 3.1                | 3.0      | 1.5 | ZV225S_P531_0080 EZ503U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.08   | 2.1               | 4.2                | 3.5      | 1.3 | ZV225S_P531_0080 EZ702U | 6.9                  | 10                    | 182                  | 8.000 | 1.29                   | 2.43                   | 23                 | 8                        | 34                 | 2             | 25 | 53.1          |
| 2.38   | 0.9               | 1.1                | 1.9      | 3.0 | ZV225S_P531_0070 EZ501U | 4.1                  | 10                    | 109                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 2.38   | 1.3               | 2.0                | 2.9      | 1.9 | ZV225S_P531_0070 EZ502U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 2.38   | 1.3               | 2.0                | 2.9      | 1.9 | ZV225S_P531_0070 EZ701U | 5.1                  | 10                    | 136                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 2.38   | 1.6               | 2.7                | 3.4      | 1.6 | ZV225S_P531_0070 EZ503U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 2.38   | 1.8               | 3.7                | 3.9      | 1.4 | ZV225S_P531_0070 EZ702U | 6.9                  | 10                    | 182                  | 7.000 | 1.47                   | 2.78                   | 23                 | 8                        | 36                 | 2             | 25 | 53.1          |
| 3.33   | 0.6               | 0.8                | 2.8      | 3.7 | ZV225S_P531_0050 EZ501U | 2.9                  | 10                    | 78                   | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.33   | 1.0               | 1.4                | 4.3      | 2.4 | ZV225S_P531_0050 EZ502U | 5.7                  | 10                    | 150                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.33   | 1.0               | 1.4                | 4.3      | 2.4 | ZV225S_P531_0050 EZ701U | 3.7                  | 10                    | 97                   | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.33   | 1.1               | 1.9                | 5.1      | 2.0 | ZV225S_P531_0050 EZ503U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 3.33   | 1.3               | 2.6                | 5.9      | 1.7 | ZV225S_P531_0050 EZ702U | 6.9                  | 10                    | 182                  | 5.000 | 1.94                   | 3.89                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 0.5               | 0.6                | 3.6      | 4.3 | ZV225S_P531_0040 EZ501U | 2.3                  | 10                    | 62                   | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 0.8               | 1.1                | 5.6      | 2.8 | ZV225S_P531_0040 EZ502U | 4.5                  | 10                    | 120                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 0.8               | 1.2                | 5.6      | 2.8 | ZV225S_P531_0040 EZ701U | 2.9                  | 10                    | 78                   | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 0.9               | 1.6                | 6.7      | 2.4 | ZV225S_P531_0040 EZ503U | 6.3                  | 10                    | 167                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| 4.17   | 1.1               | 2.1                | 7.7      | 2.0 | ZV225S_P531_0040 EZ702U | 6.0                  | 10                    | 159                  | 4.000 | 2.08                   | 4.17                   | 23                 | 8                        | 37                 | 2             | 25 | 53.1          |
| <b>ZV3P5 (<math>n_{in} = 3000</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.16   | 5.2               | 5.6                | 1.0      | 1.0 | ZV318S_P532_0560 EZ401U | 6.7                  | 10                    | 192                  | 56.00 | 0.21                   | 0.43                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.18   | 4.6               | 5.0                | 0.9      | 1.1 | ZV318S_P532_0500 EZ401U | 6.7                  | 10                    | 192                  | 50.00 | 0.24                   | 0.48                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.23   | 3.7               | 4.0                | 1.2      | 1.4 | ZV318S_P532_0400 EZ401U | 6.7                  | 10                    | 192                  | 40.00 | 0.30                   | 0.60                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.26   | 3.2               | 3.5                | 1.0      | 1.6 | ZV318S_P532_0350 EZ401U | 6.7                  | 10                    | 192                  | 35.00 | 0.34                   | 0.69                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.26   | 5.0               | 5.5                | 1.6      | 1.0 | ZV318S_P532_0350 EZ501U | 6.7                  | 10                    | 192                  | 35.00 | 0.34                   | 0.69                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.28   | 3.0               | 3.2                | 1.2      | 1.8 | ZV318S_P532_0320 EZ401U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.28   | 4.6               | 5.0                | 1.8      | 1.1 | ZV318S_P532_0320 EZ501U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.28   | 5.0               | 5.5                | 2.0      | 1.0 | ZV318S_P532_0320 EZ402U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.32   | 2.6               | 2.8                | 1.3      | 2.0 | ZV318S_P532_0280 EZ401U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.32   | 4.0               | 4.4                | 2.0      | 1.3 | ZV318S_P532_0280 EZ501U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.32   | 4.4               | 4.8                | 2.2      | 1.2 | ZV318S_P532_0280 EZ402U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.36   | 2.3               | 2.5                | 1.2      | 2.2 | ZV318S_P532_0250 EZ401U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.36   | 3.6               | 3.9                | 1.9      | 1.4 | ZV318S_P532_0250 EZ501U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.36   | 3.9               | 4.3                | 2.1      | 1.3 | ZV318S_P532_0250 EZ402U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.45   | 1.9               | 2.0                | 1.4      | 2.5 | ZV318S_P532_0200 EZ401U | 5.6                  | 10                    | 162                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.45   | 2.9               | 3.1                | 2.2      | 1.6 | ZV318S_P532_0200 EZ501U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.45   | 3.1               | 3.4                | 2.4      | 1.5 | ZV318S_P532_0200 EZ402U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.45   | 4.6               | 5.7                | 3.5      | 1.0 | ZV318S_P532_0200 EZ404U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 1.5               | 1.6                | 1.8      | 2.9 | ZV318S_P532_0160 EZ401U | 4.5                  | 10                    | 129                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 2.3               | 2.5                | 2.8      | 1.9 | ZV318S_P532_0160 EZ501U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 2.5               | 2.8                | 3.0      | 1.7 | ZV318S_P532_0160 EZ402U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 3.7               | 4.6                | 4.5      | 1.2 | ZV318S_P532_0160 EZ404U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 3.9               | 4.2                | 4.8      | 1.1 | ZV318S_P532_0160 EZ502U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.75   | 1.1               | 1.2                | 3.8      | 3.5 | ZV318S_P532_0120 EZ401U | 3.4                  | 10                    | 97                   | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.75   | 1.7               | 1.9                | 5.9      | 2.3 | ZV318S_P532_0120 EZ501U | 6.4                  | 10                    | 182                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.75   | 1.9               | 2.1                | 6.4      | 2.1 | ZV318S_P532_0120 EZ402U | 6.4                  | 10                    | 182                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.75   | 2.7               | 3.4                | 9.5      | 1.4 | ZV318S_P532_0120 EZ404U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.75   | 2.9               | 3.2                | 10       | 1.3 | ZV318S_P532_0120 EZ502U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.75   | 3.9               | 4.4                | 13       | 1.0 | ZV318S_P532_0120 EZ503U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.90   | 1.5               | 1.6                | 1.6      | 2.5 | ZV318S_P531_0100 EZ501U | 5.4                  | 10                    | 155                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 0.90   | 2.5               | 2.7                | 2.7      | 1.5 | ZV318S_P531_0100 EZ502U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 0.90   | 2.5               | 2.8                | 2.7      | 1.5 | ZV318S_P531_0100 EZ701U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 0.90   | 3.3               | 3.8                | 3.5      | 1.1 | ZV318S_P531_0100 EZ503U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.13   | 1.2               | 1.3                | 1.7      | 2.9 | ZV318S_P531_0080 EZ501U | 4.3                  | 10                    | 124                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.13   | 2.0               | 2.2                | 2.9      | 1.7 | ZV318S_P531_0080 EZ502U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.13   | 2.0               | 2.2                | 2.9      | 1.7 | ZV318S_P531_0080 EZ701U | 5.4                  | 10                    | 155                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.13   | 2.6               | 3.0                | 3.8      | 1.3 | ZV318S_P531_0080 EZ503U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.13   | 3.3               | 3.9                | 4.7      | 1.1 | ZV318S_P531_0080 EZ702U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.29   | 1.0               | 1.1                | 1.9      | 3.2 | ZV318S_P531_0070 EZ501U | 3.8                  | 10                    | 109                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 1.29   | 1.8               | 1.9                | 3.2      | 1.9 | ZV318S_P531_0070 EZ502U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 1.29   | 1.8               | 2.0                | 3.2      | 1.9 | ZV318S_P531_0070 EZ701U | 4.7                  | 10                    | 136                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 1.29   | 2.3               | 2.6                | 4.2      | 1.4 | ZV318S_P531_0070 EZ503U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 1.29   | 2.8               | 3.4                | 5.2      | 1.2 | ZV318S_P531_0070 EZ702U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |



| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV3P5 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.29   | 3.2               | 3.8                | 5.9      | 1.0 | ZV318S_P531_0070 EZ505U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 1.80   | 0.7               | 0.8                | 2.8      | 4.0 | ZV318S_P531_0050 EZ501U | 2.7                  | 10                    | 78                   | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 1.3               | 1.4                | 4.8      | 2.3 | ZV318S_P531_0050 EZ502U | 5.2                  | 10                    | 150                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 1.3               | 1.4                | 4.8      | 2.3 | ZV318S_P531_0050 EZ701U | 3.4                  | 10                    | 97                   | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 1.6               | 1.9                | 6.3      | 1.8 | ZV318S_P531_0050 EZ503U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 2.0               | 2.4                | 7.8      | 1.4 | ZV318S_P531_0050 EZ702U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 2.3               | 2.7                | 8.8      | 1.3 | ZV318S_P531_0050 EZ505U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 1.80   | 2.8               | 3.5                | 11       | 1.1 | ZV318S_P531_0050 EZ703U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 0.6               | 0.6                | 3.7      | 4.7 | ZV318S_P531_0040 EZ501U | 2.2                  | 10                    | 62                   | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 1.0               | 1.1                | 6.3      | 2.7 | ZV318S_P531_0040 EZ502U | 4.2                  | 10                    | 120                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 1.0               | 1.1                | 6.3      | 2.7 | ZV318S_P531_0040 EZ701U | 2.7                  | 10                    | 78                   | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 1.3               | 1.5                | 8.3      | 2.1 | ZV318S_P531_0040 EZ503U | 5.8                  | 10                    | 167                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 1.6               | 2.0                | 10       | 1.7 | ZV318S_P531_0040 EZ702U | 5.6                  | 10                    | 159                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 1.8               | 2.2                | 11       | 1.5 | ZV318S_P531_0040 EZ505U | 6.7                  | 10                    | 192                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.25   | 2.2               | 2.8                | 14       | 1.2 | ZV318S_P531_0040 EZ703U | 6.7                  | 10                    | 192                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 0.8               | 0.8                | 16       | 3.3 | ZV318S_P531_0030 EZ502U | 3.1                  | 10                    | 90                   | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 0.8               | 0.8                | 16       | 3.3 | ZV318S_P531_0030 EZ701U | 2.0                  | 10                    | 58                   | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 1.0               | 1.1                | 20       | 2.5 | ZV318S_P531_0030 EZ503U | 4.4                  | 10                    | 125                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 1.2               | 1.5                | 25       | 2.0 | ZV318S_P531_0030 EZ702U | 4.2                  | 10                    | 119                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 1.4               | 1.6                | 28       | 1.8 | ZV318S_P531_0030 EZ505U | 6.7                  | 10                    | 192                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 1.7               | 2.1                | 35       | 1.5 | ZV318S_P531_0030 EZ703U | 6.6                  | 10                    | 189                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.00   | 2.2               | 3.1                | 45       | 1.1 | ZV318S_P531_0030 EZ705U | 6.7                  | 10                    | 192                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| <b>ZV3P5 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.35   | 3.2               | 5.2                | 4.0      | 1.0 | ZV318S_P531_0100 EZ505U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.69   | 2.6               | 4.1                | 4.2      | 1.2 | ZV318S_P531_0080 EZ505U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.93   | 2.3               | 3.6                | 4.7      | 1.3 | ZV318S_P531_0070 EZ505U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 2.70   | 1.6               | 2.6                | 7.1      | 1.6 | ZV318S_P531_0050 EZ505U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 2.70   | 2.0               | 3.4                | 9.0      | 1.3 | ZV318S_P531_0050 EZ703U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.38   | 1.3               | 2.1                | 9.3      | 1.8 | ZV318S_P531_0040 EZ505U | 6.7                  | 10                    | 192                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.38   | 1.6               | 2.7                | 12       | 1.5 | ZV318S_P531_0040 EZ703U | 6.7                  | 10                    | 192                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.38   | 2.2               | 4.1                | 16       | 1.1 | ZV318S_P531_0040 EZ705U | 6.7                  | 10                    | 192                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 1.0               | 1.6                | 23       | 2.2 | ZV318S_P531_0030 EZ505U | 6.7                  | 10                    | 192                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 1.2               | 2.0                | 29       | 1.8 | ZV318S_P531_0030 EZ703U | 6.6                  | 10                    | 189                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 1.7               | 3.0                | 40       | 1.3 | ZV318S_P531_0030 EZ705U | 6.7                  | 10                    | 192                  | 3.000 | 2.50                   | 5.00                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| <b>ZV3P5 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.32   | 4.3               | 5.2                | 0.9      | 1.2 | ZV318S_P532_0560 EZ401U | 6.7                  | 10                    | 192                  | 56.00 | 0.21                   | 0.43                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.36   | 3.8               | 4.6                | 0.9      | 1.3 | ZV318S_P532_0500 EZ401U | 6.7                  | 10                    | 192                  | 50.00 | 0.24                   | 0.48                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.45   | 3.1               | 3.7                | 1.3      | 1.5 | ZV318S_P532_0400 EZ401U | 6.7                  | 10                    | 192                  | 40.00 | 0.30                   | 0.60                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.45   | 4.5               | 5.8                | 1.9      | 1.0 | ZV318S_P532_0400 EZ501U | 6.7                  | 10                    | 192                  | 40.00 | 0.30                   | 0.60                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.45   | 4.6               | 6.5                | 2.0      | 1.0 | ZV318S_P532_0400 EZ402U | 6.7                  | 10                    | 192                  | 40.00 | 0.30                   | 0.60                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.51   | 2.7               | 3.2                | 1.1      | 1.7 | ZV318S_P532_0350 EZ401U | 6.7                  | 10                    | 192                  | 35.00 | 0.34                   | 0.69                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.51   | 3.9               | 5.1                | 1.6      | 1.1 | ZV318S_P532_0350 EZ501U | 6.7                  | 10                    | 192                  | 35.00 | 0.34                   | 0.69                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.51   | 4.1               | 5.7                | 1.6      | 1.1 | ZV318S_P532_0350 EZ402U | 6.7                  | 10                    | 192                  | 35.00 | 0.34                   | 0.69                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.56   | 2.4               | 3.0                | 1.2      | 1.8 | ZV318S_P532_0320 EZ401U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.56   | 3.6               | 4.7                | 1.7      | 1.2 | ZV318S_P532_0320 EZ501U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.56   | 3.7               | 5.2                | 1.8      | 1.2 | ZV318S_P532_0320 EZ402U | 6.7                  | 10                    | 192                  | 32.00 | 0.33                   | 0.66                   | 33                 | 17                       | 35                 | 3             | 18 | 57.3          |
| 0.64   | 2.1               | 2.6                | 1.2      | 1.9 | ZV318S_P532_0280 EZ401U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.64   | 3.2               | 4.1                | 1.8      | 1.3 | ZV318S_P532_0280 EZ501U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.64   | 3.2               | 4.5                | 1.9      | 1.3 | ZV318S_P532_0280 EZ402U | 6.7                  | 10                    | 192                  | 28.00 | 0.43                   | 0.86                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 0.72   | 1.9               | 2.3                | 1.2      | 2.1 | ZV318S_P532_0250 EZ401U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.72   | 2.8               | 3.6                | 1.8      | 1.4 | ZV318S_P532_0250 EZ501U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.72   | 2.9               | 4.1                | 1.9      | 1.4 | ZV318S_P532_0250 EZ402U | 6.7                  | 10                    | 192                  | 25.00 | 0.44                   | 0.84                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.90   | 1.5               | 1.9                | 1.4      | 2.4 | ZV318S_P532_0200 EZ401U | 5.6                  | 10                    | 162                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.90   | 2.3               | 2.9                | 2.1      | 1.6 | ZV318S_P532_0200 EZ501U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.90   | 2.3               | 3.2                | 2.1      | 1.6 | ZV318S_P532_0200 EZ402U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 0.90   | 3.4               | 5.2                | 3.2      | 1.1 | ZV318S_P532_0200 EZ502U | 6.7                  | 10                    | 192                  | 20.00 | 0.53                   | 1.05                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 1.2               | 1.5                | 1.7      | 2.8 | ZV318S_P532_0160 EZ401U | 4.5                  | 10                    | 129                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 1.8               | 2.3                | 2.5      | 1.9 | ZV318S_P532_0160 EZ501U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 1.9               | 2.6                | 2.6      | 1.8 | ZV318S_P532_0160 EZ402U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 2.8               | 4.1                | 3.8      | 1.2 | ZV318S_P532_0160 EZ502U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 3.1               | 4.5                | 4.2      | 1.1 | ZV318S_P532_0160 EZ404U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.13   | 3.3               | 5.6                | 4.5      | 1.0 | ZV318S_P532_0160 EZ503U | 6.7                  | 10                    | 192                  | 16.00 | 0.66                   | 1.31                   | 33                 | 17                       | 38                 | 3             | 18 | 57.3          |
| 1.50   | 0.9               | 1.1                | 3.5      | 3.4 | ZV318S_P532_0120 EZ401U | 3.4                  | 10                    | 97                   | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 1.50   | 1.4               | 1.8                | 5.2      | 2.3 | ZV318S_P532_0120 EZ501U | 6.4                  | 10                    | 182                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 1.50   | 1.4               | 1.9                | 5.4      | 2.2 | ZV318S_P532_0120 EZ402U | 6.4                  | 10                    | 182                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 1.50   | 2.1               | 3.1                | 8.0      | 1.5 | ZV318S_P532_0120 EZ502U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |

8.2 Selection table 8 ZVP rack and pinion drives

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV3P5 (<math>n_{in} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,7</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.50   | 2.3               | 3.3                | 8.9      | 1.4 | ZV318S_P532_0120 EZ404U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 1.50   | 2.5               | 4.2                | 9.5      | 1.3 | ZV318S_P532_0120 EZ503U | 6.7                  | 10                    | 192                  | 12.00 | 0.75                   | 1.50                   | 33                 | 17                       | 37                 | 3             | 18 | 57.3          |
| 1.80   | 1.2               | 1.5                | 1.6      | 2.5 | ZV318S_P531_0100 EZ501U | 5.4                  | 10                    | 155                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.80   | 1.8               | 2.6                | 2.4      | 1.7 | ZV318S_P531_0100 EZ502U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.80   | 1.8               | 2.7                | 2.4      | 1.7 | ZV318S_P531_0100 EZ701U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.80   | 2.1               | 3.6                | 2.8      | 1.4 | ZV318S_P531_0100 EZ503U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 1.80   | 2.4               | 4.8                | 3.3      | 1.2 | ZV318S_P531_0100 EZ702U | 6.7                  | 10                    | 192                  | 10.00 | 1.11                   | 2.10                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.25   | 0.9               | 1.2                | 1.7      | 3.0 | ZV318S_P531_0080 EZ501U | 4.3                  | 10                    | 124                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.25   | 1.4               | 2.1                | 2.5      | 1.9 | ZV318S_P531_0080 EZ502U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.25   | 1.4               | 2.1                | 2.5      | 1.9 | ZV318S_P531_0080 EZ701U | 5.4                  | 10                    | 155                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.25   | 1.7               | 2.9                | 3.0      | 1.6 | ZV318S_P531_0080 EZ503U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.25   | 2.0               | 3.9                | 3.5      | 1.4 | ZV318S_P531_0080 EZ702U | 6.7                  | 10                    | 192                  | 8.000 | 1.39                   | 2.63                   | 25                 | 8                        | 35                 | 3             | 18 | 57.3          |
| 2.57   | 0.8               | 1.0                | 1.9      | 3.2 | ZV318S_P531_0070 EZ501U | 3.8                  | 10                    | 109                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 2.57   | 1.2               | 1.8                | 2.9      | 2.1 | ZV318S_P531_0070 EZ502U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 2.57   | 1.2               | 1.9                | 2.9      | 2.1 | ZV318S_P531_0070 EZ701U | 4.7                  | 10                    | 136                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 2.57   | 1.5               | 2.5                | 3.4      | 1.8 | ZV318S_P531_0070 EZ503U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 2.57   | 1.7               | 3.4                | 3.9      | 1.5 | ZV318S_P531_0070 EZ702U | 6.7                  | 10                    | 192                  | 7.000 | 1.59                   | 3.00                   | 25                 | 8                        | 37                 | 3             | 18 | 57.3          |
| 3.60   | 0.6               | 0.7                | 2.8      | 4.0 | ZV318S_P531_0050 EZ501U | 2.7                  | 10                    | 78                   | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.60   | 0.9               | 1.3                | 4.3      | 2.6 | ZV318S_P531_0050 EZ502U | 5.2                  | 10                    | 150                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.60   | 0.9               | 1.3                | 4.3      | 2.6 | ZV318S_P531_0050 EZ701U | 3.4                  | 10                    | 97                   | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.60   | 1.0               | 1.8                | 5.1      | 2.2 | ZV318S_P531_0050 EZ503U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 3.60   | 1.2               | 2.4                | 5.9      | 1.9 | ZV318S_P531_0050 EZ702U | 6.7                  | 10                    | 192                  | 5.000 | 2.10                   | 4.20                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 0.5               | 0.6                | 3.6      | 4.7 | ZV318S_P531_0040 EZ501U | 2.2                  | 10                    | 62                   | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 0.7               | 1.1                | 5.6      | 3.1 | ZV318S_P531_0040 EZ502U | 4.2                  | 10                    | 120                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 0.7               | 1.1                | 5.6      | 3.1 | ZV318S_P531_0040 EZ701U | 2.7                  | 10                    | 78                   | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 0.8               | 1.4                | 6.7      | 2.6 | ZV318S_P531_0040 EZ503U | 5.8                  | 10                    | 167                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| 4.50   | 1.0               | 1.9                | 7.7      | 2.2 | ZV318S_P531_0040 EZ702U | 5.6                  | 10                    | 159                  | 4.000 | 2.25                   | 4.50                   | 25                 | 8                        | 38                 | 3             | 18 | 57.3          |
| <b>ZV3P7 (<math>n_{in} = 3000</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b>  |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.20   | 6.5               | 7.1                | 0.8      | 1.1 | ZV322S_P732_0560 EZ501U | 11                   | 14                    | 380                  | 56.00 | 0.24                   | 0.46                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.22   | 5.8               | 6.4                | 0.8      | 1.2 | ZV322S_P732_0500 EZ501U | 11                   | 14                    | 380                  | 50.00 | 0.27                   | 0.51                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.28   | 4.7               | 5.1                | 1.0      | 1.3 | ZV322S_P732_0400 EZ501U | 11                   | 14                    | 380                  | 40.00 | 0.34                   | 0.64                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.31   | 4.1               | 4.5                | 0.9      | 1.5 | ZV322S_P732_0350 EZ501U | 11                   | 14                    | 380                  | 35.00 | 0.39                   | 0.73                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.34   | 3.7               | 4.1                | 1.1      | 1.6 | ZV322S_P732_0320 EZ501U | 11                   | 14                    | 380                  | 32.00 | 0.34                   | 0.69                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.39   | 3.3               | 3.6                | 1.0      | 1.7 | ZV322S_P732_0280 EZ501U | 11                   | 14                    | 380                  | 28.00 | 0.49                   | 0.92                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.44   | 2.9               | 3.2                | 1.2      | 1.8 | ZV322S_P732_0250 EZ501U | 11                   | 14                    | 380                  | 25.00 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.44   | 5.0               | 5.4                | 2.0      | 1.1 | ZV322S_P732_0250 EZ502U | 11                   | 14                    | 380                  | 25.00 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.44   | 5.0               | 5.6                | 2.0      | 1.1 | ZV322S_P732_0250 EZ701U | 11                   | 14                    | 380                  | 25.00 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.55   | 2.3               | 2.6                | 1.4      | 2.1 | ZV322S_P732_0200 EZ501U | 8.7                  | 14                    | 304                  | 20.00 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.55   | 4.0               | 4.3                | 2.5      | 1.2 | ZV322S_P732_0200 EZ502U | 11                   | 14                    | 380                  | 20.00 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.55   | 4.0               | 4.5                | 2.5      | 1.2 | ZV322S_P732_0200 EZ701U | 11                   | 14                    | 380                  | 20.00 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.69   | 1.9               | 2.0                | 1.6      | 2.5 | ZV322S_P732_0160 EZ501U | 6.9                  | 14                    | 243                  | 16.00 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.69   | 3.2               | 3.5                | 2.8      | 1.4 | ZV322S_P732_0160 EZ502U | 11                   | 14                    | 380                  | 16.00 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.69   | 3.2               | 3.6                | 2.8      | 1.4 | ZV322S_P732_0160 EZ701U | 8.7                  | 14                    | 304                  | 16.00 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.69   | 4.2               | 4.8                | 3.7      | 1.1 | ZV322S_P732_0160 EZ503U | 11                   | 14                    | 380                  | 16.00 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.92   | 1.4               | 1.5                | 2.9      | 3.0 | ZV322S_P732_0120 EZ501U | 5.2                  | 14                    | 182                  | 12.00 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.92   | 2.4               | 2.6                | 5.0      | 1.7 | ZV322S_P732_0120 EZ502U | 10                   | 14                    | 353                  | 12.00 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.92   | 2.4               | 2.7                | 5.0      | 1.7 | ZV322S_P732_0120 EZ701U | 6.5                  | 14                    | 228                  | 12.00 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.92   | 3.2               | 3.6                | 6.5      | 1.3 | ZV322S_P732_0120 EZ503U | 11                   | 14                    | 380                  | 12.00 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.92   | 3.9               | 4.7                | 8.0      | 1.1 | ZV322S_P732_0120 EZ702U | 11                   | 14                    | 380                  | 12.00 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10   | 2.1               | 2.3                | 1.7      | 1.9 | ZV322S_P731_0100 EZ701U | 5.5                  | 14                    | 194                  | 10.00 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 1.10   | 3.3               | 4.0                | 2.7      | 1.2 | ZV322S_P731_0100 EZ702U | 11                   | 14                    | 380                  | 10.00 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 1.38   | 1.6               | 1.8                | 1.7      | 2.2 | ZV322S_P731_0080 EZ701U | 4.4                  | 14                    | 155                  | 8.000 | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 1.38   | 2.7               | 3.2                | 2.8      | 1.4 | ZV322S_P731_0080 EZ702U | 9.1                  | 14                    | 318                  | 8.000 | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 1.38   | 3.7               | 4.6                | 3.9      | 1.0 | ZV322S_P731_0080 EZ703U | 11                   | 14                    | 380                  | 8.000 | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 1.57   | 1.4               | 1.6                | 1.8      | 2.4 | ZV322S_P731_0070 EZ701U | 3.9                  | 14                    | 136                  | 7.000 | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 1.57   | 2.3               | 2.8                | 3.0      | 1.5 | ZV322S_P731_0070 EZ702U | 8.0                  | 14                    | 278                  | 7.000 | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 1.57   | 3.2               | 4.0                | 4.1      | 1.1 | ZV322S_P731_0070 EZ703U | 11                   | 14                    | 380                  | 7.000 | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.20   | 1.0               | 1.1                | 2.8      | 3.1 | ZV322S_P731_0050 EZ701U | 2.8                  | 14                    | 97                   | 5.000 | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.20   | 1.7               | 2.0                | 4.5      | 1.9 | ZV322S_P731_0050 EZ702U | 5.7                  | 14                    | 199                  | 5.000 | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.20   | 2.3               | 2.9                | 6.2      | 1.4 | ZV322S_P731_0050 EZ703U | 9.0                  | 14                    | 315                  | 5.000 | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.20   | 3.0               | 4.2                | 7.9      | 1.1 | ZV322S_P731_0050 EZ705U | 11                   | 14                    | 380                  | 5.000 | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.20   | 3.1               | 5.1                | 8.3      | 1.0 | ZV322S_P731_0050 EZ802U | 11                   | 14                    | 380                  | 5.000 | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.75   | 0.8               | 0.9                | 3.6      | 3.5 | ZV322S_P731_0040 EZ701U | 2.2                  | 14                    | 78                   | 4.000 | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 2.75   | 1.3               | 1.6                | 5.9      | 2.2 | ZV322S_P731_0040 EZ702U | 4.5                  | 14                    | 159                  | 4.000 | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 2.75   | 1.8               | 2.3                | 8.0      | 1.6 | ZV322S_P731_0040 EZ703U | 7.2                  | 14                    | 252                  | 4.000 | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 2.75   | 2.4               | 3.3                | 10       | 1.2 | ZV322S_P731_0040 EZ705U | 11                   | 14                    | 380                  | 4.000 | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2acc}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2acc}$<br>[Nm] | i      | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|---------------------|-----------------------|---------------------|--------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV3P7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |        |                        |                        |                    |                          |                    |               |    |               |
| 2.75  | 2.5               | 4.1                | 11       | 1.2 | ZV322S_P731_0040 EZ802U | 11                  | 14                    | 380                 | 4.000  | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 0.6               | 0.7                | 8.0      | 4.3 | ZV322S_P731_0030 EZ701U | 1.7                 | 14                    | 58                  | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 1.0               | 1.2                | 13       | 2.6 | ZV322S_P731_0030 EZ702U | 3.4                 | 14                    | 119                 | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 1.4               | 1.7                | 18       | 1.9 | ZV322S_P731_0030 EZ703U | 5.4                 | 14                    | 189                 | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 1.8               | 2.5                | 23       | 1.5 | ZV322S_P731_0030 EZ705U | 8.6                 | 14                    | 303                 | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 1.9               | 3.1                | 24       | 1.4 | ZV322S_P731_0030 EZ802U | 8.3                 | 14                    | 291                 | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 3.67  | 2.2               | 4.0                | 29       | 1.2 | ZV322S_P731_0030 EZ803U | 11                  | 14                    | 380                 | 3.000  | 2.69                   | 4.89                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| <b>ZV3P7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |        |                        |                        |                    |                          |                    |               |    |               |
| 1.38  | 3.1               | 5.0                | 6.6      | 1.2 | ZV322S_P732_0120 EZ505U | 11                  | 14                    | 380                 | 12.000 | 0.76                   | 1.53                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.65  | 2.9               | 9.6                | 2.7      | 1.2 | ZV322S_P731_0100 EZ802U | 11                  | 14                    | 380                 | 10.000 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 1.65  | 3.4               | 5.5                | 3.1      | 1.0 | ZV322S_P731_0100 EZ703U | 11                  | 14                    | 380                 | 10.000 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 2.06  | 2.3               | 7.6                | 2.8      | 1.4 | ZV322S_P731_0080 EZ802U | 11                  | 14                    | 380                 | 8.000  | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 2.06  | 2.7               | 4.4                | 3.2      | 1.2 | ZV322S_P731_0080 EZ703U | 11                  | 14                    | 380                 | 8.000  | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 2.36  | 2.0               | 6.7                | 3.0      | 1.5 | ZV322S_P731_0070 EZ802U | 11                  | 14                    | 380                 | 7.000  | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 2.36  | 2.3               | 3.9                | 3.5      | 1.3 | ZV322S_P731_0070 EZ703U | 11                  | 14                    | 380                 | 7.000  | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 3.30  | 1.5               | 4.8                | 4.5      | 1.9 | ZV322S_P731_0050 EZ802U | 11                  | 14                    | 380                 | 5.000  | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 3.30  | 1.7               | 2.8                | 5.2      | 1.6 | ZV322S_P731_0050 EZ703U | 9.0                 | 14                    | 315                 | 5.000  | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 3.30  | 2.3               | 4.2                | 7.0      | 1.2 | ZV322S_P731_0050 EZ705U | 11                  | 14                    | 380                 | 5.000  | 1.98                   | 4.03                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 4.13  | 1.2               | 3.8                | 5.9      | 2.2 | ZV322S_P731_0040 EZ802U | 11                  | 14                    | 380                 | 4.000  | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 4.13  | 1.3               | 2.2                | 6.8      | 1.9 | ZV322S_P731_0040 EZ703U | 7.2                 | 14                    | 252                 | 4.000  | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| 4.13  | 1.8               | 3.3                | 9.2      | 1.4 | ZV322S_P731_0040 EZ705U | 11                  | 14                    | 380                 | 4.000  | 2.29                   | 4.58                   | 31                 | 10                       | 47                 | 3             | 22 | 70.0          |
| <b>ZV3P7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 11</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |        |                        |                        |                    |                          |                    |               |    |               |
| 0.39  | 5.2               | 6.7                | 0.8      | 1.1 | ZV322S_P732_0560 EZ501U | 11                  | 14                    | 380                 | 56.000 | 0.24                   | 0.46                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.44  | 4.6               | 6.0                | 0.7      | 1.2 | ZV322S_P732_0500 EZ501U | 11                  | 14                    | 380                 | 50.000 | 0.27                   | 0.51                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.55  | 3.7               | 4.8                | 1.0      | 1.3 | ZV322S_P732_0400 EZ501U | 11                  | 14                    | 380                 | 40.000 | 0.34                   | 0.64                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.63  | 3.2               | 4.2                | 0.9      | 1.5 | ZV322S_P732_0350 EZ501U | 11                  | 14                    | 380                 | 35.000 | 0.39                   | 0.73                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.69  | 3.0               | 3.8                | 1.1      | 1.6 | ZV322S_P732_0320 EZ501U | 11                  | 14                    | 380                 | 32.000 | 0.34                   | 0.69                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.69  | 4.5               | 6.8                | 1.6      | 1.0 | ZV322S_P732_0320 EZ502U | 11                  | 14                    | 380                 | 32.000 | 0.34                   | 0.69                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.69  | 4.5               | 6.9                | 1.6      | 1.0 | ZV322S_P732_0320 EZ701U | 11                  | 14                    | 380                 | 32.000 | 0.34                   | 0.69                   | 41                 | 20                       | 45                 | 3             | 22 | 70.0          |
| 0.79  | 2.6               | 3.3                | 1.0      | 1.7 | ZV322S_P732_0280 EZ501U | 11                  | 14                    | 380                 | 28.000 | 0.49                   | 0.92                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.79  | 4.0               | 5.9                | 1.5      | 1.1 | ZV322S_P732_0280 EZ502U | 11                  | 14                    | 380                 | 28.000 | 0.49                   | 0.92                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.79  | 4.0               | 6.0                | 1.5      | 1.1 | ZV322S_P732_0280 EZ701U | 11                  | 14                    | 380                 | 28.000 | 0.49                   | 0.92                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.88  | 2.3               | 3.0                | 1.1      | 1.8 | ZV322S_P732_0250 EZ501U | 11                  | 14                    | 380                 | 25.000 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.88  | 3.5               | 5.3                | 1.7      | 1.2 | ZV322S_P732_0250 EZ502U | 11                  | 14                    | 380                 | 25.000 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.88  | 3.5               | 5.4                | 1.7      | 1.2 | ZV322S_P732_0250 EZ701U | 11                  | 14                    | 380                 | 25.000 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 0.88  | 4.2               | 7.2                | 2.0      | 1.0 | ZV322S_P732_0250 EZ503U | 11                  | 14                    | 380                 | 25.000 | 0.51                   | 1.03                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10  | 1.8               | 2.4                | 1.3      | 2.1 | ZV322S_P732_0200 EZ501U | 8.7                 | 14                    | 304                 | 20.000 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10  | 2.8               | 4.2                | 1.9      | 1.4 | ZV322S_P732_0200 EZ502U | 11                  | 14                    | 380                 | 20.000 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10  | 2.8               | 4.3                | 1.9      | 1.4 | ZV322S_P732_0200 EZ701U | 11                  | 14                    | 380                 | 20.000 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10  | 3.4               | 5.8                | 2.3      | 1.2 | ZV322S_P732_0200 EZ503U | 11                  | 14                    | 380                 | 20.000 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.10  | 3.9               | 7.8                | 2.7      | 1.0 | ZV322S_P732_0200 EZ702U | 11                  | 14                    | 380                 | 20.000 | 0.55                   | 1.10                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.38  | 1.5               | 1.9                | 1.4      | 2.5 | ZV322S_P732_0160 EZ501U | 6.9                 | 14                    | 243                 | 16.000 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.38  | 2.3               | 3.4                | 2.2      | 1.6 | ZV322S_P732_0160 EZ502U | 11                  | 14                    | 380                 | 16.000 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.38  | 2.3               | 3.4                | 2.2      | 1.6 | ZV322S_P732_0160 EZ701U | 8.7                 | 14                    | 304                 | 16.000 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.38  | 2.7               | 4.6                | 2.6      | 1.4 | ZV322S_P732_0160 EZ503U | 11                  | 14                    | 380                 | 16.000 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 1.38  | 3.1               | 6.2                | 3.0      | 1.2 | ZV322S_P732_0160 EZ702U | 11                  | 14                    | 380                 | 16.000 | 0.69                   | 1.38                   | 41                 | 20                       | 46                 | 3             | 22 | 70.0          |
| 2.20  | 1.4               | 2.2                | 1.5      | 2.2 | ZV322S_P731_0100 EZ701U | 5.5                 | 14                    | 194                 | 10.000 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 2.20  | 2.0               | 4.0                | 2.0      | 1.6 | ZV322S_P731_0100 EZ702U | 11                  | 14                    | 380                 | 10.000 | 1.10                   | 2.20                   | 31                 | 10                       | 44                 | 3             | 22 | 70.0          |
| 2.75  | 1.2               | 1.8                | 1.5      | 2.5 | ZV322S_P731_0080 EZ701U | 4.4                 | 14                    | 155                 | 8.000  | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 2.75  | 1.6               | 3.2                | 2.1      | 1.8 | ZV322S_P731_0080 EZ702U | 9.1                 | 14                    | 318                 | 8.000  | 1.38                   | 2.75                   | 31                 | 10                       | 45                 | 3             | 22 | 70.0          |
| 3.14  | 1.0               | 1.5                | 1.6      | 2.8 | ZV322S_P731_0070 EZ701U | 3.9                 | 14                    | 136                 | 7.000  | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| 3.14  | 1.4               | 2.8                | 2.3      | 2.0 | ZV322S_P731_0070 EZ702U | 8.0                 | 14                    | 278                 | 7.000  | 1.57                   | 3.14                   | 31                 | 10                       | 46                 | 3             | 22 | 70.0          |
| <b>ZV4P7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 10</math> kN))</b> |                   |                    |          |     |                         |                     |                       |                     |        |                        |                        |                    |                          |                    |               |    |               |
| 0.21  | 6.0               | 6.5                | 0.8      | 1.2 | ZV418S_P732_0560 EZ501U | 10                  | 15                    | 398                 | 56.000 | 0.26                   | 0.50                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.24  | 5.3               | 5.8                | 0.8      | 1.3 | ZV418S_P732_0500 EZ501U | 10                  | 15                    | 398                 | 50.000 | 0.30                   | 0.56                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.30  | 4.3               | 4.7                | 1.0      | 1.5 | ZV418S_P732_0400 EZ501U | 10                  | 15                    | 398                 | 40.000 | 0.37                   | 0.70                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 0.34  | 3.7               | 4.1                | 0.9      | 1.6 | ZV418S_P732_0350 EZ501U | 10                  | 15                    | 398                 | 35.000 | 0.42                   | 0.80                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.38  | 3.4               | 3.7                | 1.1      | 1.7 | ZV418S_P732_0320 EZ501U | 10                  | 15                    | 398                 | 32.000 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.38  | 5.9               | 6.4                | 1.9      | 1.0 | ZV418S_P732_0320 EZ502U | 10                  | 15                    | 398                 | 32.000 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.38  | 5.9               | 6.6                | 1.9      | 1.0 | ZV418S_P732_0320 EZ701U | 10                  | 15                    | 398                 | 32.000 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.43  | 3.0               | 3.3                | 1.0      | 1.9 | ZV418S_P732_0280 EZ501U | 10                  | 15                    | 398                 | 28.000 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.43  | 5.2               | 5.6                | 1.8      | 1.1 | ZV418S_P732_0280 EZ502U | 10                  | 15                    | 398                 | 28.000 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.43  | 5.2               | 5.8                | 1.8      | 1.1 | ZV418S_P732_0280 EZ701U | 10                  | 15                    | 398                 | 28.000 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.48  | 2.7               | 2.9                | 1.2      | 2.0 | ZV418S_P732_0250 EZ501U | 9.9                 | 15                    | 380                 | 25.000 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.48  | 4.6               | 5.0                | 2.0      | 1.2 | ZV418S_P732_0250 EZ502U | 10                  | 15                    | 398                 | 25.000 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.48  | 4.6               | 5.2                | 2.0      | 1.2 | ZV418S_P732_0250 EZ701U | 10                  | 15                    | 398                 | 25.000 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |

8.2 Selection table 8 ZVP rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV4P7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 10</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.60  | 2.1               | 2.3                | 1.4      | 2.4 | ZV418S_P732_0200 EZ501U | 8.0                  | 15                    | 304                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.60  | 3.7               | 4.0                | 2.5      | 1.4 | ZV418S_P732_0200 EZ502U | 10                   | 15                    | 398                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.60  | 3.7               | 4.1                | 2.5      | 1.4 | ZV418S_P732_0200 EZ701U | 9.9                  | 15                    | 380                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.60  | 4.8               | 5.5                | 3.2      | 1.0 | ZV418S_P732_0200 EZ503U | 10                   | 15                    | 398                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.75  | 1.7               | 1.9                | 1.6      | 2.7 | ZV418S_P732_0160 EZ501U | 6.4                  | 15                    | 243                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.75  | 2.9               | 3.2                | 2.8      | 1.6 | ZV418S_P732_0160 EZ502U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.75  | 2.9               | 3.3                | 2.8      | 1.6 | ZV418S_P732_0160 EZ701U | 8.0                  | 15                    | 304                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.75  | 3.9               | 4.4                | 3.7      | 1.2 | ZV418S_P732_0160 EZ503U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.00  | 1.3               | 1.4                | 2.9      | 3.3 | ZV418S_P732_0120 EZ501U | 4.8                  | 15                    | 182                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.00  | 2.2               | 2.4                | 5.0      | 1.9 | ZV418S_P732_0120 EZ502U | 9.3                  | 15                    | 353                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.00  | 2.2               | 2.5                | 5.0      | 1.9 | ZV418S_P732_0120 EZ701U | 6.0                  | 15                    | 228                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.00  | 2.9               | 3.3                | 6.5      | 1.5 | ZV418S_P732_0120 EZ503U | 10                   | 15                    | 398                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.00  | 3.6               | 4.3                | 8.0      | 1.2 | ZV418S_P732_0120 EZ702U | 10                   | 15                    | 398                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.00  | 4.0               | 4.8                | 9.0      | 1.1 | ZV418S_P732_0120 EZ505U | 10                   | 15                    | 398                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.20  | 1.9               | 2.1                | 1.7      | 2.1 | ZV418S_P731_0100 EZ701U | 5.1                  | 15                    | 194                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 1.20  | 3.0               | 3.7                | 2.7      | 1.3 | ZV418S_P731_0100 EZ702U | 10                   | 15                    | 398                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 1.50  | 1.5               | 1.7                | 1.7      | 2.5 | ZV418S_P731_0080 EZ701U | 4.1                  | 15                    | 155                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 1.50  | 2.4               | 2.9                | 2.8      | 1.5 | ZV418S_P731_0080 EZ702U | 8.3                  | 15                    | 318                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 1.50  | 3.4               | 4.2                | 3.9      | 1.1 | ZV418S_P731_0080 EZ703U | 10                   | 15                    | 398                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 1.71  | 1.3               | 1.5                | 1.8      | 2.7 | ZV418S_P731_0070 EZ701U | 3.6                  | 15                    | 136                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 1.71  | 2.1               | 2.6                | 3.0      | 1.7 | ZV418S_P731_0070 EZ702U | 7.3                  | 15                    | 278                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 1.71  | 2.9               | 3.7                | 4.1      | 1.2 | ZV418S_P731_0070 EZ703U | 10                   | 15                    | 398                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 2.40  | 0.9               | 1.1                | 2.8      | 3.4 | ZV418S_P731_0050 EZ701U | 2.5                  | 15                    | 97                   | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 2.40  | 1.5               | 1.8                | 4.5      | 2.1 | ZV418S_P731_0050 EZ702U | 5.2                  | 15                    | 199                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 2.40  | 2.1               | 2.6                | 6.2      | 1.5 | ZV418S_P731_0050 EZ703U | 8.3                  | 15                    | 315                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 2.40  | 2.7               | 3.8                | 7.9      | 1.2 | ZV418S_P731_0050 EZ705U | 10                   | 15                    | 398                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 2.40  | 2.8               | 4.7                | 8.3      | 1.1 | ZV418S_P731_0050 EZ802U | 10                   | 15                    | 398                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 3.00  | 0.8               | 0.8                | 3.6      | 3.9 | ZV418S_P731_0040 EZ701U | 2.0                  | 15                    | 78                   | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 3.00  | 1.2               | 1.5                | 5.9      | 2.4 | ZV418S_P731_0040 EZ702U | 4.2                  | 15                    | 159                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 3.00  | 1.7               | 2.1                | 8.0      | 1.8 | ZV418S_P731_0040 EZ703U | 6.6                  | 15                    | 252                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 3.00  | 2.2               | 3.1                | 10       | 1.4 | ZV418S_P731_0040 EZ705U | 10                   | 15                    | 398                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 3.00  | 2.3               | 3.8                | 11       | 1.3 | ZV418S_P731_0040 EZ802U | 10                   | 15                    | 388                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 3.00  | 2.7               | 4.9                | 13       | 1.1 | ZV418S_P731_0040 EZ803U | 10                   | 15                    | 398                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 0.6               | 0.6                | 8.0      | 4.8 | ZV418S_P731_0030 EZ701U | 1.5                  | 15                    | 58                   | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 0.9               | 1.1                | 13       | 2.9 | ZV418S_P731_0030 EZ702U | 3.1                  | 15                    | 119                  | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 1.3               | 1.6                | 18       | 2.1 | ZV418S_P731_0030 EZ703U | 5.0                  | 15                    | 189                  | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 1.6               | 2.3                | 23       | 1.7 | ZV418S_P731_0030 EZ705U | 7.9                  | 15                    | 303                  | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 1.7               | 2.8                | 24       | 1.6 | ZV418S_P731_0030 EZ802U | 7.6                  | 15                    | 291                  | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.00  | 2.0               | 3.7                | 29       | 1.3 | ZV418S_P731_0030 EZ803U | 10                   | 15                    | 398                  | 3.000 | 2.93                   | 5.33                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| <b>ZV4P7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{f2acc,max} = 10</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 1.13  | 3.8               | 6.1                | 3.6      | 1.1 | ZV418S_P732_0160 EZ505U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50  | 2.8               | 4.6                | 6.6      | 1.3 | ZV418S_P732_0120 EZ505U | 10                   | 15                    | 398                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.50  | 3.6               | 6.0                | 8.4      | 1.0 | ZV418S_P732_0120 EZ703U | 10                   | 15                    | 398                  | 12.00 | 0.83                   | 1.67                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 1.80  | 2.7               | 8.8                | 2.7      | 1.3 | ZV418S_P731_0100 EZ802U | 10                   | 15                    | 398                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 1.80  | 3.1               | 5.1                | 3.1      | 1.1 | ZV418S_P731_0100 EZ703U | 10                   | 15                    | 398                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 2.25  | 2.1               | 7.0                | 2.8      | 1.5 | ZV418S_P731_0080 EZ802U | 10                   | 15                    | 398                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 2.25  | 2.5               | 4.1                | 3.2      | 1.3 | ZV418S_P731_0080 EZ703U | 10                   | 15                    | 398                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 2.57  | 1.9               | 6.1                | 3.0      | 1.7 | ZV418S_P731_0070 EZ802U | 10                   | 15                    | 398                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 2.57  | 2.2               | 3.6                | 3.5      | 1.4 | ZV418S_P731_0070 EZ703U | 10                   | 15                    | 398                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 2.57  | 2.9               | 5.3                | 4.7      | 1.1 | ZV418S_P731_0070 EZ705U | 10                   | 15                    | 398                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 3.60  | 1.3               | 4.4                | 4.5      | 2.1 | ZV418S_P731_0050 EZ802U | 10                   | 15                    | 398                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 3.60  | 1.5               | 2.5                | 5.2      | 1.8 | ZV418S_P731_0050 EZ703U | 8.3                  | 15                    | 315                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 3.60  | 2.1               | 3.8                | 7.0      | 1.3 | ZV418S_P731_0050 EZ705U | 10                   | 15                    | 398                  | 5.000 | 2.16                   | 4.40                   | 33                 | 11                       | 49                 | 4             | 18 | 76.4          |
| 4.50  | 1.1               | 3.5                | 5.9      | 2.4 | ZV418S_P731_0040 EZ802U | 10                   | 15                    | 388                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.50  | 1.2               | 2.0                | 6.8      | 2.1 | ZV418S_P731_0040 EZ703U | 6.6                  | 15                    | 252                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| 4.50  | 1.7               | 3.0                | 9.2      | 1.5 | ZV418S_P731_0040 EZ705U | 10                   | 15                    | 398                  | 4.000 | 2.50                   | 5.00                   | 33                 | 11                       | 50                 | 4             | 18 | 76.4          |
| <b>ZV4P7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 10</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.34  | 5.9               | 7.7                | 0.6      | 1.0 | ZV418S_P732_0700 EZ501U | 10                   | 15                    | 398                  | 70.00 | 0.21                   | 0.40                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 0.43  | 4.7               | 6.1                | 0.8      | 1.2 | ZV418S_P732_0560 EZ501U | 10                   | 15                    | 398                  | 56.00 | 0.26                   | 0.50                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.48  | 4.2               | 5.5                | 0.7      | 1.3 | ZV418S_P732_0500 EZ501U | 10                   | 15                    | 398                  | 50.00 | 0.30                   | 0.56                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.60  | 3.4               | 4.4                | 1.0      | 1.5 | ZV418S_P732_0400 EZ501U | 10                   | 15                    | 398                  | 40.00 | 0.37                   | 0.70                   | 44                 | 22                       | 48                 | 4             | 18 | 76.4          |
| 0.69  | 3.0               | 3.8                | 0.9      | 1.6 | ZV418S_P732_0350 EZ501U | 10                   | 15                    | 398                  | 35.00 | 0.42                   | 0.80                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.69  | 4.5               | 6.8                | 1.4      | 1.1 | ZV418S_P732_0350 EZ502U | 10                   | 15                    | 398                  | 35.00 | 0.42                   | 0.80                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.69  | 4.5               | 6.9                | 1.4      | 1.1 | ZV418S_P732_0350 EZ701U | 10                   | 15                    | 398                  | 35.00 | 0.42                   | 0.80                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.75  | 2.7               | 3.5                | 1.1      | 1.7 | ZV418S_P732_0320 EZ501U | 10                   | 15                    | 398                  | 32.00 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.75  | 4.1               | 6.2                | 1.6      | 1.1 | ZV418S_P732_0320 EZ502U | 10                   | 15                    | 398                  | 32.00 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |



| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                    | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{f2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $\Delta s_{red}$<br>[μm] | $C_{in}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|-------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|--------------------------|--------------------|---------------|----|---------------|
| <b>ZV4P7 (<math>n_{f2N} = 6000</math> rpm, (<math>F_{f2acc,max} = 10</math> kN))</b> |                   |                    |          |     |                         |                      |                       |                      |       |                        |                        |                    |                          |                    |               |    |               |
| 0.75   | 4.1               | 6.3                | 1.6      | 1.1 | ZV418S_P732_0320 EZ701U | 10                   | 15                    | 398                  | 32.00 | 0.38                   | 0.75                   | 44                 | 22                       | 47                 | 4             | 18 | 76.4          |
| 0.86   | 2.4               | 3.1                | 1.0      | 1.9 | ZV418S_P732_0280 EZ501U | 10                   | 15                    | 398                  | 28.00 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.86   | 3.6               | 5.4                | 1.5      | 1.2 | ZV418S_P732_0280 EZ502U | 10                   | 15                    | 398                  | 28.00 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.86   | 3.6               | 5.5                | 1.5      | 1.2 | ZV418S_P732_0280 EZ701U | 10                   | 15                    | 398                  | 28.00 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.86   | 4.3               | 7.4                | 1.8      | 1.0 | ZV418S_P732_0280 EZ503U | 10                   | 15                    | 398                  | 28.00 | 0.53                   | 1.00                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.96   | 2.1               | 2.7                | 1.1      | 2.0 | ZV418S_P732_0250 EZ501U | 9.9                  | 15                    | 380                  | 25.00 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.96   | 3.2               | 4.8                | 1.7      | 1.3 | ZV418S_P732_0250 EZ502U | 10                   | 15                    | 398                  | 25.00 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.96   | 3.2               | 4.9                | 1.7      | 1.3 | ZV418S_P732_0250 EZ701U | 10                   | 15                    | 398                  | 25.00 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 0.96   | 3.9               | 6.6                | 2.0      | 1.1 | ZV418S_P732_0250 EZ503U | 10                   | 15                    | 398                  | 25.00 | 0.56                   | 1.12                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.20   | 1.7               | 2.2                | 1.3      | 2.4 | ZV418S_P732_0200 EZ501U | 8.0                  | 15                    | 304                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.20   | 2.6               | 3.9                | 1.9      | 1.5 | ZV418S_P732_0200 EZ502U | 10                   | 15                    | 398                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.20   | 2.6               | 3.9                | 1.9      | 1.5 | ZV418S_P732_0200 EZ701U | 9.9                  | 15                    | 380                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.20   | 3.1               | 5.3                | 2.3      | 1.3 | ZV418S_P732_0200 EZ503U | 10                   | 15                    | 398                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.20   | 3.6               | 7.1                | 2.7      | 1.1 | ZV418S_P732_0200 EZ702U | 10                   | 15                    | 398                  | 20.00 | 0.60                   | 1.20                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50   | 1.4               | 1.8                | 1.4      | 2.8 | ZV418S_P732_0160 EZ501U | 6.4                  | 15                    | 243                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50   | 2.1               | 3.1                | 2.2      | 1.8 | ZV418S_P732_0160 EZ502U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50   | 2.1               | 3.1                | 2.2      | 1.8 | ZV418S_P732_0160 EZ701U | 8.0                  | 15                    | 304                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50   | 2.5               | 4.2                | 2.6      | 1.5 | ZV418S_P732_0160 EZ503U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 1.50   | 2.9               | 5.7                | 3.0      | 1.3 | ZV418S_P732_0160 EZ702U | 10                   | 15                    | 398                  | 16.00 | 0.75                   | 1.50                   | 44                 | 22                       | 49                 | 4             | 18 | 76.4          |
| 2.40   | 1.3               | 2.0                | 1.5      | 2.4 | ZV418S_P731_0100 EZ701U | 5.1                  | 15                    | 194                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 2.40   | 1.8               | 3.6                | 2.0      | 1.7 | ZV418S_P731_0100 EZ702U | 10                   | 15                    | 398                  | 10.00 | 1.20                   | 2.40                   | 33                 | 11                       | 46                 | 4             | 18 | 76.4          |
| 3.00   | 1.1               | 1.6                | 1.5      | 2.8 | ZV418S_P731_0080 EZ701U | 4.1                  | 15                    | 155                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 3.00   | 1.5               | 2.9                | 2.1      | 2.0 | ZV418S_P731_0080 EZ702U | 8.3                  | 15                    | 318                  | 8.000 | 1.50                   | 3.00                   | 33                 | 11                       | 47                 | 4             | 18 | 76.4          |
| 3.43   | 0.9               | 1.4                | 1.6      | 3.1 | ZV418S_P731_0070 EZ701U | 3.6                  | 15                    | 136                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |
| 3.43   | 1.3               | 2.5                | 2.3      | 2.2 | ZV418S_P731_0070 EZ702U | 7.3                  | 15                    | 278                  | 7.000 | 1.71                   | 3.43                   | 33                 | 11                       | 48                 | 4             | 18 | 76.4          |

## 8.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $az$  in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

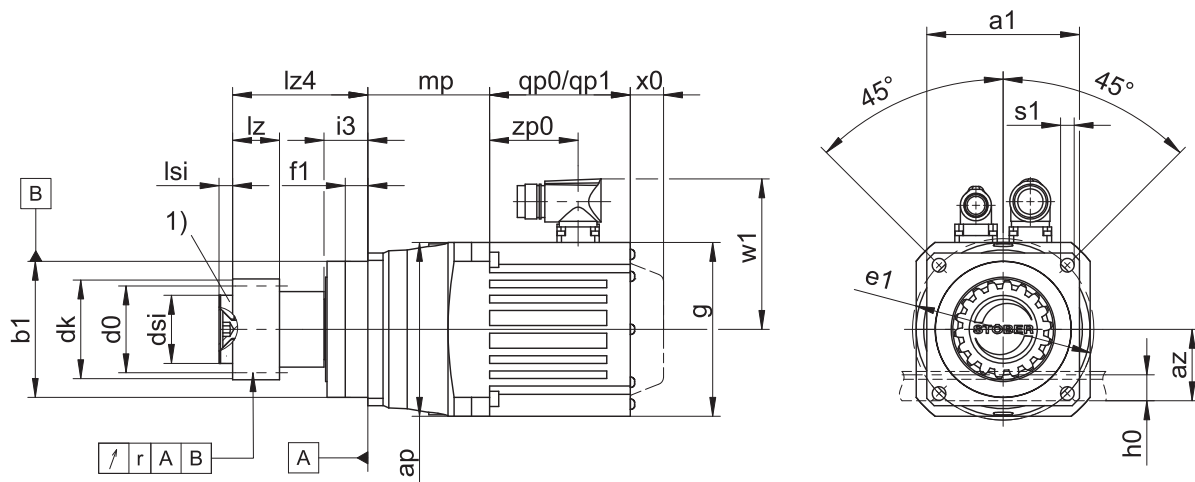
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.

### 8.3.1 Pinion position E



qp0 Applies to motors without brake.

x0 Applies to encoders using an optical measuring method.

1) Axial locking (optional)

qp1 Applies to motors with brake.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

- The radial runout specification applies only to the reinforced bearing D.

## Dimensions of gear units

| Type       | mn | □a1 | az    | Øb1               | Ød0   | Ødk   | Ødsi | Øe1 | f1   | h0 | i3 | lz | lz4   | lsi | r     | Øs1  | x   |
|------------|----|-----|-------|-------------------|-------|-------|------|-----|------|----|----|----|-------|-----|-------|------|-----|
| ZV216SEP3_ | 2  | 72  | 39.98 | 60 <sub>h6</sub>  | 33.95 | 39.81 | 25   | 75  | 7.5  | 22 | 18 | 26 | 49.5  | 4   | 0.025 | 5.5  | 0.5 |
| ZV220SEP4_ | 2  | 76  | 44.02 | 70 <sub>h6</sub>  | 42.44 | 47.90 | 30   | 85  | 7.5  | 22 | 18 | 26 | 57.5  | 6   | 0.025 | 6.6  | 0.4 |
| ZV225SEP5_ | 2  | 101 | 49.33 | 90 <sub>h6</sub>  | 53.05 | 58.52 | 45   | 120 | 15.0 | 22 | 28 | 26 | 89.5  | 8   | 0.030 | 9.0  | 0.4 |
| ZV318SEP5_ | 3  | 101 | 55.55 | 90 <sub>h6</sub>  | 57.30 | 65.01 | 45   | 120 | 15.0 | 26 | 28 | 31 | 89.5  | 8   | 0.030 | 9.0  | 0.3 |
| ZV322SEP7_ | 3  | 144 | 62.21 | 130 <sub>h6</sub> | 70.03 | 78.35 | 55   | 165 | 3.5  | 26 | 28 | 31 | 113.5 | 10  | 0.035 | 11.0 | 0.4 |
| ZV418SEP7_ | 4  | 144 | 74.40 | 130 <sub>h6</sub> | 76.40 | 86.77 | 55   | 165 | 3.5  | 35 | 28 | 41 | 113.5 | 10  | 0.035 | 11.0 | 0.3 |

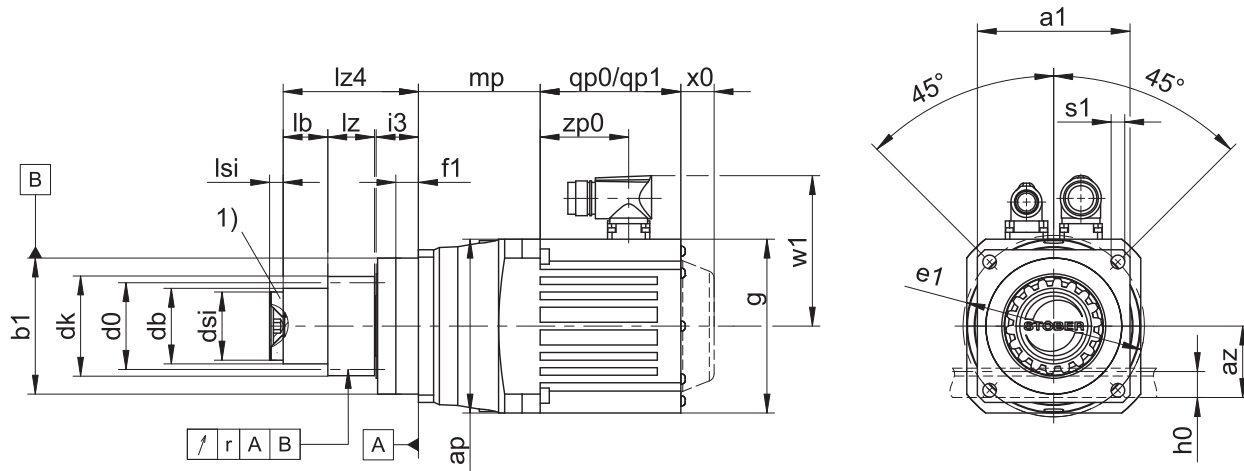
## Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ202U | 55  | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55  | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98  | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |
| EZ803U | 190 | 238 | 315.0 | 156.5 | 22 | 184.0 |
| EZ805U | 190 | 320 | 397.0 | 156.5 | 22 | 266.0 |

## Dimensions of geared motors

| Type     | EZ2 |      | EZ3  |       | EZ4  |       | EZ5  |       | EZ7  |       | EZ8  |       |
|----------|-----|------|------|-------|------|-------|------|-------|------|-------|------|-------|
|          | ap  | mp   | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    |
| ZV_P331_ | –   | –    | □72  | 68.5  | □98  | 65.0  | –    | –     | –    | –     | –    | –     |
| ZV_P332_ | Ø75 | 89.5 | Ø75  | 103.0 | –    | –     | –    | –     | –    | –     | –    | –     |
| ZV_P431_ | –   | –    | –    | –     | □98  | 80.5  | □115 | 80.0  | –    | –     | –    | –     |
| ZV_P432_ | –   | –    | Ø100 | 117.5 | Ø100 | 114.0 | –    | –     | –    | –     | –    | –     |
| ZV_P531_ | –   | –    | –    | –     | –    | –     | □115 | 80.5  | □145 | 83.5  | –    | –     |
| ZV_P532_ | –   | –    | –    | –     | Ø120 | 122.5 | Ø120 | 122.0 | –    | –     | –    | –     |
| ZV_P731_ | –   | –    | –    | –     | –    | –     | –    | –     | □158 | 100.5 | □190 | 110.5 |
| ZV_P732_ | –   | –    | –    | –     | –    | –     | Ø150 | 148.5 | Ø150 | 151.5 | –    | –     |

### 8.3.2 Pinion position S



- qp0 Applies to motors without brake.
- qp1 Applies to motors with brake.
- x0 Applies to encoders using an optical measuring method.
- w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4](#)
- 1) Axial locking (optional)
- The radial runout specification applies only to the reinforced bearing D.

#### Dimensions of gear units

| Type       | mn | □a1 | az    | Øb1               | Ød0  | Ødb | Ødk   | Ødsi | Øe1 | f1   | h0 | i3 | lb   | lz | lz4   | lsi | r     | Øs1  | x   |
|------------|----|-----|-------|-------------------|------|-----|-------|------|-----|------|----|----|------|----|-------|-----|-------|------|-----|
| ZV216SSP3_ | 2  | 72  | 39.98 | 60 <sub>h6</sub>  | 34.0 | 30  | 39.81 | 25   | 75  | 7.5  | 22 | 18 | 4.5  | 26 | 49.5  | 4   | 0.025 | 5.5  | 0.5 |
| ZV220SSP4_ | 2  | 76  | 44.02 | 70 <sub>h6</sub>  | 42.4 | 38  | 47.90 | 30   | 85  | 7.5  | 22 | 18 | 12.5 | 26 | 57.5  | 6   | 0.025 | 6.6  | 0.4 |
| ZV225SSP5_ | 2  | 101 | 49.33 | 90 <sub>h6</sub>  | 53.1 | 50  | 58.52 | 45   | 120 | 15.0 | 22 | 28 | 34.5 | 26 | 89.5  | 8   | 0.030 | 9.0  | 0.4 |
| ZV318SSP5_ | 3  | 101 | 55.55 | 90 <sub>h6</sub>  | 57.3 | 50  | 65.01 | 45   | 120 | 15.0 | 26 | 28 | 29.5 | 31 | 89.5  | 8   | 0.030 | 9.0  | 0.3 |
| ZV322SSP7_ | 3  | 144 | 62.21 | 130 <sub>h6</sub> | 70.0 | 62  | 78.35 | 55   | 165 | 3.5  | 26 | 28 | 53.5 | 31 | 113.5 | 10  | 0.035 | 11.0 | 0.4 |
| ZV418SSP7_ | 4  | 144 | 74.40 | 130 <sub>h6</sub> | 76.4 | 62  | 86.77 | 55   | 165 | 3.5  | 35 | 28 | 43.5 | 41 | 113.5 | 10  | 0.035 | 11.0 | 0.3 |

#### Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ202U | 55  | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55  | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98  | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |
| EZ803U | 190 | 238 | 315.0 | 156.5 | 22 | 184.0 |
| EZ805U | 190 | 320 | 397.0 | 156.5 | 22 | 266.0 |

## Dimensions of geared motors

| Type     | EZ2 |      | EZ3  |       | EZ4  |       | EZ5  |       | EZ7  |       | EZ8  |       |
|----------|-----|------|------|-------|------|-------|------|-------|------|-------|------|-------|
|          | ap  | mp   | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    |
| ZV_P331_ | -   | -    | □72  | 68.5  | □98  | 65.0  | -    | -     | -    | -     | -    | -     |
| ZV_P332_ | ∅75 | 89.5 | ∅75  | 103.0 | -    | -     | -    | -     | -    | -     | -    | -     |
| ZV_P431_ | -   | -    | -    | -     | □98  | 80.5  | □115 | 80.0  | -    | -     | -    | -     |
| ZV_P432_ | -   | -    | ∅100 | 117.5 | ∅100 | 114.0 | -    | -     | -    | -     | -    | -     |
| ZV_P531_ | -   | -    | -    | -     | -    | -     | □115 | 80.5  | □145 | 83.5  | -    | -     |
| ZV_P532_ | -   | -    | -    | -     | ∅120 | 122.5 | ∅120 | 122.0 | -    | -     | -    | -     |
| ZV_P731_ | -   | -    | -    | -     | -    | -     | -    | -     | □158 | 100.5 | □190 | 110.5 |
| ZV_P732_ | -   | -    | -    | -     | -    | -     | ∅150 | 148.5 | ∅150 | 151.5 | -    | -     |

## 8.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |   |   |   |   |   |   |   |   |   |      |        |
|---|---|---|----|---|---|---|---|---|---|---|---|---|---|------|--------|
| Z | V | 3 | 22 | S | S | P | 7 | 3 | 1 | S | P | S | S | 0050 | EZ802U |
|---|---|---|----|---|---|---|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design                          |
|--------|--------------------------------------|---------------------------------|
| Z      | Type                                 | Rack and pinion drive           |
| V      | Design                               | Plug-on pinion                  |
| 3      | Module                               | $m_n = 3$ (example)             |
| 22     | Number of teeth                      | $z = 22$ (example)              |
| S      | Toothing                             | Helical (left-hand 19° 31' 42") |
| E      | Pinion position                      | Shaft end                       |
| S      |                                      | Shaft shoulder                  |
| P      | Type                                 | Planetary gear unit             |
| 7      | Size                                 | 7 (example)                     |
| 3      | Generation                           | Generation 3                    |
| 1      | Stages                               | Single-stage                    |
| 2      |                                      | Two-stage                       |
| S      | Housing                              | Standard                        |
| P      | Shaft                                | Solid shaft with feather key    |
| S      | Bearing                              | Standard bearing                |
| D      |                                      | Axially reinforced bearing      |
| S      | Backlash                             | Standard                        |
| R      |                                      | Reduced                         |
| 0050   | Transmission ratio ( $i \times 10$ ) | $i = 5$ (example)               |
| EZ802U | Motor                                | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

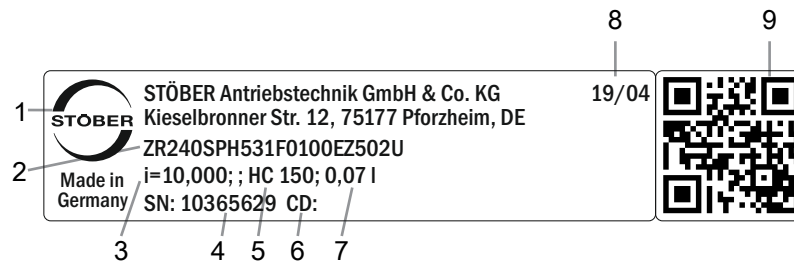
- A detailed type designation of the motor, see chapter [▶ 13](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [▶ 8.6.2](#)
- Position of the plug connectors, see chapter [▶ 8.5.5](#)
- For axial locking (optional), see the chapter [▶ 8.3](#)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [▶ 8.5.1](#).

## 8.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 8.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

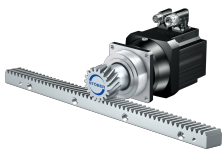
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 8.5 Product description

### 8.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



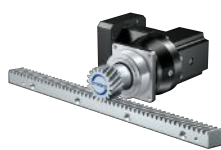
Catalog ID 443286\_en

Motor adapter



Catalog ID 443137\_en

KX right-angle input with MF motor adapter



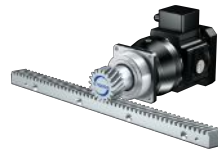
On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 8.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 6.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material       |
|-------------------|---------------------------|--------------------------|
| 2 – 4             | 8                         | C45 inductively hardened |

Also note the project configuration of the gear rack on the Atlanta pages.

### 8.5.2.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 8.5.3 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 12.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 8.5.4 Lubricants

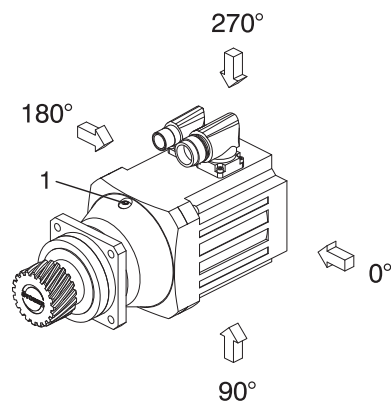
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 8.5.4.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 8.5.5 Position of the plug connectors



In the standard version, the plug connectors are attached in the 270° position (relative to the oil drain plug (1) of the planetary gear unit). Indicate variations for your rack and pinion drive in the order.

Note that the plug connectors also rotate when the gear rack is rotated to a different position.

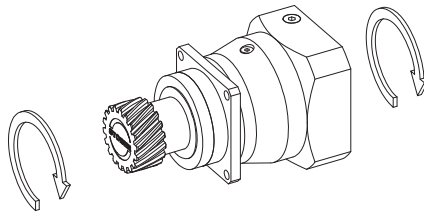


## 8.5.6 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 90 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 8.5.7 Direction of rotation

The input and output rotate in the same direction.



## 8.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

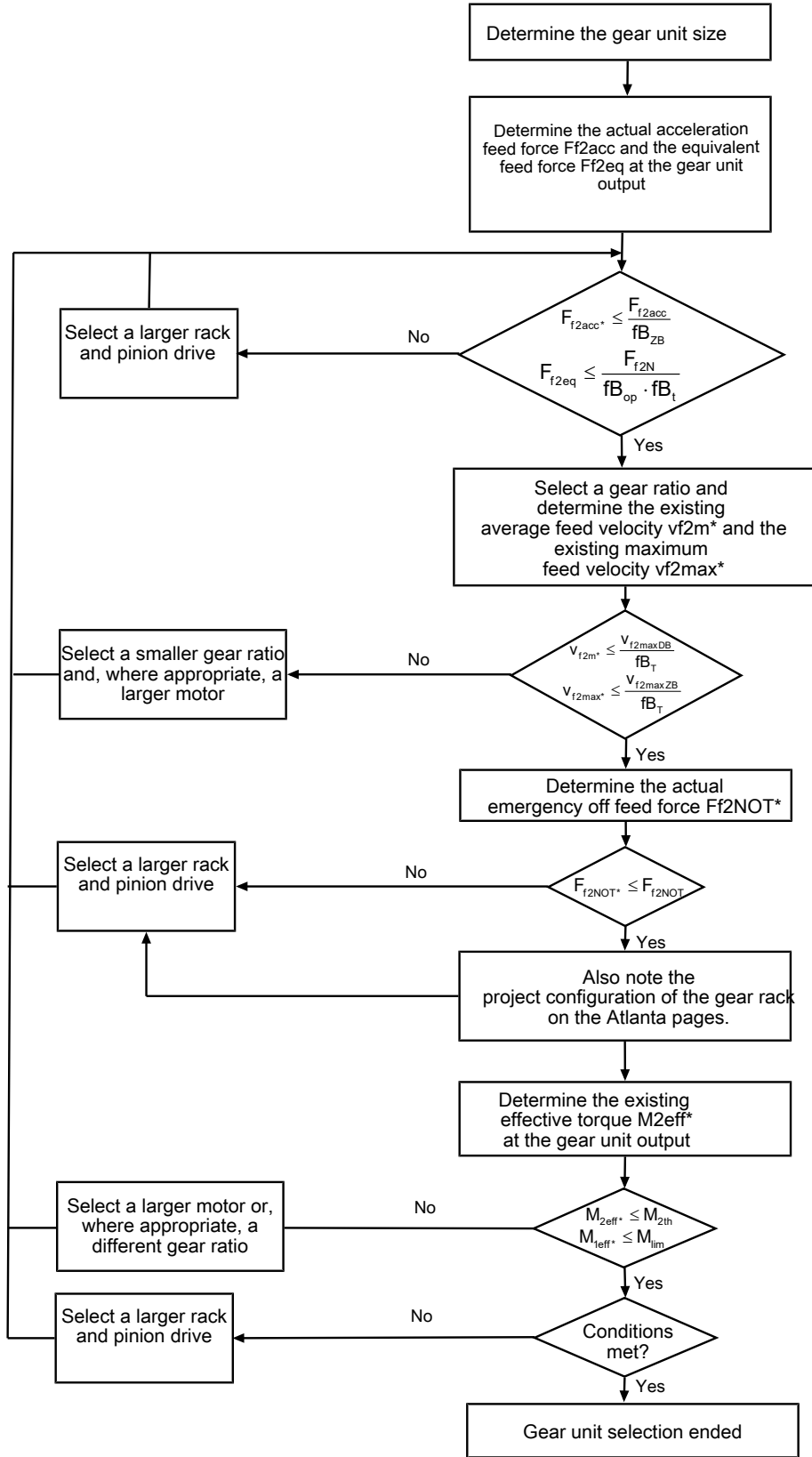
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

<sup>1</sup>Observe the protection class of all the components.

### 8.6.1 Drive selection

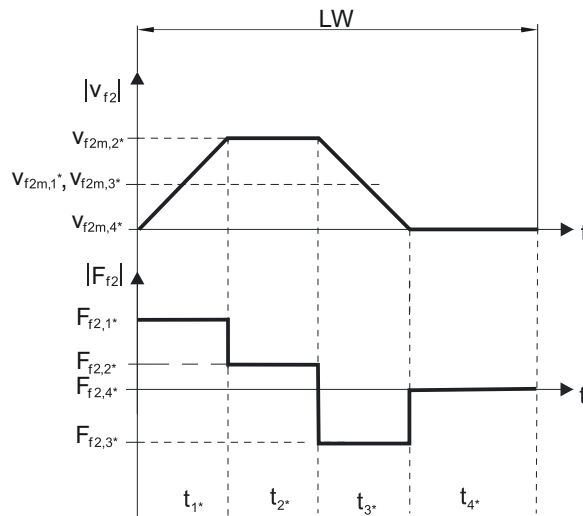


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

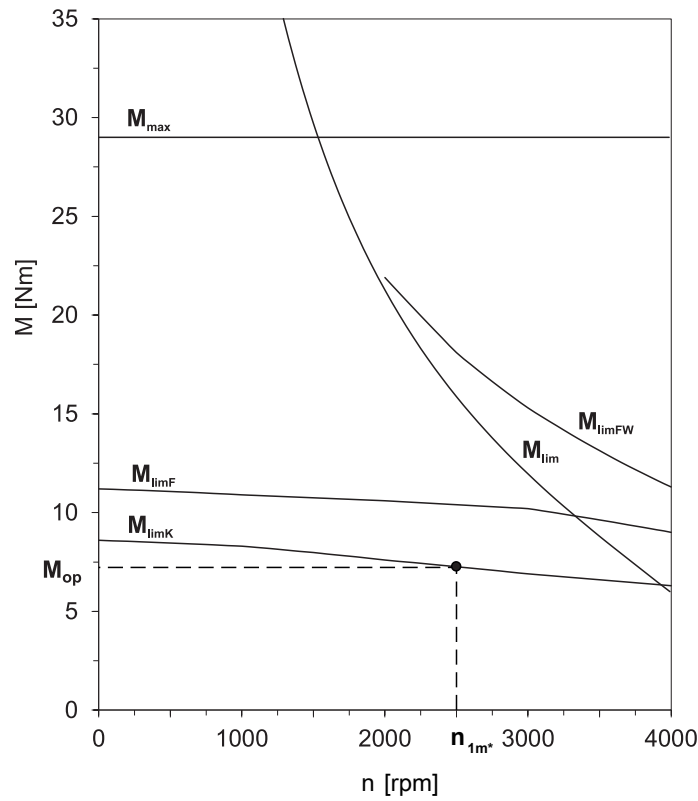
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,95 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 8.6.2 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

## 8.7 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

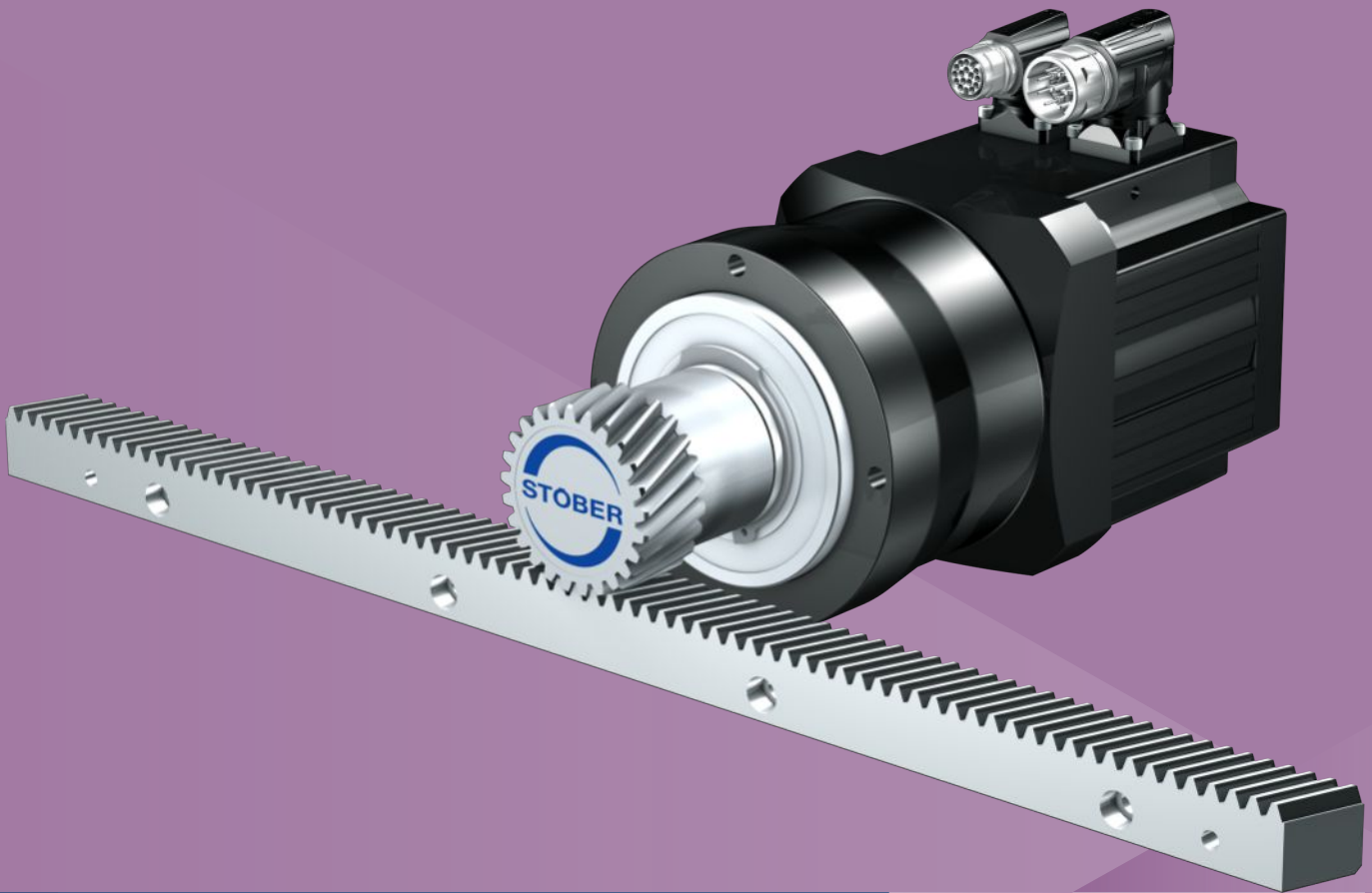
| Documentation  | ID        |
|--|-----------|
| Operating manual gear units, geared motors P23 – P93 | 443356_en |
| Operating manual for EZ synchronous servo motors     | 443032_en |
| Operating manual for gear racks (Atlanta)            | 442455    |



## 9 ZVPE rack and pinion drives

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## 9 Rack and pinion drives

# ZVPE

### 9.1 Overview

Cost-effective planetary geared motors with plug-on pinions

#### Features

|   |       |
|---|-------|
| Power density   | ★★★★☆ |
| Linear clearance  | ★★★★☆ |
| Price category  | €     |
| Smooth operation  | ★★★★☆ |
| Linear rigidity   | ★★★★☆ |
| Mass moment of inertia                                    | ★★★★☆ |
| Ready-to-install drive solution                           | ✓     |
| Pinion gearing quality 6 (DIN 3962)                       | ✓     |
| Helical gearing   | ✓     |
| Case-hardened and smoothed                                | ✓     |
| Compact and highly dynamic due to direct motor attachment | ✓     |

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                       |
|-------------|-----------------------|
| $m_n$       | 2 – 3 mm              |
| $z$         | 16 – 25               |
| $F_{f2acc}$ | 0.48 – 6.1 kN         |
| $v_{f2N}$   | 0.13 – 4.5 m/s        |
| $\Delta s$  | 40 – 83 $\mu\text{m}$ |



## 9.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 9.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2PE3 (<math>n_{1N} = 3000</math> rpm, (<math>F_{f2acc,max} = 1,9</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.21   | 1.3               | 1.3                | 3.6      | 1.1 | ZV216S_PE322_0250 EZ301U | 1.9                  | 3.4                   | 32                  | 25.00 | 0.28                   | 0.57                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.27   | 1.0               | 1.1                | 4.0      | 1.3 | ZV216S_PE322_0200 EZ301U | 1.9                  | 3.4                   | 32                  | 20.00 | 0.36                   | 0.71                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.33   | 0.8               | 0.9                | 4.5      | 1.5 | ZV216S_PE322_0160 EZ301U | 1.9                  | 3.4                   | 32                  | 16.00 | 0.44                   | 0.89                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.53   | 0.5               | 0.5                | 0.7      | 2.0 | ZV216S_PE321_0100 EZ301U | 1.6                  | 3.4                   | 27                  | 10.00 | 0.71                   | 1.24                   | 40                 | 6.3                 | 2             | 16 | 34.0          |
| 0.53   | 0.9               | 1.0                | 1.2      | 1.2 | ZV216S_PE321_0100 EZ302U | 1.9                  | 3.4                   | 32                  | 10.00 | 0.71                   | 1.24                   | 40                 | 6.3                 | 2             | 16 | 34.0          |
| 0.76   | 0.4               | 0.4                | 1.1      | 2.6 | ZV216S_PE321_0070 EZ301U | 1.1                  | 3.4                   | 19                  | 7.000 | 1.02                   | 1.78                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 0.76   | 0.6               | 0.7                | 1.8      | 1.5 | ZV216S_PE321_0070 EZ302U | 1.9                  | 3.4                   | 32                  | 7.000 | 1.02                   | 1.78                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 0.76   | 0.8               | 0.9                | 2.4      | 1.2 | ZV216S_PE321_0070 EZ303U | 1.9                  | 3.4                   | 32                  | 7.000 | 1.02                   | 1.78                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.07   | 0.3               | 0.3                | 1.7      | 3.2 | ZV216S_PE321_0050 EZ301U | 0.8                  | 3.4                   | 14                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 1.07   | 0.5               | 0.5                | 2.9      | 1.9 | ZV216S_PE321_0050 EZ302U | 1.4                  | 3.4                   | 24                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 1.07   | 0.6               | 0.6                | 3.7      | 1.5 | ZV216S_PE321_0050 EZ303U | 1.9                  | 3.4                   | 32                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 1.07   | 0.8               | 0.9                | 5.1      | 1.1 | ZV216S_PE321_0050 EZ401U | 1.9                  | 3.4                   | 32                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 1.33   | 0.2               | 0.2                | 2.3      | 3.8 | ZV216S_PE321_0040 EZ301U | 0.6                  | 3.4                   | 11                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.33   | 0.4               | 0.4                | 3.9      | 2.2 | ZV216S_PE321_0040 EZ302U | 1.1                  | 3.4                   | 19                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.33   | 0.5               | 0.5                | 5.1      | 1.7 | ZV216S_PE321_0040 EZ303U | 1.6                  | 3.4                   | 27                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.33   | 0.6               | 0.7                | 6.9      | 1.3 | ZV216S_PE321_0040 EZ401U | 1.9                  | 3.4                   | 32                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.78   | 0.2               | 0.2                | 3.7      | 4.6 | ZV216S_PE321_0030 EZ301U | 0.5                  | 3.4                   | 8.1                 | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| 1.78   | 0.3               | 0.3                | 6.3      | 2.7 | ZV216S_PE321_0030 EZ302U | 0.9                  | 3.4                   | 15                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| 1.78   | 0.4               | 0.4                | 8.2      | 2.1 | ZV216S_PE321_0030 EZ303U | 1.2                  | 3.4                   | 20                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| 1.78   | 0.5               | 0.5                | 11       | 1.5 | ZV216S_PE321_0030 EZ401U | 1.5                  | 3.4                   | 25                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| <b>ZV2PE3 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 1,9</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.27   | 0.9               | 1.0                | 1.5      | 1.2 | ZV216S_PE322_0400 EZ202U | 1.9                  | 3.4                   | 32                  | 40.00 | 0.20                   | 0.36                   | 49                 | 6.3                 | 2             | 16 | 34.0          |
| 0.31   | 0.8               | 0.9                | 1.6      | 1.4 | ZV216S_PE322_0350 EZ202U | 1.9                  | 3.4                   | 32                  | 35.00 | 0.20                   | 0.41                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.38   | 0.6               | 0.7                | 1.8      | 1.8 | ZV216S_PE322_0280 EZ202U | 1.9                  | 3.4                   | 32                  | 28.00 | 0.25                   | 0.51                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.38   | 1.0               | 1.1                | 2.8      | 1.2 | ZV216S_PE322_0280 EZ203U | 1.9                  | 3.4                   | 32                  | 28.00 | 0.25                   | 0.51                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.43   | 0.6               | 0.6                | 1.9      | 2.0 | ZV216S_PE322_0250 EZ202U | 1.9                  | 3.4                   | 32                  | 25.00 | 0.28                   | 0.57                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.43   | 0.9               | 1.0                | 2.9      | 1.3 | ZV216S_PE322_0250 EZ203U | 1.9                  | 3.4                   | 32                  | 25.00 | 0.28                   | 0.57                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.53   | 0.4               | 0.5                | 2.2      | 2.4 | ZV216S_PE322_0200 EZ202U | 1.7                  | 3.4                   | 28                  | 20.00 | 0.36                   | 0.71                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.53   | 0.7               | 0.8                | 3.3      | 1.6 | ZV216S_PE322_0200 EZ203U | 1.9                  | 3.4                   | 32                  | 20.00 | 0.36                   | 0.71                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.53   | 1.0               | 1.1                | 4.8      | 1.1 | ZV216S_PE322_0200 EZ301U | 1.9                  | 3.4                   | 32                  | 20.00 | 0.36                   | 0.71                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.67   | 0.4               | 0.4                | 2.4      | 2.8 | ZV216S_PE322_0160 EZ202U | 1.3                  | 3.4                   | 22                  | 16.00 | 0.44                   | 0.89                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.67   | 0.5               | 0.6                | 3.7      | 1.8 | ZV216S_PE322_0160 EZ203U | 1.9                  | 3.4                   | 32                  | 16.00 | 0.44                   | 0.89                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 0.67   | 0.8               | 0.9                | 5.4      | 1.3 | ZV216S_PE322_0160 EZ301U | 1.9                  | 3.4                   | 32                  | 16.00 | 0.44                   | 0.89                   | 49                 | 6.4                 | 2             | 16 | 34.0          |
| 1.07   | 0.5               | 0.5                | 0.9      | 1.7 | ZV216S_PE321_0100 EZ301U | 1.6                  | 3.4                   | 27                  | 10.00 | 0.71                   | 1.24                   | 40                 | 6.3                 | 2             | 16 | 34.0          |
| 1.07   | 0.9               | 1.0                | 1.4      | 1.0 | ZV216S_PE321_0100 EZ302U | 1.9                  | 3.4                   | 32                  | 10.00 | 0.71                   | 1.24                   | 40                 | 6.3                 | 2             | 16 | 34.0          |
| 1.52   | 0.4               | 0.4                | 1.3      | 2.2 | ZV216S_PE321_0070 EZ301U | 1.1                  | 3.4                   | 19                  | 7.000 | 1.02                   | 1.78                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 1.52   | 0.6               | 0.7                | 2.2      | 1.3 | ZV216S_PE321_0070 EZ302U | 1.9                  | 3.4                   | 32                  | 7.000 | 1.02                   | 1.78                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 2.13   | 0.3               | 0.3                | 2.0      | 2.7 | ZV216S_PE321_0050 EZ301U | 0.8                  | 3.4                   | 14                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 2.13   | 0.4               | 0.5                | 3.4      | 1.6 | ZV216S_PE321_0050 EZ302U | 1.4                  | 3.4                   | 24                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 2.13   | 0.6               | 0.6                | 4.5      | 1.2 | ZV216S_PE321_0050 EZ303U | 1.9                  | 3.4                   | 32                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 2.13   | 0.7               | 0.8                | 5.2      | 1.0 | ZV216S_PE321_0050 EZ401U | 1.9                  | 3.4                   | 32                  | 5.000 | 1.32                   | 2.49                   | 40                 | 6.5                 | 2             | 16 | 34.0          |
| 2.67   | 0.2               | 0.2                | 2.8      | 3.1 | ZV216S_PE321_0040 EZ301U | 0.6                  | 3.4                   | 11                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 2.67   | 0.3               | 0.4                | 4.7      | 1.9 | ZV216S_PE321_0040 EZ302U | 1.1                  | 3.4                   | 19                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 2.67   | 0.4               | 0.5                | 6.1      | 1.4 | ZV216S_PE321_0040 EZ303U | 1.6                  | 3.4                   | 27                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 2.67   | 0.5               | 0.6                | 7.1      | 1.2 | ZV216S_PE321_0040 EZ401U | 1.9                  | 3.4                   | 32                  | 4.000 | 1.64                   | 3.11                   | 40                 | 6.4                 | 2             | 16 | 34.0          |
| 3.56   | 0.2               | 0.2                | 4.5      | 3.8 | ZV216S_PE321_0030 EZ301U | 0.5                  | 3.4                   | 8.1                 | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| 3.56   | 0.3               | 0.3                | 7.5      | 2.2 | ZV216S_PE321_0030 EZ302U | 0.9                  | 3.4                   | 15                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |

9.2 Selection tables 9 ZVPE rack and pinion drives

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2PE3 (<math>n_{IN} = 6000</math> rpm, (<math>F_{fzacc,max} = 1,9</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 3.56   | 0.3               | 0.4                | 9.8      | 1.7 | ZV216S_PE321_0030 EZ303U | 1.2                  | 3.4                   | 20                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| 3.56   | 0.4               | 0.5                | 12       | 1.5 | ZV216S_PE321_0030 EZ401U | 1.5                  | 3.4                   | 25                  | 3.000 | 2.07                   | 3.56                   | 40                 | 6.2                 | 2             | 16 | 34.0          |
| <b>ZV2PE4 (<math>n_{IN} = 3000</math> rpm, (<math>F_{fzacc,max} = 2,7</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.17   | 1.7               | 1.7                | 1.5      | 1.1 | ZV220S_PE422_0400 EZ301U | 2.7                  | 4.3                   | 58                  | 40.00 | 0.22                   | 0.39                   | 62                 | 9.9                 | 2             | 20 | 42.4          |
| 0.19   | 1.5               | 1.5                | 1.6      | 1.2 | ZV220S_PE422_0350 EZ301U | 2.7                  | 4.3                   | 58                  | 35.00 | 0.25                   | 0.44                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.24   | 1.2               | 1.2                | 1.7      | 1.4 | ZV220S_PE422_0280 EZ301U | 2.7                  | 4.3                   | 58                  | 28.00 | 0.32                   | 0.56                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.27   | 1.0               | 1.1                | 1.8      | 1.5 | ZV220S_PE422_0250 EZ301U | 2.7                  | 4.3                   | 58                  | 25.00 | 0.33                   | 0.62                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.33   | 0.8               | 0.9                | 2.1      | 1.8 | ZV220S_PE422_0200 EZ301U | 2.5                  | 4.3                   | 53                  | 20.00 | 0.41                   | 0.78                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.33   | 1.4               | 1.5                | 3.5      | 1.0 | ZV220S_PE422_0200 EZ302U | 2.7                  | 4.3                   | 58                  | 20.00 | 0.41                   | 0.78                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.42   | 0.7               | 0.7                | 2.3      | 2.1 | ZV220S_PE422_0160 EZ301U | 2.0                  | 4.3                   | 43                  | 16.00 | 0.51                   | 0.97                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.42   | 1.1               | 1.2                | 4.0      | 1.2 | ZV220S_PE422_0160 EZ302U | 2.7                  | 4.3                   | 58                  | 16.00 | 0.51                   | 0.97                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.95   | 0.9               | 1.0                | 1.7      | 1.2 | ZV220S_PE421_0070 EZ401U | 2.7                  | 4.3                   | 58                  | 7.000 | 1.14                   | 1.91                   | 49                 | 9.9                 | 2             | 20 | 42.4          |
| 1.33   | 0.6               | 0.7                | 2.8      | 1.4 | ZV220S_PE421_0050 EZ401U | 1.9                  | 4.3                   | 41                  | 5.000 | 1.51                   | 2.67                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 1.67   | 0.5               | 0.5                | 3.7      | 1.7 | ZV220S_PE421_0040 EZ401U | 1.6                  | 4.3                   | 33                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 1.67   | 0.8               | 0.9                | 5.6      | 1.1 | ZV220S_PE421_0040 EZ501U | 2.7                  | 4.3                   | 58                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 1.67   | 0.9               | 1.0                | 6.2      | 1.0 | ZV220S_PE421_0040 EZ402U | 2.7                  | 4.3                   | 58                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 2.22   | 0.4               | 0.4                | 6.3      | 2.0 | ZV220S_PE421_0030 EZ401U | 1.2                  | 4.3                   | 25                  | 3.000 | 2.22                   | 4.07                   | 49                 | 9.9                 | 2             | 20 | 42.4          |
| 2.22   | 0.6               | 0.6                | 9.7      | 1.3 | ZV220S_PE421_0030 EZ501U | 2.2                  | 4.3                   | 47                  | 3.000 | 2.22                   | 4.07                   | 49                 | 9.9                 | 2             | 20 | 42.4          |
| 2.22   | 0.6               | 0.7                | 11       | 1.2 | ZV220S_PE421_0030 EZ402U | 2.2                  | 4.3                   | 47                  | 3.000 | 2.22                   | 4.07                   | 49                 | 9.9                 | 2             | 20 | 42.4          |
| <b>ZV2PE4 (<math>n_{IN} = 6000</math> rpm, (<math>F_{fzacc,max} = 2,7</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.38   | 1.4               | 1.5                | 1.9      | 1.0 | ZV220S_PE422_0350 EZ301U | 2.7                  | 4.3                   | 58                  | 35.00 | 0.25                   | 0.44                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.48   | 1.1               | 1.2                | 2.1      | 1.2 | ZV220S_PE422_0280 EZ301U | 2.7                  | 4.3                   | 58                  | 28.00 | 0.32                   | 0.56                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.53   | 1.0               | 1.1                | 2.2      | 1.3 | ZV220S_PE422_0250 EZ301U | 2.7                  | 4.3                   | 58                  | 25.00 | 0.33                   | 0.62                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.67   | 0.8               | 0.9                | 2.5      | 1.5 | ZV220S_PE422_0200 EZ301U | 2.5                  | 4.3                   | 53                  | 20.00 | 0.41                   | 0.78                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.83   | 0.6               | 0.7                | 2.8      | 1.7 | ZV220S_PE422_0160 EZ301U | 2.0                  | 4.3                   | 43                  | 16.00 | 0.51                   | 0.97                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 0.83   | 1.1               | 1.2                | 4.7      | 1.0 | ZV220S_PE422_0160 EZ302U | 2.7                  | 4.3                   | 58                  | 16.00 | 0.51                   | 0.97                   | 62                 | 10                  | 2             | 20 | 42.4          |
| 1.91   | 0.7               | 0.9                | 1.8      | 1.1 | ZV220S_PE421_0070 EZ401U | 2.7                  | 4.3                   | 58                  | 7.000 | 1.14                   | 1.91                   | 49                 | 9.9                 | 2             | 20 | 42.4          |
| 2.67   | 0.5               | 0.6                | 2.9      | 1.4 | ZV220S_PE421_0050 EZ401U | 1.9                  | 4.3                   | 41                  | 5.000 | 1.51                   | 2.67                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 3.33   | 0.4               | 0.5                | 3.8      | 1.6 | ZV220S_PE421_0040 EZ401U | 1.6                  | 4.3                   | 33                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 3.33   | 0.6               | 0.8                | 5.6      | 1.1 | ZV220S_PE421_0040 EZ501U | 2.7                  | 4.3                   | 58                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| 3.33   | 0.6               | 0.9                | 5.8      | 1.1 | ZV220S_PE421_0040 EZ402U | 2.7                  | 4.3                   | 58                  | 4.000 | 1.89                   | 3.33                   | 49                 | 10                  | 2             | 20 | 42.4          |
| <b>ZV2PE5 (<math>n_{IN} = 3000</math> rpm, (<math>F_{fzacc,max} = 6,1</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.24   | 3.5               | 3.8                | 2.1      | 1.0 | ZV225S_PE522_0350 EZ401U | 6.1                  | 7.6                   | 162                 | 35.00 | 0.29                   | 0.48                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.30   | 2.8               | 3.0                | 2.4      | 1.2 | ZV225S_PE522_0280 EZ401U | 6.1                  | 7.6                   | 162                 | 28.00 | 0.36                   | 0.60                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.33   | 2.5               | 2.7                | 2.5      | 1.3 | ZV225S_PE522_0250 EZ401U | 6.1                  | 7.6                   | 162                 | 25.00 | 0.38                   | 0.67                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.42   | 2.0               | 2.1                | 2.8      | 1.5 | ZV225S_PE522_0200 EZ401U | 6.1                  | 7.6                   | 162                 | 20.00 | 0.47                   | 0.83                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.52   | 1.6               | 1.7                | 3.1      | 1.7 | ZV225S_PE522_0160 EZ401U | 4.9                  | 7.6                   | 129                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.52   | 2.5               | 2.7                | 4.8      | 1.1 | ZV225S_PE522_0160 EZ501U | 6.1                  | 7.6                   | 162                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.52   | 2.7               | 3.0                | 5.3      | 1.0 | ZV225S_PE522_0160 EZ402U | 6.1                  | 7.6                   | 162                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.83   | 1.6               | 1.7                | 2.2      | 1.5 | ZV225S_PE521_0100 EZ501U | 5.9                  | 7.6                   | 155                 | 10.00 | 0.83                   | 1.39                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.19   | 1.1               | 1.2                | 3.3      | 1.9 | ZV225S_PE521_0070 EZ501U | 4.1                  | 7.6                   | 109                 | 7.000 | 1.11                   | 1.98                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.19   | 1.9               | 2.0                | 5.7      | 1.1 | ZV225S_PE521_0070 EZ502U | 6.1                  | 7.6                   | 162                 | 7.000 | 1.11                   | 1.98                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.19   | 1.9               | 2.1                | 5.7      | 1.1 | ZV225S_PE521_0070 EZ701U | 5.1                  | 7.6                   | 136                 | 7.000 | 1.11                   | 1.98                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.67   | 0.8               | 0.9                | 5.0      | 2.3 | ZV225S_PE521_0050 EZ501U | 2.9                  | 7.6                   | 78                  | 5.000 | 1.44                   | 2.78                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.67   | 1.4               | 1.5                | 8.6      | 1.4 | ZV225S_PE521_0050 EZ502U | 5.7                  | 7.6                   | 150                 | 5.000 | 1.44                   | 2.78                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.67   | 1.4               | 1.5                | 8.6      | 1.4 | ZV225S_PE521_0050 EZ701U | 3.7                  | 7.6                   | 97                  | 5.000 | 1.44                   | 2.78                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 1.67   | 1.8               | 2.0                | 11       | 1.0 | ZV225S_PE521_0050 EZ503U | 6.1                  | 7.6                   | 162                 | 5.000 | 1.44                   | 2.78                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.08   | 0.6               | 0.7                | 6.5      | 2.7 | ZV225S_PE521_0040 EZ501U | 2.3                  | 7.6                   | 62                  | 4.000 | 1.81                   | 3.47                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.08   | 1.1               | 1.2                | 11       | 1.6 | ZV225S_PE521_0040 EZ502U | 4.5                  | 7.6                   | 120                 | 4.000 | 1.81                   | 3.47                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.08   | 1.1               | 1.2                | 11       | 1.6 | ZV225S_PE521_0040 EZ701U | 2.9                  | 7.6                   | 78                  | 4.000 | 1.81                   | 3.47                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.08   | 1.4               | 1.6                | 15       | 1.2 | ZV225S_PE521_0040 EZ503U | 6.1                  | 7.6                   | 162                 | 4.000 | 1.81                   | 3.47                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 0.5               | 0.5                | 13       | 3.3 | ZV225S_PE521_0030 EZ501U | 1.8                  | 7.6                   | 47                  | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 0.8               | 0.9                | 23       | 1.9 | ZV225S_PE521_0030 EZ502U | 3.4                  | 7.6                   | 90                  | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 0.8               | 0.9                | 23       | 1.9 | ZV225S_PE521_0030 EZ701U | 2.2                  | 7.6                   | 58                  | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 1.1               | 1.2                | 30       | 1.5 | ZV225S_PE521_0030 EZ503U | 4.7                  | 7.6                   | 125                 | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 1.3               | 1.6                | 37       | 1.2 | ZV225S_PE521_0030 EZ702U | 4.5                  | 7.6                   | 119                 | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 2.78   | 1.5               | 1.8                | 42       | 1.0 | ZV225S_PE521_0030 EZ505U | 6.1                  | 7.6                   | 162                 | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| <b>ZV2PE5 (<math>n_{IN} = 4500</math> rpm, (<math>F_{fzacc,max} = 6,1</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 3.13   | 1.4               | 2.2                | 16       | 1.1 | ZV225S_PE521_0040 EZ505U | 6.1                  | 7.6                   | 162                 | 4.000 | 1.81                   | 3.47                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 4.17   | 1.0               | 1.7                | 34       | 1.3 | ZV225S_PE521_0030 EZ505U | 6.1                  | 7.6                   | 162                 | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| 4.17   | 1.3               | 2.2                | 43       | 1.0 | ZV225S_PE521_0030 EZ703U | 6.1                  | 7.6                   | 162                 | 3.000 | 2.32                   | 4.17                   | 62                 | 13                  | 2             | 25 | 53.1          |
| <b>ZV2PE5 (<math>n_{IN} = 6000</math> rpm, (<math>F_{fzacc,max} = 6,1</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.60   | 2.3               | 2.8                | 2.5      | 1.1 | ZV225S_PE522_0280 EZ401U | 6.1                  | 7.6                   | 162                 | 28.00 | 0.36                   | 0.60                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.67   | 2.1               | 2.5                | 2.6      | 1.2 | ZV225S_PE522_0250 EZ401U | 6.1                  | 7.6                   | 162                 | 25.00 | 0.38                   | 0.67                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 0.83   | 1.6               | 2.0                | 2.9      | 1.4 | ZV225S_PE522_0200 EZ401U | 6.1                  | 7.6                   | 162                 | 20.00 | 0.47                   | 0.83                   | 77                 | 13                  | 2             | 25 | 53.1          |

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2PE5 (<math>n_{IN} = 6000</math> rpm, (<math>F_{f2acc,max} = 6,1</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 1.04   | 1.3               | 1.6                | 3.3      | 1.6 | ZV225S_PE522_0160 EZ401U | 4.9                  | 7.6                   | 129                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 1.04   | 1.9               | 2.5                | 4.8      | 1.1 | ZV225S_PE522_0160 EZ501U | 6.1                  | 7.6                   | 162                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| 1.04   | 2.0               | 2.8                | 4.9      | 1.1 | ZV225S_PE522_0160 EZ402U | 6.1                  | 7.6                   | 162                 | 16.00 | 0.59                   | 1.04                   | 77                 | 13                  | 2             | 25 | 53.1          |
| <b>ZV3PE5 (<math>n_{IN} = 3000</math> rpm, (<math>F_{f2acc,max} = 5,8</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.23   | 3.7               | 4.0                | 2.0      | 1.0 | ZV318S_PE522_0400 EZ401U | 5.8                  | 7.8                   | 166                 | 40.00 | 0.27                   | 0.45                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.26   | 3.2               | 3.5                | 2.1      | 1.1 | ZV318S_PE522_0350 EZ401U | 5.8                  | 7.8                   | 166                 | 35.00 | 0.31                   | 0.51                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.32   | 2.6               | 2.8                | 2.4      | 1.3 | ZV318S_PE522_0280 EZ401U | 5.8                  | 7.8                   | 166                 | 28.00 | 0.39                   | 0.64                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.36   | 2.3               | 2.5                | 2.5      | 1.4 | ZV318S_PE522_0250 EZ401U | 5.8                  | 7.8                   | 166                 | 25.00 | 0.41                   | 0.72                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.45   | 1.9               | 2.0                | 2.8      | 1.6 | ZV318S_PE522_0200 EZ401U | 5.6                  | 7.8                   | 162                 | 20.00 | 0.51                   | 0.90                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.45   | 2.9               | 3.1                | 4.3      | 1.0 | ZV318S_PE522_0200 EZ501U | 5.8                  | 7.8                   | 166                 | 20.00 | 0.51                   | 0.90                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.56   | 1.5               | 1.6                | 3.1      | 1.9 | ZV318S_PE522_0160 EZ401U | 4.5                  | 7.8                   | 129                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.56   | 2.3               | 2.5                | 4.8      | 1.2 | ZV318S_PE522_0160 EZ501U | 5.8                  | 7.8                   | 166                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.56   | 2.5               | 2.8                | 5.3      | 1.1 | ZV318S_PE522_0160 EZ402U | 5.8                  | 7.8                   | 166                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.90   | 1.5               | 1.6                | 2.2      | 1.6 | ZV318S_PE521_0100 EZ501U | 5.4                  | 7.8                   | 155                 | 10.00 | 0.90                   | 1.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.29   | 1.0               | 1.1                | 3.3      | 2.1 | ZV318S_PE521_0070 EZ501U | 3.8                  | 7.8                   | 109                 | 7.000 | 1.20                   | 2.14                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.29   | 1.8               | 1.9                | 5.7      | 1.2 | ZV318S_PE521_0070 EZ502U | 5.8                  | 7.8                   | 166                 | 7.000 | 1.20                   | 2.14                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.29   | 1.8               | 2.0                | 5.7      | 1.2 | ZV318S_PE521_0070 EZ701U | 4.7                  | 7.8                   | 136                 | 7.000 | 1.20                   | 2.14                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.80   | 0.7               | 0.8                | 5.0      | 2.6 | ZV318S_PE521_0050 EZ501U | 2.7                  | 7.8                   | 78                  | 5.000 | 1.56                   | 3.00                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.80   | 1.3               | 1.4                | 8.6      | 1.5 | ZV318S_PE521_0050 EZ502U | 5.2                  | 7.8                   | 150                 | 5.000 | 1.56                   | 3.00                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.80   | 1.3               | 1.4                | 8.6      | 1.5 | ZV318S_PE521_0050 EZ701U | 3.4                  | 7.8                   | 97                  | 5.000 | 1.56                   | 3.00                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 1.80   | 1.6               | 1.9                | 11       | 1.1 | ZV318S_PE521_0050 EZ503U | 5.8                  | 7.8                   | 166                 | 5.000 | 1.56                   | 3.00                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 2.25   | 0.6               | 0.6                | 6.5      | 3.0 | ZV318S_PE521_0040 EZ501U | 2.2                  | 7.8                   | 62                  | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 2.25   | 1.0               | 1.1                | 11       | 1.7 | ZV318S_PE521_0040 EZ502U | 4.2                  | 7.8                   | 120                 | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 2.25   | 1.0               | 1.1                | 11       | 1.7 | ZV318S_PE521_0040 EZ701U | 2.7                  | 7.8                   | 78                  | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 2.25   | 1.3               | 1.5                | 15       | 1.3 | ZV318S_PE521_0040 EZ503U | 5.8                  | 7.8                   | 166                 | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 2.25   | 1.6               | 2.0                | 18       | 1.1 | ZV318S_PE521_0040 EZ702U | 5.6                  | 7.8                   | 159                 | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 0.4               | 0.5                | 13       | 3.6 | ZV318S_PE521_0030 EZ501U | 1.6                  | 7.8                   | 47                  | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 0.8               | 0.8                | 23       | 2.1 | ZV318S_PE521_0030 EZ502U | 3.1                  | 7.8                   | 90                  | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 0.8               | 0.8                | 23       | 2.1 | ZV318S_PE521_0030 EZ701U | 2.0                  | 7.8                   | 58                  | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 1.0               | 1.1                | 30       | 1.6 | ZV318S_PE521_0030 EZ503U | 4.4                  | 7.8                   | 125                 | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 1.2               | 1.5                | 37       | 1.3 | ZV318S_PE521_0030 EZ702U | 4.2                  | 7.8                   | 119                 | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.00   | 1.4               | 1.6                | 42       | 1.2 | ZV318S_PE521_0030 EZ505U | 5.8                  | 7.8                   | 166                 | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| <b>ZV3PE5 (<math>n_{IN} = 4500</math> rpm, (<math>F_{f2acc,max} = 5,8</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 2.70   | 1.6               | 2.6                | 13       | 1.0 | ZV318S_PE521_0050 EZ505U | 5.8                  | 7.8                   | 166                 | 5.000 | 1.56                   | 3.00                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 3.38   | 1.3               | 2.1                | 16       | 1.2 | ZV318S_PE521_0040 EZ505U | 5.8                  | 7.8                   | 166                 | 4.000 | 1.95                   | 3.75                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 4.50   | 1.0               | 1.6                | 34       | 1.4 | ZV318S_PE521_0030 EZ505U | 5.8                  | 7.8                   | 166                 | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| 4.50   | 1.2               | 2.0                | 43       | 1.1 | ZV318S_PE521_0030 EZ703U | 5.8                  | 7.8                   | 166                 | 3.000 | 2.50                   | 4.50                   | 67                 | 14                  | 3             | 18 | 57.3          |
| <b>ZV3PE5 (<math>n_{IN} = 6000</math> rpm, (<math>F_{f2acc,max} = 5,8</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.51   | 2.7               | 3.2                | 2.2      | 1.1 | ZV318S_PE522_0350 EZ401U | 5.8                  | 7.8                   | 166                 | 35.00 | 0.31                   | 0.51                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.64   | 2.1               | 2.6                | 2.5      | 1.2 | ZV318S_PE522_0280 EZ401U | 5.8                  | 7.8                   | 166                 | 28.00 | 0.39                   | 0.64                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.72   | 1.9               | 2.3                | 2.6      | 1.3 | ZV318S_PE522_0250 EZ401U | 5.8                  | 7.8                   | 166                 | 25.00 | 0.41                   | 0.72                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.90   | 1.5               | 1.9                | 2.9      | 1.5 | ZV318S_PE522_0200 EZ401U | 5.6                  | 7.8                   | 162                 | 20.00 | 0.51                   | 0.90                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.90   | 2.3               | 2.9                | 4.3      | 1.0 | ZV318S_PE522_0200 EZ501U | 5.8                  | 7.8                   | 166                 | 20.00 | 0.51                   | 0.90                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 0.90   | 2.3               | 3.2                | 4.4      | 1.0 | ZV318S_PE522_0200 EZ402U | 5.8                  | 7.8                   | 166                 | 20.00 | 0.51                   | 0.90                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 1.13   | 1.2               | 1.5                | 3.3      | 1.8 | ZV318S_PE522_0160 EZ401U | 4.5                  | 7.8                   | 129                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 1.13   | 1.8               | 2.3                | 4.8      | 1.2 | ZV318S_PE522_0160 EZ501U | 5.8                  | 7.8                   | 166                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |
| 1.13   | 1.9               | 2.6                | 4.9      | 1.2 | ZV318S_PE522_0160 EZ402U | 5.8                  | 7.8                   | 166                 | 16.00 | 0.64                   | 1.13                   | 83                 | 14                  | 3             | 18 | 57.3          |

## 9.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

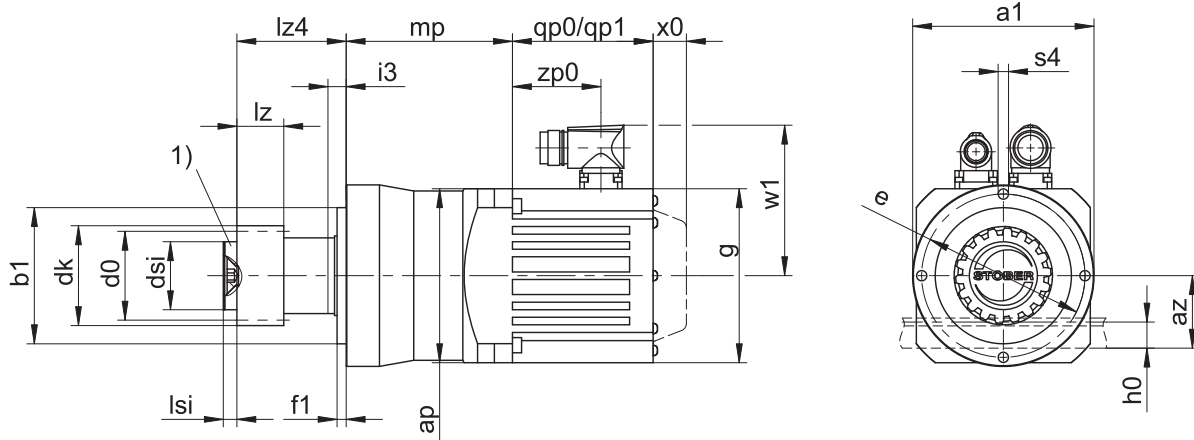
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.

### 9.3.1 Pinion position E



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type        | mn | Øa1 | az    | Øb1              | Ød0   | Ødk   | Ødsi | Øe  | f1 | h0 | i3 | lz | lz4  | lsi | Øs4 | x   |
|-------------|----|-----|-------|------------------|-------|-------|------|-----|----|----|----|----|------|-----|-----|-----|
| ZV216SEPE3_ | 2  | 70  | 39.98 | 52 <sub>h6</sub> | 33.95 | 39.81 | 25   | 62  | 5  | 22 | 7  | 26 | 37.5 | 4   | M5  | 0.5 |
| ZV220SEPE4_ | 2  | 90  | 44.02 | 68 <sub>h6</sub> | 42.44 | 47.90 | 30   | 80  | 5  | 22 | 10 | 26 | 48.5 | 6   | M6  | 0.4 |
| ZV225SEPE5_ | 2  | 120 | 49.33 | 90 <sub>h6</sub> | 53.05 | 58.52 | 45   | 108 | 6  | 22 | 12 | 26 | 72.5 | 8   | M8  | 0.4 |
| ZV318SEPE5_ | 3  | 120 | 55.55 | 90 <sub>h6</sub> | 57.30 | 65.01 | 45   | 108 | 6  | 26 | 12 | 31 | 72.5 | 8   | M8  | 0.3 |

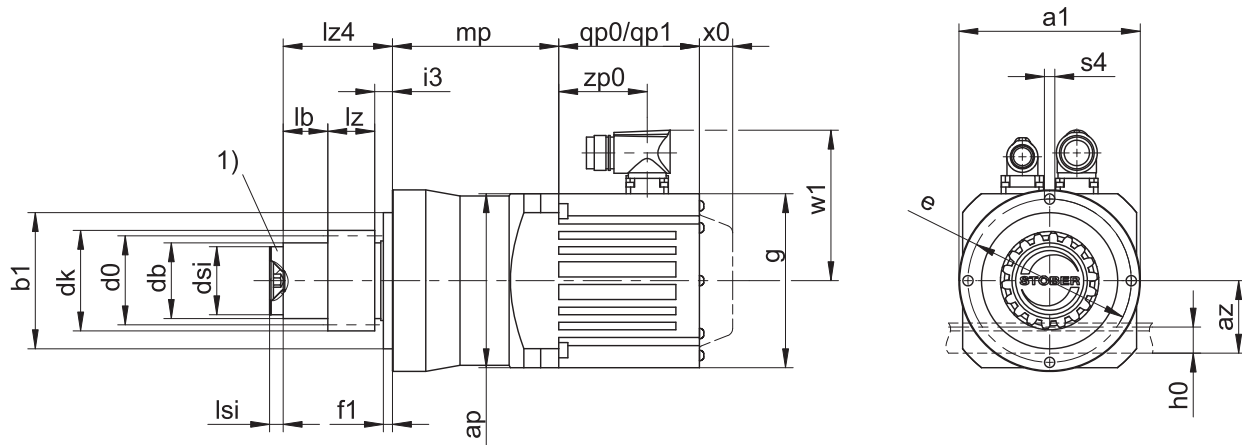
#### Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ202U | 55  | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55  | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98  | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |

#### Dimensions of geared motors

| Type      | EZ2 |       | EZ3  |       | EZ4  |       | EZ5  |       | EZ7  |       |
|-----------|-----|-------|------|-------|------|-------|------|-------|------|-------|
|           | ap  | mp    | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    |
| ZV_PE321_ | -   | -     | □72  | 86.5  | □98  | 83.0  | -    | -     | -    | -     |
| ZV_PE322_ | Ø75 | 106.5 | Ø75  | 120.0 | -    | -     | -    | -     | -    | -     |
| ZV_PE421_ | -   | -     | -    | -     | □98  | 89.0  | □115 | 91.5  | -    | -     |
| ZV_PE422_ | -   | -     | Ø100 | 129.0 | -    | -     | -    | -     | -    | -     |
| ZV_PE521_ | -   | -     | -    | -     | -    | -     | Ø120 | 110.0 | □145 | 113.0 |
| ZV_PE522_ | -   | -     | -    | -     | Ø120 | 152.0 | Ø120 | 151.5 | -    | -     |

### 9.3.2 Pinion position S



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type        | mn | Øa1 | az    | Øb1              | Ød0   | Ødb | Ødk   | Ødsi | Øe  | f1 | h0 | i3 | lb   | lz | lz4  | lsi | Øs4 | x   |
|-------------|----|-----|-------|------------------|-------|-----|-------|------|-----|----|----|----|------|----|------|-----|-----|-----|
| ZV216SSPE3_ | 2  | 70  | 39.98 | 52 <sub>h6</sub> | 33.95 | 30  | 39.81 | 25   | 62  | 5  | 22 | 7  | 4.5  | 26 | 37.5 | 4   | M5  | 0.5 |
| ZV220SSPE4_ | 2  | 90  | 44.02 | 68 <sub>h6</sub> | 42.44 | 38  | 47.90 | 30   | 80  | 5  | 22 | 10 | 12.5 | 26 | 48.5 | 6   | M6  | 0.4 |
| ZV225SSPE5_ | 2  | 120 | 49.33 | 90 <sub>h6</sub> | 53.05 | 50  | 58.52 | 45   | 108 | 6  | 22 | 12 | 34.5 | 26 | 72.5 | 8   | M8  | 0.4 |
| ZV318SSPE5_ | 3  | 120 | 55.55 | 90 <sub>h6</sub> | 57.30 | 50  | 65.01 | 45   | 108 | 6  | 26 | 12 | 29.5 | 31 | 72.5 | 8   | M8  | 0.3 |

#### Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ202U | 55  | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55  | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98  | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |

#### Dimensions of geared motors

| Type      | EZ2 |       | EZ3  |       | EZ4  |       | EZ5  |       | EZ7  |       |
|-----------|-----|-------|------|-------|------|-------|------|-------|------|-------|
|           | ap  | mp    | ap   | mp    | ap   | mp    | ap   | mp    | ap   | mp    |
| ZV_PE321_ | -   | -     | □72  | 86.5  | □98  | 83.0  | -    | -     | -    | -     |
| ZV_PE322_ | Ø75 | 106.5 | Ø75  | 120.0 | -    | -     | -    | -     | -    | -     |
| ZV_PE421_ | -   | -     | -    | -     | □98  | 89.0  | □115 | 91.5  | -    | -     |
| ZV_PE422_ | -   | -     | Ø100 | 129.0 | -    | -     | -    | -     | -    | -     |
| ZV_PE521_ | -   | -     | -    | -     | -    | -     | Ø120 | 110.0 | □145 | 113.0 |
| ZV_PE522_ | -   | -     | -    | -     | Ø120 | 152.0 | Ø120 | 151.5 | -    | -     |

## 9.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |   |    |   |   |   |   |   |   |   |      |        |
|---|---|---|----|---|---|----|---|---|---|---|---|---|---|------|--------|
| Z | V | 2 | 20 | S | S | PE | 4 | 2 | 1 | S | P | S | S | 0050 | EZ401U |
|---|---|---|----|---|---|----|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                 | Design                          |
|--------|-----------------------------|---------------------------------|
| Z      | Type                        | Rack and pinion drive           |
| V      | Design                      | Plug-on pinion                  |
| 2      | Module                      | $m_n = 2$ (example)             |
| 20     | Number of teeth             | $z = 20$ (example)              |
| S      | Toothing                    | Helical (left-hand 19° 31' 42") |
| E      | Pinion position             | Shaft end                       |
| S      |                             | Shaft shoulder                  |
| PE     | Type                        | Planetary gear unit             |
| 4      | Size                        | 4 (example)                     |
| 2      | Generation                  | Generation 2                    |
| 1      | Stages                      | Single-stage                    |
| 2      |                             | Two-stage                       |
| S      | Housing                     | Standard                        |
| P      | Shaft                       | Solid shaft with feather key    |
| S      | Bearing                     | Standard bearing                |
| S      | Backlash                    | Standard                        |
| 0050   | Transmission ratio (i x 10) | i = 5 (example)                 |
| EZ401U | Motor                       | EZ synchronous servo motor      |

To complete the type designation, also specify the following in your order:

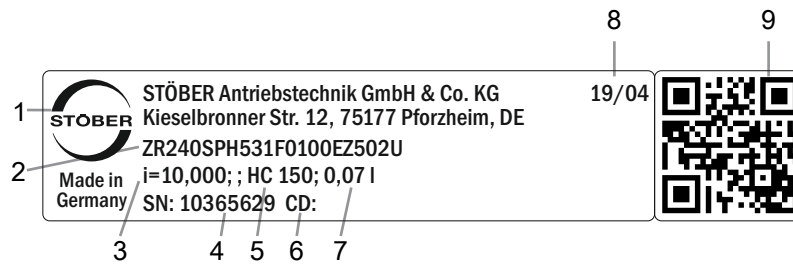
- For a detailed type designation of the motor, see the chapter [\[ 13\]](#)
- For axial locking (optional), see the chapter [\[ 9.3\]](#)

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 9.5.1\]](#).

## 9.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 9.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 9.5 Product description

### 9.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

ME motor adapter



Catalog ID 443137\_en

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 9.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 6.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material       |
|-------------------|---------------------------|--------------------------|
| 2 – 4             | 8                         | C45 inductively hardened |

Also note the project configuration of the gear rack on the Atlanta pages.

### 9.5.2.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 9.5.3 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 9.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 9.5.4.1 Rack and pinion drive lubrication

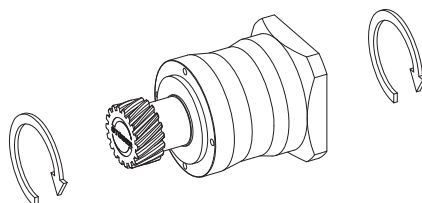
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 9.5.5 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 80 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable          |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP64                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 9.5.6 Direction of rotation

The input and output rotate in the same direction.



<sup>1</sup> Observe the protection class of all the components.

## 9.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

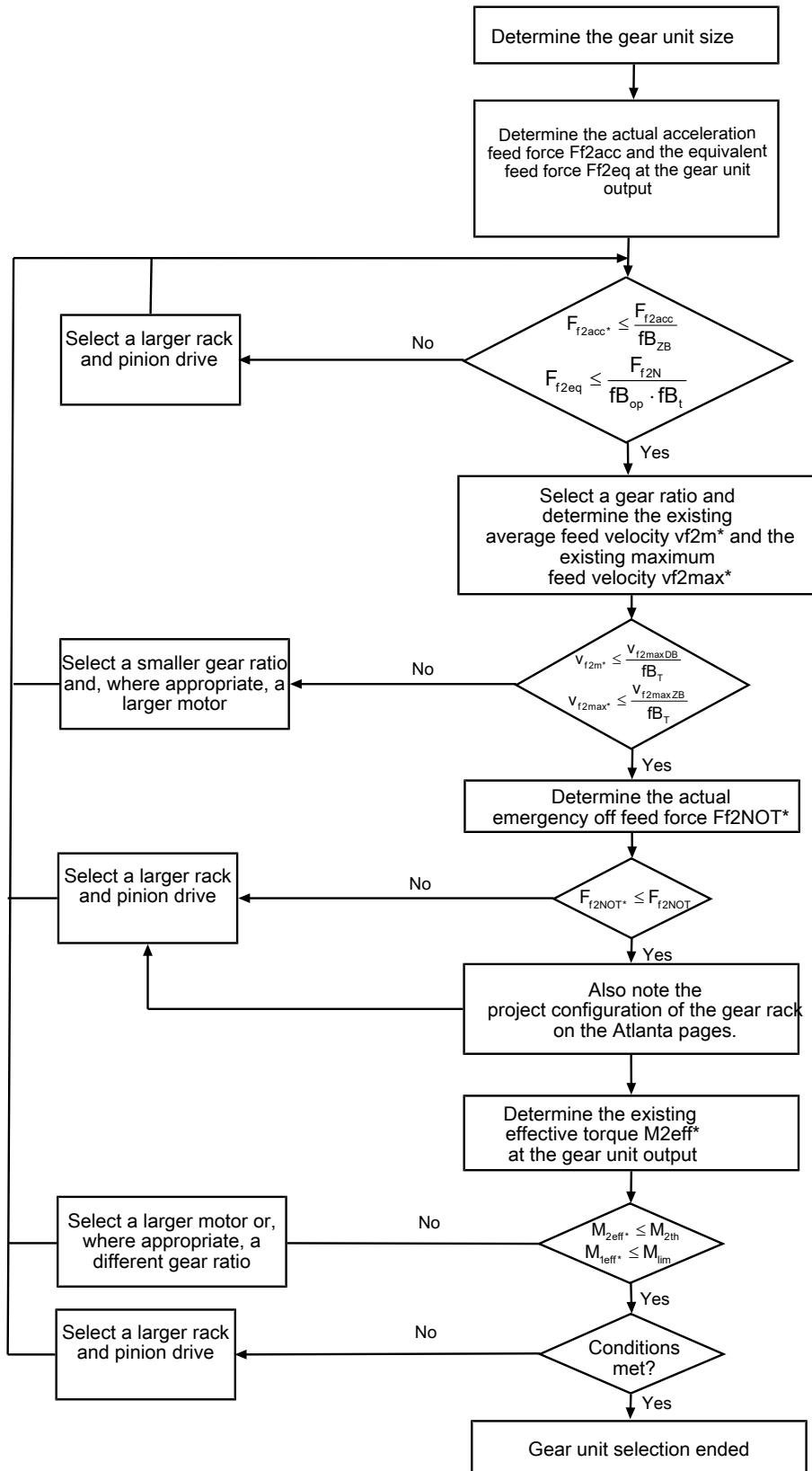
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 9.6.1 Drive selection

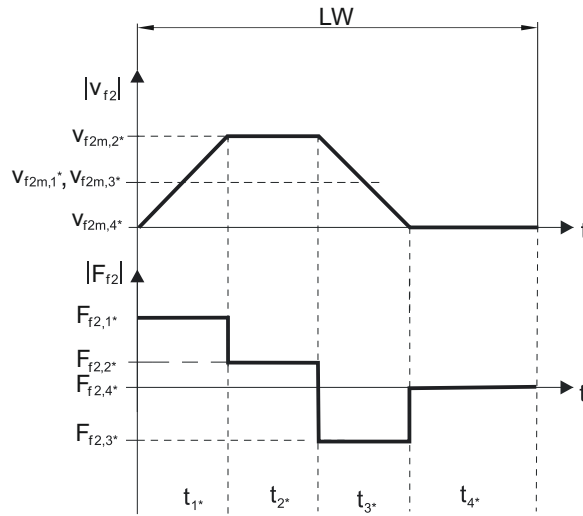


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

### Example of cyclic operation

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:



#### Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

#### Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

#### Calculation of the actual emergency off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

#### Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

#### Calculation of the thermal limit torque

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

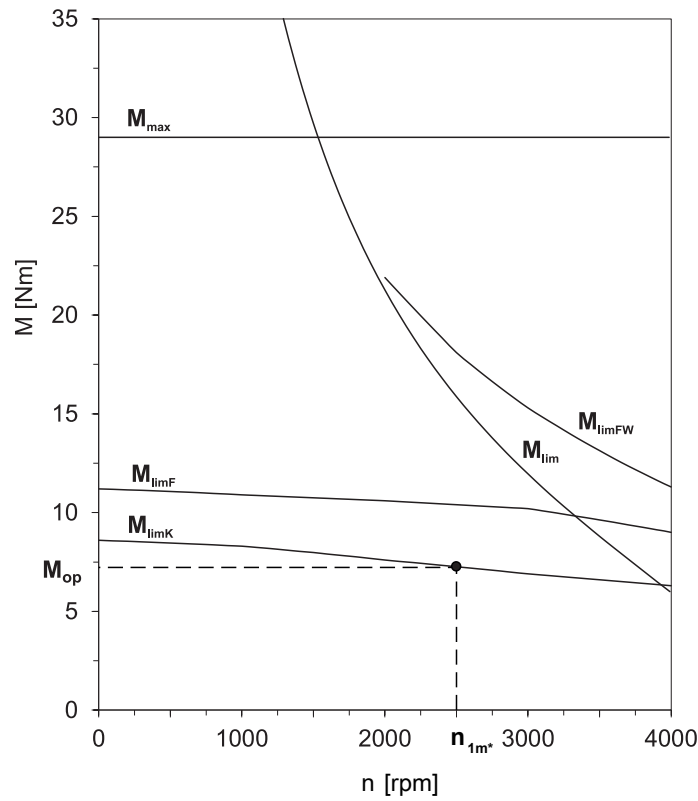
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,95 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



**Calculation of the actual effective torque**

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

**Operating factors**

| Operating mode                  |                         | $fB_{op}$ |
|---------------------------------|-------------------------|-----------|
| Uniform continuous operation    |                         | 1.00      |
| Cyclic operation                |                         | 1.00      |
| Reversing load cyclic operation |                         | 1.00      |
| Run time                        |                         | $fB_t$    |
| Daily runtime ≤ 8 h             |                         | 1.00      |
| Daily runtime ≤ 16 h            |                         | 1.15      |
| Daily runtime ≤ 24 h            |                         | 1.20      |
| Cyclic operation                |                         | $fB_{zB}$ |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00      |
| > 1000 load changes/hour (LW/h) |                         | 1.15      |
| Temperature                     |                         | $fB_T$    |
| Motor cooling                   | Surrounding temperature |           |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9       |
|                                 | ≤ 30 °C                 | 1.0       |
|                                 | ≤ 40 °C                 | 1.15      |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0       |
|                                 | ≤ 30 °C                 | 1.1       |
|                                 | ≤ 40 °C                 | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

**9.6.2 Radial shaft seal rings****Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

**9.7 Additional documentation**

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

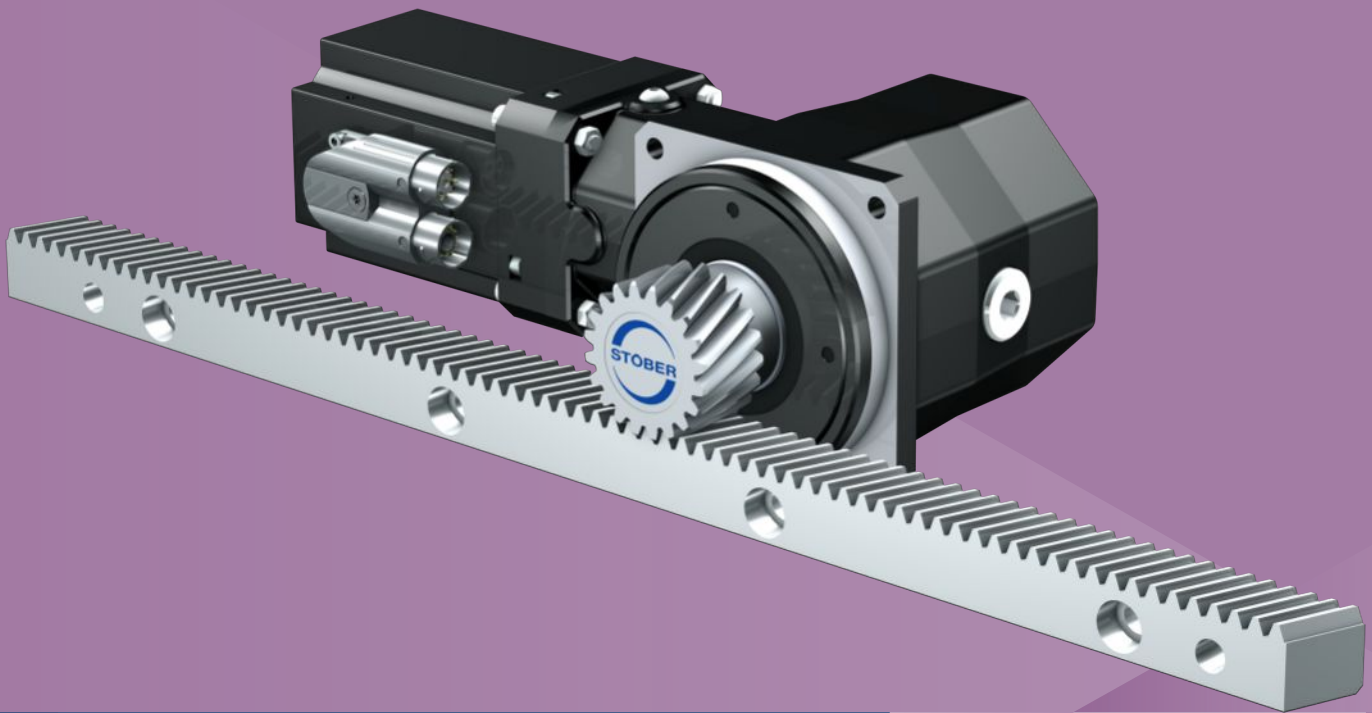
Enter the ID of the documentation in the Search term field.

| Documentation   | ID        |
|---|-----------|
| Operating manual for PE22 – PE52 planetary gear units and planetary geared motors | 443252_en |
| Operating manual for EZ synchronous servo motors                                  | 443032_en |
| Operating manual for gear racks (Atlanta)   | 442455    |

# 10 ZVKS rack and pinion drives

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# 10

## Rack and pinion drives

# ZVKS

### 10.1 Overview

Right-angle servo geared motors with plug-on pinion

#### Features

- Power density ★★★★★
- Linear clearance ★★★★★
- Price category €€€
- Smooth operation ★★★★★
- Linear rigidity ★★★★★
- Mass moment of inertia ★★★★★
- Ready-to-install drive solution ✓
- Pinion gearing quality 6 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓
- Compact and highly dynamic due to direct motor attachment ✓

Key ★☆☆☆☆ good | ★★★★★ excellent  
 € Economy | €€€€€ Premium

#### Technical data

|             |                       |
|-------------|-----------------------|
| $m_n$       | 2 – 4 mm              |
| $z$         | 18 – 25               |
| $F_{f2acc}$ | 1.3 – 11 kN           |
| $v_{f2N}$   | 0.08 – 3 m/s          |
| $\Delta s$  | 37 – 44 $\mu\text{m}$ |



## 10.2 Selection table

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 10.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to <https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2KS4 (<math>n_{1N} = 3000</math> rpm, <math>F_{f2acc,max} = 4,2</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.13  | 2.0               | 2.1                | 0.2      | 1.2 | ZV220S_KS403_0500 EZ301U | 4.2                  | 6.6                   | 90                  | 50.00 | 0.18                   | 0.27                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.17  | 1.6               | 1.7                | 0.3      | 1.5 | ZV220S_KS403_0400 EZ301U | 4.2                  | 6.6                   | 90                  | 40.00 | 0.19                   | 0.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.21  | 1.3               | 1.3                | 0.4      | 1.9 | ZV220S_KS403_0320 EZ301U | 3.9                  | 6.6                   | 83                  | 32.00 | 0.24                   | 0.42                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.21  | 2.2               | 2.4                | 0.6      | 1.1 | ZV220S_KS403_0320 EZ302U | 4.2                  | 6.6                   | 90                  | 32.00 | 0.24                   | 0.42                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.28  | 1.0               | 1.0                | 0.5      | 2.5 | ZV220S_KS403_0240 EZ301U | 2.9                  | 6.6                   | 62                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.28  | 1.7               | 1.8                | 0.9      | 1.5 | ZV220S_KS403_0240 EZ302U | 4.2                  | 6.6                   | 90                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.28  | 2.2               | 2.3                | 1.2      | 1.1 | ZV220S_KS403_0240 EZ303U | 4.2                  | 6.6                   | 90                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 0.8               | 0.9                | 0.7      | 2.9 | ZV220S_KS402_0200 EZ301U | 2.5                  | 6.6                   | 53                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 1.4               | 1.5                | 1.2      | 1.7 | ZV220S_KS402_0200 EZ302U | 4.2                  | 6.6                   | 90                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 1.9               | 2.0                | 1.5      | 1.3 | ZV220S_KS402_0200 EZ303U | 4.2                  | 6.6                   | 90                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.48  | 0.6               | 0.6                | 1.0      | 4.2 | ZV220S_KS402_0140 EZ301U | 1.8                  | 6.6                   | 37                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.48  | 1.0               | 1.1                | 1.8      | 2.4 | ZV220S_KS402_0140 EZ302U | 3.1                  | 6.6                   | 67                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.48  | 1.3               | 1.4                | 2.3      | 1.9 | ZV220S_KS402_0140 EZ303U | 4.2                  | 6.6                   | 90                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.48  | 1.8               | 1.9                | 3.1      | 1.4 | ZV220S_KS402_0140 EZ401U | 4.2                  | 6.6                   | 90                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 0.7               | 0.8                | 2.6      | 3.4 | ZV220S_KS402_0100 EZ302U | 2.2                  | 6.6                   | 48                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 0.9               | 1.0                | 3.4      | 2.6 | ZV220S_KS402_0100 EZ303U | 3.1                  | 6.6                   | 67                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 1.3               | 1.3                | 4.7      | 1.9 | ZV220S_KS402_0100 EZ401U | 3.8                  | 6.6                   | 81                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 1.9               | 2.1                | 7.2      | 1.3 | ZV220S_KS402_0100 EZ501U | 4.2                  | 6.6                   | 90                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 2.1               | 2.3                | 7.8      | 1.2 | ZV220S_KS402_0100 EZ402U | 4.2                  | 6.6                   | 90                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.83  | 0.6               | 0.6                | 3.5      | 4.3 | ZV220S_KS402_0080 EZ302U | 1.8                  | 6.6                   | 38                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.83  | 0.7               | 0.8                | 4.5      | 3.3 | ZV220S_KS402_0080 EZ303U | 2.5                  | 6.6                   | 53                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.83  | 1.0               | 1.1                | 6.1      | 2.4 | ZV220S_KS402_0080 EZ401U | 3.0                  | 6.6                   | 65                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.83  | 1.5               | 1.7                | 9.3      | 1.6 | ZV220S_KS402_0080 EZ501U | 4.2                  | 6.6                   | 90                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.83  | 1.7               | 1.9                | 10       | 1.4 | ZV220S_KS402_0080 EZ402U | 4.2                  | 6.6                   | 90                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 0.6               | 0.6                | 6.4      | 4.4 | ZV220S_KS402_0060 EZ303U | 1.9                  | 6.6                   | 40                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 0.8               | 0.8                | 8.6      | 3.2 | ZV220S_KS402_0060 EZ401U | 2.3                  | 6.6                   | 48                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 1.2               | 1.3                | 13       | 2.1 | ZV220S_KS402_0060 EZ501U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 1.3               | 1.4                | 14       | 1.9 | ZV220S_KS402_0060 EZ402U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 1.9               | 2.3                | 21       | 1.3 | ZV220S_KS402_0060 EZ404U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.11  | 2.0               | 2.1                | 23       | 1.2 | ZV220S_KS402_0060 EZ502U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| <b>ZV2KS4 (<math>n_{1N} = 6000</math> rpm, <math>F_{f2acc,max} = 4,2</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.13  | 1.8               | 1.9                | 0.1      | 1.1 | ZV220S_KS403_1000 EZ202U | 4.2                  | 6.6                   | 90                  | 100.0 | 0.10                   | 0.13                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.17  | 1.4               | 1.5                | 0.1      | 1.4 | ZV220S_KS403_0800 EZ202U | 4.2                  | 6.6                   | 90                  | 80.00 | 0.13                   | 0.17                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.19  | 1.2               | 1.3                | 0.1      | 1.6 | ZV220S_KS403_0700 EZ202U | 4.2                  | 6.6                   | 90                  | 70.00 | 0.14                   | 0.19                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.19  | 1.9               | 2.1                | 0.1      | 1.0 | ZV220S_KS403_0700 EZ203U | 4.2                  | 6.6                   | 90                  | 70.00 | 0.14                   | 0.19                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.27  | 0.9               | 1.0                | 0.1      | 2.2 | ZV220S_KS403_0500 EZ202U | 3.2                  | 6.6                   | 69                  | 50.00 | 0.18                   | 0.27                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.27  | 1.3               | 1.5                | 0.2      | 1.4 | ZV220S_KS403_0500 EZ203U | 4.2                  | 6.6                   | 90                  | 50.00 | 0.18                   | 0.27                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 0.7               | 0.8                | 0.2      | 2.8 | ZV220S_KS403_0400 EZ202U | 2.6                  | 6.6                   | 55                  | 40.00 | 0.19                   | 0.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 1.1               | 1.2                | 0.2      | 1.8 | ZV220S_KS403_0400 EZ203U | 4.2                  | 6.6                   | 90                  | 40.00 | 0.19                   | 0.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.33  | 1.6               | 1.7                | 0.3      | 1.2 | ZV220S_KS403_0400 EZ301U | 4.2                  | 6.6                   | 90                  | 40.00 | 0.19                   | 0.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.42  | 0.6               | 0.6                | 0.2      | 3.4 | ZV220S_KS403_0320 EZ202U | 2.1                  | 6.6                   | 44                  | 32.00 | 0.24                   | 0.42                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.42  | 0.9               | 1.0                | 0.3      | 2.3 | ZV220S_KS403_0320 EZ203U | 3.8                  | 6.6                   | 80                  | 32.00 | 0.24                   | 0.42                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.42  | 1.2               | 1.3                | 0.5      | 1.5 | ZV220S_KS403_0320 EZ301U | 3.9                  | 6.6                   | 83                  | 32.00 | 0.24                   | 0.42                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.56  | 0.4               | 0.5                | 0.3      | 4.6 | ZV220S_KS403_0240 EZ202U | 1.6                  | 6.6                   | 33                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.56  | 0.6               | 0.7                | 0.4      | 3.0 | ZV220S_KS403_0240 EZ203U | 2.8                  | 6.6                   | 60                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.56  | 0.9               | 1.0                | 0.6      | 2.1 | ZV220S_KS403_0240 EZ301U | 2.9                  | 6.6                   | 62                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.56  | 1.6               | 1.8                | 1.1      | 1.2 | ZV220S_KS403_0240 EZ302U | 4.2                  | 6.6                   | 90                  | 24.00 | 0.32                   | 0.56                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67  | 0.8               | 0.9                | 0.8      | 2.4 | ZV220S_KS402_0200 EZ301U | 2.5                  | 6.6                   | 53                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |

10.2 Selection table 10 ZVKS rack and pinion drives

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{zaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2KS4 (<math>n_{fN} = 6000</math> rpm, (<math>F_{fzacc,max} = 4,2</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.67   | 1.3               | 1.5                | 1.4      | 1.4 | ZV220S_KS402_0200 EZ302U | 4.2                  | 6.6                   | 90                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.67   | 1.8               | 2.0                | 1.8      | 1.1 | ZV220S_KS402_0200 EZ303U | 4.2                  | 6.6                   | 90                  | 20.00 | 0.44                   | 0.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.95   | 0.6               | 0.6                | 1.2      | 3.5 | ZV220S_KS402_0140 EZ301U | 1.8                  | 6.6                   | 37                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.95   | 0.9               | 1.1                | 2.1      | 2.1 | ZV220S_KS402_0140 EZ302U | 3.1                  | 6.6                   | 67                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.95   | 1.2               | 1.4                | 2.7      | 1.6 | ZV220S_KS402_0140 EZ303U | 4.2                  | 6.6                   | 90                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 0.95   | 1.4               | 1.8                | 3.2      | 1.3 | ZV220S_KS402_0140 EZ401U | 4.2                  | 6.6                   | 90                  | 14.00 | 0.64                   | 0.95                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 0.4               | 0.4                | 1.9      | 4.8 | ZV220S_KS402_0100 EZ301U | 1.3                  | 6.6                   | 27                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 0.7               | 0.8                | 3.1      | 2.9 | ZV220S_KS402_0100 EZ302U | 2.2                  | 6.6                   | 48                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 0.9               | 1.0                | 4.1      | 2.2 | ZV220S_KS402_0100 EZ303U | 3.1                  | 6.6                   | 67                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 1.0               | 1.3                | 4.8      | 1.9 | ZV220S_KS402_0100 EZ401U | 3.8                  | 6.6                   | 81                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 1.5               | 2.0                | 7.1      | 1.3 | ZV220S_KS402_0100 EZ501U | 4.2                  | 6.6                   | 90                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.33   | 1.6               | 2.2                | 7.3      | 1.2 | ZV220S_KS402_0100 EZ402U | 4.2                  | 6.6                   | 90                  | 10.00 | 0.84                   | 1.33                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 0.5               | 0.6                | 4.1      | 3.6 | ZV220S_KS402_0080 EZ302U | 1.8                  | 6.6                   | 38                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 0.7               | 0.8                | 5.4      | 2.7 | ZV220S_KS402_0080 EZ303U | 2.5                  | 6.6                   | 53                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 0.8               | 1.0                | 6.3      | 2.3 | ZV220S_KS402_0080 EZ401U | 3.0                  | 6.6                   | 65                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 1.2               | 1.6                | 9.3      | 1.6 | ZV220S_KS402_0080 EZ501U | 4.2                  | 6.6                   | 90                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 1.3               | 1.8                | 9.6      | 1.5 | ZV220S_KS402_0080 EZ402U | 4.2                  | 6.6                   | 90                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 1.67   | 1.9               | 2.8                | 14       | 1.0 | ZV220S_KS402_0080 EZ502U | 4.2                  | 6.6                   | 90                  | 8.000 | 0.97                   | 1.67                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 0.4               | 0.5                | 5.8      | 4.8 | ZV220S_KS402_0060 EZ302U | 1.3                  | 6.6                   | 29                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 0.5               | 0.6                | 7.6      | 3.7 | ZV220S_KS402_0060 EZ303U | 1.9                  | 6.6                   | 40                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 0.6               | 0.8                | 8.9      | 3.1 | ZV220S_KS402_0060 EZ401U | 2.3                  | 6.6                   | 48                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 0.9               | 1.2                | 13       | 2.1 | ZV220S_KS402_0060 EZ501U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 0.9               | 1.3                | 14       | 2.1 | ZV220S_KS402_0060 EZ402U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 1.4               | 2.1                | 20       | 1.4 | ZV220S_KS402_0060 EZ502U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 1.6               | 2.3                | 22       | 1.2 | ZV220S_KS402_0060 EZ404U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| 2.22   | 1.7               | 2.8                | 24       | 1.2 | ZV220S_KS402_0060 EZ503U | 4.2                  | 6.6                   | 90                  | 6.000 | 1.11                   | 2.22                   | 37                 | 36                  | 2             | 20 | 42.4          |
| <b>ZV2KS5 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 7,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.08   | 3.3               | 3.3                | 0.1      | 1.1 | ZV225S_KS503_1000 EZ301U | 7.5                  | 11                    | 200                 | 100.0 | 0.12                   | 0.17                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.10   | 2.6               | 2.7                | 0.1      | 1.4 | ZV225S_KS503_0800 EZ301U | 7.5                  | 11                    | 200                 | 80.00 | 0.15                   | 0.21                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.12   | 2.3               | 2.3                | 0.1      | 1.6 | ZV225S_KS503_0700 EZ301U | 6.9                  | 11                    | 182                 | 70.00 | 0.17                   | 0.24                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.17   | 1.6               | 1.7                | 0.1      | 2.3 | ZV225S_KS503_0500 EZ301U | 4.9                  | 11                    | 130                 | 50.00 | 0.19                   | 0.33                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.17   | 2.8               | 2.9                | 0.2      | 1.3 | ZV225S_KS503_0500 EZ302U | 7.5                  | 11                    | 200                 | 50.00 | 0.19                   | 0.33                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.17   | 3.6               | 3.8                | 0.3      | 1.0 | ZV225S_KS503_0500 EZ303U | 7.5                  | 11                    | 200                 | 50.00 | 0.19                   | 0.33                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.21   | 1.3               | 1.3                | 0.2      | 2.9 | ZV225S_KS503_0400 EZ301U | 3.9                  | 11                    | 104                 | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.21   | 2.2               | 2.4                | 0.3      | 1.7 | ZV225S_KS503_0400 EZ302U | 7.0                  | 11                    | 186                 | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.21   | 2.9               | 3.1                | 0.4      | 1.3 | ZV225S_KS503_0400 EZ303U | 7.5                  | 11                    | 200                 | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.26   | 1.0               | 1.1                | 0.2      | 3.6 | ZV225S_KS503_0320 EZ301U | 3.1                  | 11                    | 83                  | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.26   | 1.8               | 1.9                | 0.4      | 2.1 | ZV225S_KS503_0320 EZ302U | 5.6                  | 11                    | 149                 | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.26   | 2.3               | 2.5                | 0.5      | 1.6 | ZV225S_KS503_0320 EZ303U | 7.5                  | 11                    | 200                 | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.26   | 3.1               | 3.4                | 0.7      | 1.2 | ZV225S_KS503_0320 EZ401U | 7.5                  | 11                    | 200                 | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.35   | 0.8               | 0.8                | 0.3      | 4.8 | ZV225S_KS503_0240 EZ301U | 2.4                  | 11                    | 62                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.35   | 1.3               | 1.4                | 0.6      | 2.8 | ZV225S_KS503_0240 EZ302U | 4.2                  | 11                    | 112                 | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.35   | 1.7               | 1.8                | 0.7      | 2.1 | ZV225S_KS503_0240 EZ303U | 5.9                  | 11                    | 156                 | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.35   | 2.4               | 2.5                | 1.0      | 1.6 | ZV225S_KS503_0240 EZ401U | 7.2                  | 11                    | 190                 | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.35   | 3.6               | 4.0                | 1.5      | 1.0 | ZV225S_KS503_0240 EZ501U | 7.5                  | 11                    | 200                 | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 2.0               | 2.1                | 1.2      | 1.9 | ZV225S_KS502_0200 EZ401U | 6.1                  | 11                    | 162                 | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 3.1               | 3.4                | 1.9      | 1.2 | ZV225S_KS502_0200 EZ501U | 7.5                  | 11                    | 200                 | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 3.4               | 3.7                | 2.1      | 1.1 | ZV225S_KS502_0200 EZ402U | 7.5                  | 11                    | 200                 | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 1.4               | 1.5                | 1.9      | 2.7 | ZV225S_KS502_0140 EZ401U | 4.3                  | 11                    | 113                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 2.2               | 2.4                | 2.9      | 1.7 | ZV225S_KS502_0140 EZ501U | 7.5                  | 11                    | 200                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 2.4               | 2.6                | 3.2      | 1.6 | ZV225S_KS502_0140 EZ402U | 7.5                  | 11                    | 200                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 3.5               | 4.3                | 4.7      | 1.1 | ZV225S_KS502_0140 EZ404U | 7.5                  | 11                    | 200                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 3.7               | 4.0                | 5.0      | 1.0 | ZV225S_KS502_0140 EZ502U | 7.5                  | 11                    | 200                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.60   | 3.7               | 4.2                | 5.0      | 1.0 | ZV225S_KS502_0140 EZ701U | 7.5                  | 11                    | 200                 | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 1.0               | 1.1                | 2.9      | 3.7 | ZV225S_KS502_0100 EZ401U | 3.0                  | 11                    | 81                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 1.5               | 1.7                | 4.4      | 2.4 | ZV225S_KS502_0100 EZ501U | 5.7                  | 11                    | 152                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 1.7               | 1.9                | 4.8      | 2.2 | ZV225S_KS502_0100 EZ402U | 5.7                  | 11                    | 152                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 2.5               | 3.1                | 7.0      | 1.5 | ZV225S_KS502_0100 EZ404U | 7.5                  | 11                    | 200                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 2.7               | 2.9                | 7.6      | 1.4 | ZV225S_KS502_0100 EZ502U | 7.5                  | 11                    | 200                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 2.7               | 3.0                | 7.6      | 1.4 | ZV225S_KS502_0100 EZ701U | 7.2                  | 11                    | 190                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 3.5               | 4.0                | 9.9      | 1.1 | ZV225S_KS502_0100 EZ503U | 7.5                  | 11                    | 200                 | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 0.8               | 0.9                | 3.7      | 4.7 | ZV225S_KS502_0080 EZ401U | 2.4                  | 11                    | 65                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 1.2               | 1.3                | 5.7      | 3.0 | ZV225S_KS502_0080 EZ501U | 4.6                  | 11                    | 122                 | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 1.3               | 1.5                | 6.3      | 2.8 | ZV225S_KS502_0080 EZ402U | 4.6                  | 11                    | 122                 | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 2.0               | 2.5                | 9.2      | 1.9 | ZV225S_KS502_0080 EZ404U | 7.5                  | 11                    | 200                 | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 2.1               | 2.3                | 9.9      | 1.8 | ZV225S_KS502_0080 EZ502U | 7.5                  | 11                    | 200                 | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{fzaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2KS5 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 7,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.04   | 2.1               | 2.4                | 9.9      | 1.8 | ZV225S_KS502_0080 EZ701U | 5.7                  | 11                    | 152                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 2.8               | 3.2                | 13       | 1.3 | ZV225S_KS502_0080 EZ503U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.04   | 3.4               | 4.1                | 16       | 1.1 | ZV225S_KS502_0080 EZ702U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 0.9               | 1.0                | 9.2      | 3.6 | ZV225S_KS502_0060 EZ501U | 3.4                  | 11                    | 91                   | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 1.0               | 1.1                | 10       | 3.3 | ZV225S_KS502_0060 EZ402U | 3.4                  | 11                    | 91                   | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 1.5               | 1.8                | 15       | 2.2 | ZV225S_KS502_0060 EZ404U | 6.2                  | 11                    | 165                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 1.6               | 1.7                | 16       | 2.1 | ZV225S_KS502_0060 EZ502U | 6.7                  | 11                    | 177                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 1.6               | 1.8                | 16       | 2.1 | ZV225S_KS502_0060 EZ701U | 4.3                  | 11                    | 114                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 2.1               | 2.4                | 21       | 1.6 | ZV225S_KS502_0060 EZ503U | 7.5                  | 11                    | 200                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 2.6               | 3.1                | 26       | 1.3 | ZV225S_KS502_0060 EZ702U | 7.5                  | 11                    | 200                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.39   | 2.9               | 3.4                | 29       | 1.1 | ZV225S_KS502_0060 EZ505U | 7.5                  | 11                    | 200                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| <b>ZV2KS5 (<math>n_{fN} = 4500</math> rpm, (<math>F_{fzacc,max} = 7,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.56   | 2.7               | 4.4                | 15       | 1.2 | ZV225S_KS502_0080 EZ505U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 2.0               | 3.3                | 23       | 1.4 | ZV225S_KS502_0060 EZ505U | 7.5                  | 11                    | 200                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 2.6               | 4.3                | 30       | 1.1 | ZV225S_KS502_0060 EZ703U | 7.5                  | 11                    | 200                  | 6.000 | 1.16                   | 2.55                   | 39                 | 46                  | 2             | 25 | 53.1          |
| <b>ZV2KS5 (<math>n_{fN} = 6000</math> rpm, (<math>F_{fzacc,max} = 7,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.21   | 2.5               | 2.7                | 0.1      | 1.2 | ZV225S_KS503_0800 EZ301U | 7.5                  | 11                    | 200                  | 80.00 | 0.15                   | 0.21                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.24   | 2.2               | 2.3                | 0.1      | 1.4 | ZV225S_KS503_0700 EZ301U | 6.9                  | 11                    | 182                  | 70.00 | 0.17                   | 0.24                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.33   | 1.6               | 1.7                | 0.2      | 1.9 | ZV225S_KS503_0500 EZ301U | 4.9                  | 11                    | 130                  | 50.00 | 0.19                   | 0.33                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.33   | 2.6               | 2.9                | 0.3      | 1.1 | ZV225S_KS503_0500 EZ302U | 7.5                  | 11                    | 200                  | 50.00 | 0.19                   | 0.33                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 1.2               | 1.3                | 0.2      | 2.4 | ZV225S_KS503_0400 EZ301U | 3.9                  | 11                    | 104                  | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 2.1               | 2.4                | 0.4      | 1.4 | ZV225S_KS503_0400 EZ302U | 7.0                  | 11                    | 186                  | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.42   | 2.7               | 3.2                | 0.5      | 1.1 | ZV225S_KS503_0400 EZ303U | 7.5                  | 11                    | 200                  | 40.00 | 0.22                   | 0.42                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.52   | 1.0               | 1.1                | 0.3      | 3.0 | ZV225S_KS503_0320 EZ301U | 3.1                  | 11                    | 83                   | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.52   | 1.7               | 1.9                | 0.5      | 1.8 | ZV225S_KS503_0320 EZ302U | 5.6                  | 11                    | 149                  | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.52   | 2.2               | 2.5                | 0.6      | 1.4 | ZV225S_KS503_0320 EZ303U | 7.5                  | 11                    | 200                  | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.52   | 2.6               | 3.1                | 0.7      | 1.2 | ZV225S_KS503_0320 EZ401U | 7.5                  | 11                    | 200                  | 32.00 | 0.27                   | 0.52                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 0.7               | 0.8                | 0.4      | 4.0 | ZV225S_KS503_0240 EZ301U | 2.4                  | 11                    | 62                   | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 1.3               | 1.4                | 0.7      | 2.4 | ZV225S_KS503_0240 EZ302U | 4.2                  | 11                    | 112                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 1.6               | 1.9                | 0.9      | 1.8 | ZV225S_KS503_0240 EZ303U | 5.9                  | 11                    | 156                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 1.9               | 2.4                | 1.0      | 1.5 | ZV225S_KS503_0240 EZ401U | 7.2                  | 11                    | 190                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 2.9               | 3.7                | 1.5      | 1.0 | ZV225S_KS503_0240 EZ501U | 7.5                  | 11                    | 200                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.69   | 2.9               | 4.1                | 1.5      | 1.0 | ZV225S_KS503_0240 EZ402U | 7.5                  | 11                    | 200                  | 24.00 | 0.36                   | 0.69                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 1.6               | 2.0                | 1.3      | 1.8 | ZV225S_KS502_0200 EZ401U | 6.1                  | 11                    | 162                  | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 2.4               | 3.2                | 1.9      | 1.2 | ZV225S_KS502_0200 EZ501U | 7.5                  | 11                    | 200                  | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 0.83   | 2.5               | 3.5                | 2.0      | 1.2 | ZV225S_KS502_0200 EZ402U | 7.5                  | 11                    | 200                  | 20.00 | 0.49                   | 0.83                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 1.2               | 1.4                | 2.0      | 2.6 | ZV225S_KS502_0140 EZ401U | 4.3                  | 11                    | 113                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 1.7               | 2.2                | 2.9      | 1.7 | ZV225S_KS502_0140 EZ501U | 7.5                  | 11                    | 200                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 1.8               | 2.5                | 3.0      | 1.7 | ZV225S_KS502_0140 EZ402U | 7.5                  | 11                    | 200                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 2.6               | 3.9                | 4.5      | 1.1 | ZV225S_KS502_0140 EZ502U | 7.5                  | 11                    | 200                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 2.6               | 4.0                | 4.5      | 1.1 | ZV225S_KS502_0140 EZ701U | 7.5                  | 11                    | 200                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.19   | 2.9               | 4.2                | 5.0      | 1.0 | ZV225S_KS502_0140 EZ404U | 7.5                  | 11                    | 200                  | 14.00 | 0.64                   | 1.19                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 0.8               | 1.0                | 3.0      | 3.6 | ZV225S_KS502_0100 EZ401U | 3.0                  | 11                    | 81                   | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 1.2               | 1.6                | 4.4      | 2.4 | ZV225S_KS502_0100 EZ501U | 5.7                  | 11                    | 152                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 1.3               | 1.8                | 4.5      | 2.4 | ZV225S_KS502_0100 EZ402U | 5.7                  | 11                    | 152                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 1.9               | 2.8                | 6.7      | 1.6 | ZV225S_KS502_0100 EZ502U | 7.5                  | 11                    | 200                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 1.9               | 2.8                | 6.7      | 1.6 | ZV225S_KS502_0100 EZ701U | 7.2                  | 11                    | 190                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 2.1               | 3.0                | 7.5      | 1.4 | ZV225S_KS502_0100 EZ404U | 7.5                  | 11                    | 200                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 2.2               | 3.8                | 8.0      | 1.3 | ZV225S_KS502_0100 EZ503U | 7.5                  | 11                    | 200                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 1.67   | 2.6               | 5.1                | 9.3      | 1.2 | ZV225S_KS502_0100 EZ702U | 7.5                  | 11                    | 200                  | 10.00 | 0.83                   | 1.67                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 0.7               | 0.8                | 3.9      | 4.5 | ZV225S_KS502_0080 EZ401U | 2.4                  | 11                    | 65                   | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.0               | 1.3                | 5.7      | 3.0 | ZV225S_KS502_0080 EZ501U | 4.6                  | 11                    | 122                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.0               | 1.4                | 5.9      | 3.0 | ZV225S_KS502_0080 EZ402U | 4.6                  | 11                    | 122                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.5               | 2.2                | 8.7      | 2.0 | ZV225S_KS502_0080 EZ502U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.5               | 2.3                | 8.7      | 2.0 | ZV225S_KS502_0080 EZ701U | 5.7                  | 11                    | 152                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.7               | 2.4                | 9.7      | 1.8 | ZV225S_KS502_0080 EZ404U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 1.8               | 3.0                | 10       | 1.7 | ZV225S_KS502_0080 EZ503U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| 2.08   | 2.1               | 4.1                | 12       | 1.4 | ZV225S_KS502_0080 EZ702U | 7.5                  | 11                    | 200                  | 8.000 | 0.97                   | 2.08                   | 39                 | 46                  | 2             | 25 | 53.1          |
| <b>ZV3KS5 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 7,0</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.09   | 3.0               | 3.1                | 0.1      | 1.1 | ZV318S_KS503_1000 EZ301U | 7.0                  | 10                    | 200                  | 100.0 | 0.13                   | 0.18                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.11   | 2.4               | 2.5                | 0.1      | 1.4 | ZV318S_KS503_0800 EZ301U | 7.0                  | 10                    | 200                  | 80.00 | 0.16                   | 0.23                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.13   | 2.1               | 2.2                | 0.1      | 1.6 | ZV318S_KS503_0700 EZ301U | 6.4                  | 10                    | 182                  | 70.00 | 0.18                   | 0.26                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.18   | 1.5               | 1.5                | 0.1      | 2.3 | ZV318S_KS503_0500 EZ301U | 4.5                  | 10                    | 130                  | 50.00 | 0.21                   | 0.36                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.18   | 2.6               | 2.7                | 0.2      | 1.3 | ZV318S_KS503_0500 EZ302U | 7.0                  | 10                    | 200                  | 50.00 | 0.21                   | 0.36                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.18   | 3.4               | 3.6                | 0.3      | 1.0 | ZV318S_KS503_0500 EZ303U | 7.0                  | 10                    | 200                  | 50.00 | 0.21                   | 0.36                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.23   | 1.2               | 1.2                | 0.2      | 2.9 | ZV318S_KS503_0400 EZ301U | 3.6                  | 10                    | 104                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |

10.2 Selection table 10 ZVKS rack and pinion drives

| $v_{fzN}$<br>[m/s]  | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{fzaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV3KS5 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 7,0</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.23  | 2.1               | 2.2                | 0.3      | 1.7 | ZV318S_KS503_0400 EZ302U | 6.5                  | 10                    | 186                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.23  | 2.7               | 2.8                | 0.4      | 1.3 | ZV318S_KS503_0400 EZ303U | 7.0                  | 10                    | 200                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.28  | 1.0               | 1.0                | 0.2      | 3.6 | ZV318S_KS503_0320 EZ301U | 2.9                  | 10                    | 83                   | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.28  | 1.7               | 1.7                | 0.4      | 2.1 | ZV318S_KS503_0320 EZ302U | 5.2                  | 10                    | 149                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.28  | 2.2               | 2.3                | 0.5      | 1.6 | ZV318S_KS503_0320 EZ303U | 7.0                  | 10                    | 200                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.28  | 2.9               | 3.1                | 0.7      | 1.2 | ZV318S_KS503_0320 EZ401U | 7.0                  | 10                    | 200                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.38  | 0.7               | 0.7                | 0.3      | 4.8 | ZV318S_KS503_0240 EZ301U | 2.2                  | 10                    | 62                   | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.38  | 1.2               | 1.3                | 0.6      | 2.8 | ZV318S_KS503_0240 EZ302U | 3.9                  | 10                    | 112                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.38  | 1.6               | 1.7                | 0.7      | 2.1 | ZV318S_KS503_0240 EZ303U | 5.5                  | 10                    | 156                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.38  | 2.2               | 2.3                | 1.0      | 1.6 | ZV318S_KS503_0240 EZ401U | 6.6                  | 10                    | 190                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.38  | 3.4               | 3.7                | 1.5      | 1.0 | ZV318S_KS503_0240 EZ501U | 7.0                  | 10                    | 200                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 1.9               | 2.0                | 1.2      | 1.9 | ZV318S_KS502_0200 EZ401U | 5.6                  | 10                    | 162                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 2.9               | 3.1                | 1.9      | 1.2 | ZV318S_KS502_0200 EZ501U | 7.0                  | 10                    | 200                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 3.1               | 3.4                | 2.1      | 1.1 | ZV318S_KS502_0200 EZ402U | 7.0                  | 10                    | 200                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 1.3               | 1.4                | 1.9      | 2.7 | ZV318S_KS502_0140 EZ401U | 3.9                  | 10                    | 113                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 2.0               | 2.2                | 2.9      | 1.7 | ZV318S_KS502_0140 EZ501U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 2.2               | 2.4                | 3.2      | 1.6 | ZV318S_KS502_0140 EZ402U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 3.2               | 4.0                | 4.7      | 1.1 | ZV318S_KS502_0140 EZ404U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 3.4               | 3.7                | 5.0      | 1.0 | ZV318S_KS502_0140 EZ502U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.64  | 3.4               | 3.9                | 5.0      | 1.0 | ZV318S_KS502_0140 EZ701U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 0.9               | 1.0                | 2.9      | 3.7 | ZV318S_KS502_0100 EZ401U | 2.8                  | 10                    | 81                   | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 1.4               | 1.6                | 4.4      | 2.4 | ZV318S_KS502_0100 EZ501U | 5.3                  | 10                    | 152                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 1.6               | 1.7                | 4.8      | 2.2 | ZV318S_KS502_0100 EZ402U | 5.3                  | 10                    | 152                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 2.3               | 2.9                | 7.0      | 1.5 | ZV318S_KS502_0100 EZ404U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 2.5               | 2.7                | 7.6      | 1.4 | ZV318S_KS502_0100 EZ502U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 2.5               | 2.8                | 7.6      | 1.4 | ZV318S_KS502_0100 EZ701U | 6.6                  | 10                    | 190                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 3.2               | 3.7                | 9.9      | 1.1 | ZV318S_KS502_0100 EZ503U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 0.7               | 0.8                | 3.7      | 4.7 | ZV318S_KS502_0080 EZ401U | 2.3                  | 10                    | 65                   | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 1.1               | 1.2                | 5.7      | 3.0 | ZV318S_KS502_0080 EZ501U | 4.2                  | 10                    | 122                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 1.2               | 1.4                | 6.3      | 2.8 | ZV318S_KS502_0080 EZ402U | 4.2                  | 10                    | 122                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 1.8               | 2.3                | 9.2      | 1.9 | ZV318S_KS502_0080 EZ404U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 2.0               | 2.1                | 9.9      | 1.8 | ZV318S_KS502_0080 EZ502U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 2.0               | 2.2                | 9.9      | 1.8 | ZV318S_KS502_0080 EZ701U | 5.3                  | 10                    | 152                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 2.6               | 2.9                | 13       | 1.3 | ZV318S_KS502_0080 EZ503U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.13  | 3.2               | 3.8                | 16       | 1.1 | ZV318S_KS502_0080 EZ702U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 0.9               | 0.9                | 9.2      | 3.6 | ZV318S_KS502_0060 EZ501U | 3.2                  | 10                    | 91                   | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 0.9               | 1.0                | 10       | 3.3 | ZV318S_KS502_0060 EZ402U | 3.2                  | 10                    | 91                   | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 1.4               | 1.7                | 15       | 2.2 | ZV318S_KS502_0060 EZ404U | 5.8                  | 10                    | 165                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 1.5               | 1.6                | 16       | 2.1 | ZV318S_KS502_0060 EZ502U | 6.2                  | 10                    | 177                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 1.5               | 1.7                | 16       | 2.1 | ZV318S_KS502_0060 EZ701U | 4.0                  | 10                    | 114                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 1.9               | 2.2                | 21       | 1.6 | ZV318S_KS502_0060 EZ503U | 7.0                  | 10                    | 200                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 2.4               | 2.9                | 26       | 1.3 | ZV318S_KS502_0060 EZ702U | 7.0                  | 10                    | 200                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.50  | 2.7               | 3.2                | 29       | 1.1 | ZV318S_KS502_0060 EZ505U | 7.0                  | 10                    | 200                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| <b>ZV3KS5 (<math>n_{fN} = 4500</math> rpm, (<math>F_{fzacc,max} = 7,0</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.69  | 2.5               | 4.1                | 15       | 1.2 | ZV318S_KS502_0080 EZ505U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25  | 1.9               | 3.0                | 23       | 1.4 | ZV318S_KS502_0060 EZ505U | 7.0                  | 10                    | 200                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25  | 2.4               | 4.0                | 30       | 1.1 | ZV318S_KS502_0060 EZ703U | 7.0                  | 10                    | 200                  | 6.000 | 1.25                   | 2.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| <b>ZV3KS5 (<math>n_{fN} = 6000</math> rpm, (<math>F_{fzacc,max} = 7,0</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.23  | 2.3               | 2.5                | 0.1      | 1.2 | ZV318S_KS503_0800 EZ301U | 7.0                  | 10                    | 200                  | 80.00 | 0.16                   | 0.23                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.26  | 2.0               | 2.2                | 0.1      | 1.4 | ZV318S_KS503_0700 EZ301U | 6.4                  | 10                    | 182                  | 70.00 | 0.18                   | 0.26                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.36  | 1.4               | 1.5                | 0.2      | 1.9 | ZV318S_KS503_0500 EZ301U | 4.5                  | 10                    | 130                  | 50.00 | 0.21                   | 0.36                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.36  | 2.4               | 2.7                | 0.3      | 1.1 | ZV318S_KS503_0500 EZ302U | 7.0                  | 10                    | 200                  | 50.00 | 0.21                   | 0.36                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 1.2               | 1.2                | 0.2      | 2.4 | ZV318S_KS503_0400 EZ301U | 3.6                  | 10                    | 104                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 1.9               | 2.2                | 0.4      | 1.4 | ZV318S_KS503_0400 EZ302U | 6.5                  | 10                    | 186                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.45  | 2.5               | 2.9                | 0.5      | 1.1 | ZV318S_KS503_0400 EZ303U | 7.0                  | 10                    | 200                  | 40.00 | 0.23                   | 0.45                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.56  | 0.9               | 1.0                | 0.3      | 3.0 | ZV318S_KS503_0320 EZ301U | 2.9                  | 10                    | 83                   | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.56  | 1.6               | 1.7                | 0.5      | 1.8 | ZV318S_KS503_0320 EZ302U | 5.2                  | 10                    | 149                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.56  | 2.0               | 2.3                | 0.6      | 1.4 | ZV318S_KS503_0320 EZ303U | 7.0                  | 10                    | 200                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.56  | 2.4               | 2.9                | 0.7      | 1.2 | ZV318S_KS503_0320 EZ401U | 7.0                  | 10                    | 200                  | 32.00 | 0.29                   | 0.56                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 0.7               | 0.7                | 0.4      | 4.0 | ZV318S_KS503_0240 EZ301U | 2.2                  | 10                    | 62                   | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 1.2               | 1.3                | 0.7      | 2.4 | ZV318S_KS503_0240 EZ302U | 3.9                  | 10                    | 112                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 1.5               | 1.8                | 0.9      | 1.8 | ZV318S_KS503_0240 EZ303U | 5.5                  | 10                    | 156                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 1.8               | 2.2                | 1.0      | 1.5 | ZV318S_KS503_0240 EZ401U | 6.6                  | 10                    | 190                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 2.6               | 3.4                | 1.5      | 1.0 | ZV318S_KS503_0240 EZ501U | 7.0                  | 10                    | 200                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.75  | 2.7               | 3.8                | 1.5      | 1.0 | ZV318S_KS503_0240 EZ402U | 7.0                  | 10                    | 200                  | 24.00 | 0.39                   | 0.75                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90  | 1.5               | 1.9                | 1.3      | 1.8 | ZV318S_KS502_0200 EZ401U | 5.6                  | 10                    | 162                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |



| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{fzaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV3KS5 (<math>n_{fN} = 6000</math> rpm, (<math>F_{fzacc,max} = 7,0</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.90   | 2.3               | 2.9                | 1.9      | 1.2 | ZV318S_KS502_0200 EZ501U | 7.0                  | 10                    | 200                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 0.90   | 2.3               | 3.2                | 2.0      | 1.2 | ZV318S_KS502_0200 EZ402U | 7.0                  | 10                    | 200                  | 20.00 | 0.53                   | 0.90                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 1.1               | 1.3                | 2.0      | 2.6 | ZV318S_KS502_0140 EZ401U | 3.9                  | 10                    | 113                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 1.6               | 2.0                | 2.9      | 1.7 | ZV318S_KS502_0140 EZ501U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 1.6               | 2.3                | 3.0      | 1.7 | ZV318S_KS502_0140 EZ402U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 2.4               | 3.6                | 4.5      | 1.1 | ZV318S_KS502_0140 EZ502U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 2.4               | 3.7                | 4.5      | 1.1 | ZV318S_KS502_0140 EZ701U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.29   | 2.7               | 3.9                | 5.0      | 1.0 | ZV318S_KS502_0140 EZ404U | 7.0                  | 10                    | 200                  | 14.00 | 0.69                   | 1.29                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 0.8               | 0.9                | 3.0      | 3.6 | ZV318S_KS502_0100 EZ401U | 2.8                  | 10                    | 81                   | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 1.1               | 1.5                | 4.4      | 2.4 | ZV318S_KS502_0100 EZ501U | 5.3                  | 10                    | 152                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 1.2               | 1.6                | 4.5      | 2.4 | ZV318S_KS502_0100 EZ402U | 5.3                  | 10                    | 152                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 1.7               | 2.6                | 6.7      | 1.6 | ZV318S_KS502_0100 EZ502U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 1.7               | 2.6                | 6.7      | 1.6 | ZV318S_KS502_0100 EZ701U | 6.6                  | 10                    | 190                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 1.9               | 2.8                | 7.5      | 1.4 | ZV318S_KS502_0100 EZ404U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 2.1               | 3.5                | 8.0      | 1.3 | ZV318S_KS502_0100 EZ503U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 1.80   | 2.4               | 4.7                | 9.3      | 1.2 | ZV318S_KS502_0100 EZ702U | 7.0                  | 10                    | 200                  | 10.00 | 0.90                   | 1.80                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 0.6               | 0.7                | 3.9      | 4.5 | ZV318S_KS502_0080 EZ401U | 2.3                  | 10                    | 65                   | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 0.9               | 1.2                | 5.7      | 3.0 | ZV318S_KS502_0080 EZ501U | 4.2                  | 10                    | 122                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 0.9               | 1.3                | 5.9      | 3.0 | ZV318S_KS502_0080 EZ402U | 4.2                  | 10                    | 122                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 1.4               | 2.1                | 8.7      | 2.0 | ZV318S_KS502_0080 EZ502U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 1.4               | 2.1                | 8.7      | 2.0 | ZV318S_KS502_0080 EZ701U | 5.3                  | 10                    | 152                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 1.5               | 2.2                | 9.7      | 1.8 | ZV318S_KS502_0080 EZ404U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 1.6               | 2.8                | 10       | 1.7 | ZV318S_KS502_0080 EZ503U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| 2.25   | 1.9               | 3.8                | 12       | 1.4 | ZV318S_KS502_0080 EZ702U | 7.0                  | 10                    | 200                  | 8.000 | 1.05                   | 2.25                   | 42                 | 44                  | 3             | 18 | 57.3          |
| <b>ZV3KS7 (<math>n_{fN} = 3000</math> rpm, (<math>F_{fzacc,max} = 11</math> kN)</b>  |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.16   | 5.2               | 5.6                | 0.2      | 1.1 | ZV322S_KS703_0700 EZ401U | 11                   | 17                    | 400                  | 70.00 | 0.18                   | 0.31                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.22   | 3.7               | 4.0                | 0.3      | 1.5 | ZV322S_KS703_0500 EZ401U | 11                   | 17                    | 395                  | 50.00 | 0.24                   | 0.44                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.28   | 3.0               | 3.2                | 0.3      | 1.9 | ZV322S_KS703_0400 EZ401U | 9.0                  | 17                    | 316                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.28   | 4.6               | 5.0                | 0.5      | 1.2 | ZV322S_KS703_0400 EZ501U | 11                   | 17                    | 400                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.28   | 5.0               | 5.5                | 0.6      | 1.1 | ZV322S_KS703_0400 EZ402U | 11                   | 17                    | 400                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.34   | 2.4               | 2.5                | 0.5      | 2.4 | ZV322S_KS703_0320 EZ401U | 7.2                  | 17                    | 253                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.34   | 3.7               | 4.0                | 0.7      | 1.6 | ZV322S_KS703_0320 EZ501U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.34   | 4.0               | 4.4                | 0.8      | 1.4 | ZV322S_KS703_0320 EZ402U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 1.8               | 1.9                | 0.6      | 3.2 | ZV322S_KS703_0240 EZ401U | 5.4                  | 17                    | 190                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 2.7               | 3.0                | 1.0      | 2.1 | ZV322S_KS703_0240 EZ501U | 10                   | 17                    | 357                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 3.0               | 3.3                | 1.1      | 1.9 | ZV322S_KS703_0240 EZ402U | 10                   | 17                    | 357                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 4.4               | 5.5                | 1.6      | 1.3 | ZV322S_KS703_0240 EZ404U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 4.7               | 5.1                | 1.7      | 1.2 | ZV322S_KS703_0240 EZ502U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.46   | 4.7               | 5.3                | 1.7      | 1.2 | ZV322S_KS703_0240 EZ701U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 2.3               | 2.6                | 2.7      | 2.4 | ZV322S_KS702_0200 EZ501U | 8.7                  | 17                    | 304                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 4.0               | 4.3                | 4.6      | 1.4 | ZV322S_KS702_0200 EZ502U | 11                   | 17                    | 400                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 4.0               | 4.5                | 4.6      | 1.4 | ZV322S_KS702_0200 EZ701U | 11                   | 17                    | 380                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 5.3               | 6.0                | 6.0      | 1.1 | ZV322S_KS702_0200 EZ503U | 11                   | 17                    | 400                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 1.6               | 1.8                | 4.1      | 3.5 | ZV322S_KS702_0140 EZ501U | 6.1                  | 17                    | 213                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 2.8               | 3.0                | 7.0      | 2.0 | ZV322S_KS702_0140 EZ502U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 2.8               | 3.2                | 7.0      | 2.0 | ZV322S_KS702_0140 EZ701U | 7.6                  | 17                    | 266                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 3.7               | 4.2                | 9.2      | 1.5 | ZV322S_KS702_0140 EZ503U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 4.6               | 5.5                | 11       | 1.2 | ZV322S_KS702_0140 EZ702U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.79   | 5.1               | 6.1                | 13       | 1.1 | ZV322S_KS702_0140 EZ505U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 1.2               | 1.3                | 6.1      | 4.9 | ZV322S_KS702_0100 EZ501U | 4.3                  | 17                    | 152                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 2.0               | 2.2                | 10       | 2.8 | ZV322S_KS702_0100 EZ502U | 8.4                  | 17                    | 295                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 2.0               | 2.3                | 10       | 2.8 | ZV322S_KS702_0100 EZ701U | 5.4                  | 17                    | 190                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 2.6               | 3.0                | 14       | 2.2 | ZV322S_KS702_0100 EZ503U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 3.3               | 3.9                | 17       | 1.7 | ZV322S_KS702_0100 EZ702U | 11                   | 17                    | 390                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 3.7               | 4.3                | 19       | 1.5 | ZV322S_KS702_0100 EZ505U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 4.5               | 5.6                | 23       | 1.3 | ZV322S_KS702_0100 EZ703U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 1.6               | 1.7                | 14       | 3.5 | ZV322S_KS702_0080 EZ502U | 6.7                  | 17                    | 236                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 1.6               | 1.8                | 14       | 3.5 | ZV322S_KS702_0080 EZ701U | 4.3                  | 17                    | 152                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 2.1               | 2.4                | 18       | 2.7 | ZV322S_KS702_0080 EZ503U | 9.3                  | 17                    | 327                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 2.6               | 3.1                | 22       | 2.2 | ZV322S_KS702_0080 EZ702U | 8.9                  | 17                    | 312                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 2.9               | 3.5                | 25       | 1.9 | ZV322S_KS702_0080 EZ505U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 3.6               | 4.5                | 31       | 1.6 | ZV322S_KS702_0080 EZ703U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 4.6               | 6.6                | 39       | 1.2 | ZV322S_KS702_0080 EZ705U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.38   | 4.8               | 8.1                | 41       | 1.2 | ZV322S_KS702_0080 EZ802U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 1.2               | 1.3                | 19       | 4.7 | ZV322S_KS702_0060 EZ502U | 5.0                  | 17                    | 177                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 1.2               | 1.4                | 19       | 4.7 | ZV322S_KS702_0060 EZ701U | 3.3                  | 17                    | 114                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |

10.2 Selection table 10 ZVKS rack and pinion drives

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{fzaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV3KS7 (<math>n_{IN} = 3000</math> rpm, <math>F_{fzacc,max} = 11</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.83   | 1.6               | 1.8                | 25       | 3.6 | ZV322S_KS702_0060 EZ503U | 7.0                  | 17                    | 245                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 2.0               | 2.3                | 31       | 2.9 | ZV322S_KS702_0060 EZ702U | 6.7                  | 17                    | 234                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 2.2               | 2.6                | 35       | 2.6 | ZV322S_KS702_0060 EZ505U | 11                   | 17                    | 382                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 2.7               | 3.4                | 43       | 2.1 | ZV322S_KS702_0060 EZ703U | 11                   | 17                    | 371                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 3.5               | 4.9                | 56       | 1.6 | ZV322S_KS702_0060 EZ705U | 11                   | 17                    | 400                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.83   | 3.6               | 6.0                | 58       | 1.6 | ZV322S_KS702_0060 EZ802U | 11                   | 17                    | 400                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| <b>ZV3KS7 (<math>n_{IN} = 4500</math> rpm, <math>F_{fzacc,max} = 11</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.18   | 3.6               | 5.8                | 10       | 1.4 | ZV322S_KS702_0140 EZ505U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.18   | 4.6               | 7.6                | 13       | 1.1 | ZV322S_KS702_0140 EZ703U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.65   | 2.6               | 4.2                | 15       | 1.9 | ZV322S_KS702_0100 EZ505U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.65   | 2.8               | 9.4                | 17       | 1.7 | ZV322S_KS702_0100 EZ802U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.65   | 3.3               | 5.4                | 20       | 1.5 | ZV322S_KS702_0100 EZ703U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.65   | 4.4               | 8.1                | 27       | 1.1 | ZV322S_KS702_0100 EZ705U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.06   | 2.1               | 3.3                | 20       | 2.4 | ZV322S_KS702_0080 EZ505U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.06   | 2.3               | 7.5                | 22       | 2.2 | ZV322S_KS702_0080 EZ802U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.06   | 2.6               | 4.3                | 26       | 1.9 | ZV322S_KS702_0080 EZ703U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.06   | 3.6               | 6.5                | 35       | 1.4 | ZV322S_KS702_0080 EZ705U | 11                   | 17                    | 400                  | 8.000 | 1.15                   | 2.29                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.75   | 1.5               | 2.5                | 28       | 3.2 | ZV322S_KS702_0060 EZ505U | 11                   | 17                    | 382                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.75   | 1.7               | 5.6                | 31       | 2.9 | ZV322S_KS702_0060 EZ802U | 11                   | 17                    | 400                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.75   | 2.0               | 3.3                | 36       | 2.5 | ZV322S_KS702_0060 EZ703U | 11                   | 17                    | 371                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.75   | 2.7               | 4.9                | 49       | 1.9 | ZV322S_KS702_0060 EZ705U | 11                   | 17                    | 400                  | 6.000 | 1.28                   | 2.75                   | 41                 | 68                  | 3             | 22 | 70.0          |
| <b>ZV3KS7 (<math>n_{IN} = 6000</math> rpm, <math>F_{fzacc,max} = 11</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.31   | 4.3               | 5.2                | 0.2      | 1.1 | ZV322S_KS703_0700 EZ401U | 11                   | 17                    | 400                  | 70.00 | 0.18                   | 0.31                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.44   | 3.1               | 3.7                | 0.3      | 1.5 | ZV322S_KS703_0500 EZ401U | 11                   | 17                    | 395                  | 50.00 | 0.24                   | 0.44                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 2.4               | 3.0                | 0.4      | 1.8 | ZV322S_KS703_0400 EZ401U | 9.0                  | 17                    | 316                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 3.6               | 4.7                | 0.5      | 1.2 | ZV322S_KS703_0400 EZ501U | 11                   | 17                    | 400                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.55   | 3.7               | 5.2                | 0.5      | 1.2 | ZV322S_KS703_0400 EZ402U | 11                   | 17                    | 400                  | 40.00 | 0.28                   | 0.55                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.69   | 2.0               | 2.4                | 0.5      | 2.3 | ZV322S_KS703_0320 EZ401U | 7.2                  | 17                    | 253                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.69   | 2.9               | 3.7                | 0.7      | 1.6 | ZV322S_KS703_0320 EZ501U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.69   | 3.0               | 4.2                | 0.7      | 1.5 | ZV322S_KS703_0320 EZ402U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.69   | 4.4               | 6.6                | 1.1      | 1.0 | ZV322S_KS703_0320 EZ502U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.69   | 4.4               | 6.7                | 1.1      | 1.0 | ZV322S_KS703_0320 EZ701U | 11                   | 17                    | 400                  | 32.00 | 0.34                   | 0.69                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 1.5               | 1.8                | 0.7      | 3.1 | ZV322S_KS703_0240 EZ401U | 5.4                  | 17                    | 190                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 2.2               | 2.8                | 1.0      | 2.1 | ZV322S_KS703_0240 EZ501U | 10                   | 17                    | 357                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 2.2               | 3.1                | 1.0      | 2.0 | ZV322S_KS703_0240 EZ402U | 10                   | 17                    | 357                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 3.3               | 5.0                | 1.5      | 1.4 | ZV322S_KS703_0240 EZ502U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 3.3               | 5.0                | 1.5      | 1.4 | ZV322S_KS703_0240 EZ701U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 3.7               | 5.4                | 1.7      | 1.2 | ZV322S_KS703_0240 EZ404U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 0.92   | 4.0               | 6.8                | 1.8      | 1.1 | ZV322S_KS703_0240 EZ503U | 11                   | 17                    | 400                  | 24.00 | 0.46                   | 0.92                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 1.8               | 2.4                | 2.6      | 2.4 | ZV322S_KS702_0200 EZ501U | 8.7                  | 17                    | 304                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 2.8               | 4.2                | 4.0      | 1.6 | ZV322S_KS702_0200 EZ502U | 11                   | 17                    | 400                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 2.8               | 4.3                | 4.0      | 1.6 | ZV322S_KS702_0200 EZ701U | 11                   | 17                    | 380                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 3.4               | 5.8                | 4.8      | 1.3 | ZV322S_KS702_0200 EZ503U | 11                   | 17                    | 400                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.10   | 3.9               | 7.8                | 5.6      | 1.2 | ZV322S_KS702_0200 EZ702U | 11                   | 17                    | 400                  | 20.00 | 0.59                   | 1.10                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.57   | 1.3               | 1.7                | 4.1      | 3.5 | ZV322S_KS702_0140 EZ501U | 6.1                  | 17                    | 213                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.57   | 2.0               | 3.0                | 6.2      | 2.3 | ZV322S_KS702_0140 EZ502U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.57   | 2.0               | 3.0                | 6.2      | 2.3 | ZV322S_KS702_0140 EZ701U | 7.6                  | 17                    | 266                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.57   | 2.4               | 4.0                | 7.4      | 1.9 | ZV322S_KS702_0140 EZ503U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 1.57   | 2.7               | 5.4                | 8.6      | 1.6 | ZV322S_KS702_0140 EZ702U | 11                   | 17                    | 400                  | 14.00 | 0.79                   | 1.57                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.20   | 0.9               | 1.2                | 6.1      | 4.9 | ZV322S_KS702_0100 EZ501U | 4.3                  | 17                    | 152                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.20   | 1.4               | 2.1                | 9.3      | 3.2 | ZV322S_KS702_0100 EZ502U | 8.4                  | 17                    | 295                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.20   | 1.4               | 2.1                | 9.3      | 3.2 | ZV322S_KS702_0100 EZ701U | 5.4                  | 17                    | 190                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.20   | 1.7               | 2.9                | 11       | 2.7 | ZV322S_KS702_0100 EZ503U | 11                   | 17                    | 400                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| 2.20   | 2.0               | 3.9                | 13       | 2.3 | ZV322S_KS702_0100 EZ702U | 11                   | 17                    | 390                  | 10.00 | 1.03                   | 2.20                   | 41                 | 68                  | 3             | 22 | 70.0          |
| <b>ZV4KS7 (<math>n_{IN} = 3000</math> rpm, <math>F_{fzacc,max} = 10</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.17   | 4.8               | 5.1                | 0.2      | 1.1 | ZV418S_KS703_0700 EZ401U | 10                   | 16                    | 400                  | 70.00 | 0.20                   | 0.34                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.24   | 3.4               | 3.7                | 0.3      | 1.5 | ZV418S_KS703_0500 EZ401U | 10                   | 16                    | 395                  | 50.00 | 0.26                   | 0.48                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.30   | 2.7               | 2.9                | 0.3      | 1.9 | ZV418S_KS703_0400 EZ401U | 8.3                  | 16                    | 316                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.30   | 4.2               | 4.6                | 0.5      | 1.2 | ZV418S_KS703_0400 EZ501U | 10                   | 16                    | 400                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.30   | 4.6               | 5.1                | 0.6      | 1.1 | ZV418S_KS703_0400 EZ402U | 10                   | 16                    | 400                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.38   | 2.2               | 2.3                | 0.5      | 2.4 | ZV418S_KS703_0320 EZ401U | 6.6                  | 16                    | 253                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.38   | 3.4               | 3.7                | 0.7      | 1.6 | ZV418S_KS703_0320 EZ501U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.38   | 3.7               | 4.1                | 0.8      | 1.4 | ZV418S_KS703_0320 EZ402U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.50   | 1.6               | 1.8                | 0.6      | 3.2 | ZV418S_KS703_0240 EZ401U | 5.0                  | 16                    | 190                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.50   | 2.5               | 2.7                | 1.0      | 2.1 | ZV418S_KS703_0240 EZ501U | 9.3                  | 16                    | 357                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.50   | 2.7               | 3.0                | 1.1      | 1.9 | ZV418S_KS703_0240 EZ402U | 9.3                  | 16                    | 357                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |

| $v_{fzN}$<br>[m/s]   | $F_{fzN}$<br>[kN] | $F_{fz,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{fzaccE}$<br>[kN] | $F_{fzNOT,E}$<br>[kN] | $M_{fzaccE}$<br>[Nm] | i     | $v_{fzmaxDB}$<br>[m/s] | $v_{fzmaxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|----------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV4KS7 (<math>n_{1N} = 3000</math> rpm, (<math>F_{fzacc,max} = 10</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.50   | 4.0               | 5.0                | 1.6      | 1.3 | ZV418S_KS703_0240 EZ404U | 10                   | 16                    | 400                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.50   | 4.3               | 4.7                | 1.7      | 1.2 | ZV418S_KS703_0240 EZ502U | 10                   | 16                    | 400                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.50   | 4.3               | 4.8                | 1.7      | 1.2 | ZV418S_KS703_0240 EZ701U | 10                   | 16                    | 400                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 2.1               | 2.3                | 2.7      | 2.4 | ZV418S_KS702_0200 EZ501U | 8.0                  | 16                    | 304                  | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 3.7               | 4.0                | 4.6      | 1.4 | ZV418S_KS702_0200 EZ502U | 10                   | 16                    | 400                  | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 3.7               | 4.1                | 4.6      | 1.4 | ZV418S_KS702_0200 EZ701U | 9.9                  | 16                    | 380                  | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 4.8               | 5.5                | 6.0      | 1.1 | ZV418S_KS702_0200 EZ503U | 10                   | 16                    | 400                  | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 1.5               | 1.6                | 4.1      | 3.5 | ZV418S_KS702_0140 EZ501U | 5.6                  | 16                    | 213                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 2.6               | 2.8                | 7.0      | 2.0 | ZV418S_KS702_0140 EZ502U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 2.6               | 2.9                | 7.0      | 2.0 | ZV418S_KS702_0140 EZ701U | 7.0                  | 16                    | 266                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 3.4               | 3.9                | 9.2      | 1.5 | ZV418S_KS702_0140 EZ503U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 4.2               | 5.0                | 11       | 1.2 | ZV418S_KS702_0140 EZ702U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.86   | 4.7               | 5.6                | 13       | 1.1 | ZV418S_KS702_0140 EZ505U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 1.1               | 1.2                | 6.1      | 4.9 | ZV418S_KS702_0100 EZ501U | 4.0                  | 16                    | 152                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 1.8               | 2.0                | 10       | 2.8 | ZV418S_KS702_0100 EZ502U | 7.7                  | 16                    | 295                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 1.8               | 2.1                | 10       | 2.8 | ZV418S_KS702_0100 EZ701U | 5.0                  | 16                    | 190                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 2.4               | 2.8                | 14       | 2.2 | ZV418S_KS702_0100 EZ503U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 3.0               | 3.6                | 17       | 1.7 | ZV418S_KS702_0100 EZ702U | 10                   | 16                    | 390                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 3.4               | 4.0                | 19       | 1.5 | ZV418S_KS702_0100 EZ505U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20   | 4.1               | 5.2                | 23       | 1.3 | ZV418S_KS702_0100 EZ703U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 1.5               | 1.6                | 14       | 3.5 | ZV418S_KS702_0080 EZ502U | 6.2                  | 16                    | 236                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 1.5               | 1.7                | 14       | 3.5 | ZV418S_KS702_0080 EZ701U | 4.0                  | 16                    | 152                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 1.9               | 2.2                | 18       | 2.7 | ZV418S_KS702_0080 EZ503U | 8.6                  | 16                    | 327                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 2.4               | 2.9                | 22       | 2.2 | ZV418S_KS702_0080 EZ702U | 8.2                  | 16                    | 312                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 2.7               | 3.2                | 25       | 1.9 | ZV418S_KS702_0080 EZ505U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 3.3               | 4.1                | 31       | 1.6 | ZV418S_KS702_0080 EZ703U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 4.2               | 6.0                | 39       | 1.2 | ZV418S_KS702_0080 EZ705U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.50   | 4.4               | 7.4                | 41       | 1.2 | ZV418S_KS702_0080 EZ802U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 1.1               | 1.2                | 19       | 4.7 | ZV418S_KS702_0060 EZ502U | 4.6                  | 16                    | 177                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 1.1               | 1.2                | 19       | 4.7 | ZV418S_KS702_0060 EZ701U | 3.0                  | 16                    | 114                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 1.4               | 1.7                | 25       | 3.6 | ZV418S_KS702_0060 EZ503U | 6.4                  | 16                    | 245                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 1.8               | 2.1                | 31       | 2.9 | ZV418S_KS702_0060 EZ702U | 6.1                  | 16                    | 234                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 2.0               | 2.4                | 35       | 2.6 | ZV418S_KS702_0060 EZ505U | 10                   | 16                    | 382                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 2.5               | 3.1                | 43       | 2.1 | ZV418S_KS702_0060 EZ703U | 9.7                  | 16                    | 371                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 3.2               | 4.5                | 56       | 1.6 | ZV418S_KS702_0060 EZ705U | 10                   | 16                    | 400                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.00   | 3.3               | 5.5                | 58       | 1.6 | ZV418S_KS702_0060 EZ802U | 10                   | 16                    | 400                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| <b>ZV4KS7 (<math>n_{1N} = 4500</math> rpm, (<math>F_{fzacc,max} = 10</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 1.29   | 3.3               | 5.3                | 10       | 1.4 | ZV418S_KS702_0140 EZ505U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.29   | 4.2               | 7.0                | 13       | 1.1 | ZV418S_KS702_0140 EZ703U | 10                   | 16                    | 400                  | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.80   | 2.4               | 3.8                | 15       | 1.9 | ZV418S_KS702_0100 EZ505U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.80   | 2.6               | 8.6                | 17       | 1.7 | ZV418S_KS702_0100 EZ802U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.80   | 3.0               | 5.0                | 20       | 1.5 | ZV418S_KS702_0100 EZ703U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.80   | 4.1               | 7.5                | 27       | 1.1 | ZV418S_KS702_0100 EZ705U | 10                   | 16                    | 400                  | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.25   | 1.9               | 3.0                | 20       | 2.4 | ZV418S_KS702_0080 EZ505U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.25   | 2.1               | 6.9                | 22       | 2.2 | ZV418S_KS702_0080 EZ802U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.25   | 2.4               | 4.0                | 26       | 1.9 | ZV418S_KS702_0080 EZ703U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.25   | 3.3               | 6.0                | 35       | 1.4 | ZV418S_KS702_0080 EZ705U | 10                   | 16                    | 400                  | 8.000 | 1.25                   | 2.50                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 3.00   | 1.4               | 2.3                | 28       | 3.2 | ZV418S_KS702_0060 EZ505U | 10                   | 16                    | 382                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 3.00   | 1.6               | 5.1                | 31       | 2.9 | ZV418S_KS702_0060 EZ802U | 10                   | 16                    | 400                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 3.00   | 1.8               | 3.0                | 36       | 2.5 | ZV418S_KS702_0060 EZ703U | 9.7                  | 16                    | 371                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 3.00   | 2.4               | 4.5                | 49       | 1.9 | ZV418S_KS702_0060 EZ705U | 10                   | 16                    | 400                  | 6.000 | 1.40                   | 3.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| <b>ZV4KS7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{fzacc,max} = 10</math> kN))</b> |                   |                    |          |     |                          |                      |                       |                      |       |                        |                        |                    |                     |               |    |               |
| 0.34   | 3.9               | 4.8                | 0.2      | 1.1 | ZV418S_KS703_0700 EZ401U | 10                   | 16                    | 400                  | 70.00 | 0.20                   | 0.34                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.48   | 2.8               | 3.4                | 0.3      | 1.5 | ZV418S_KS703_0500 EZ401U | 10                   | 16                    | 395                  | 50.00 | 0.26                   | 0.48                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 2.2               | 2.7                | 0.4      | 1.8 | ZV418S_KS703_0400 EZ401U | 8.3                  | 16                    | 316                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 3.3               | 4.3                | 0.5      | 1.2 | ZV418S_KS703_0400 EZ501U | 10                   | 16                    | 400                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.60   | 3.4               | 4.8                | 0.5      | 1.2 | ZV418S_KS703_0400 EZ402U | 10                   | 16                    | 400                  | 40.00 | 0.30                   | 0.60                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.75   | 1.8               | 2.2                | 0.5      | 2.3 | ZV418S_KS703_0320 EZ401U | 6.6                  | 16                    | 253                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.75   | 2.6               | 3.4                | 0.7      | 1.6 | ZV418S_KS703_0320 EZ501U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.75   | 2.7               | 3.8                | 0.7      | 1.5 | ZV418S_KS703_0320 EZ402U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.75   | 4.1               | 6.1                | 1.1      | 1.0 | ZV418S_KS703_0320 EZ502U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 0.75   | 4.1               | 6.2                | 1.1      | 1.0 | ZV418S_KS703_0320 EZ701U | 10                   | 16                    | 400                  | 32.00 | 0.38                   | 0.75                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00   | 1.3               | 1.6                | 0.7      | 3.1 | ZV418S_KS703_0240 EZ401U | 5.0                  | 16                    | 190                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00   | 2.0               | 2.6                | 1.0      | 2.1 | ZV418S_KS703_0240 EZ501U | 9.3                  | 16                    | 357                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00   | 2.0               | 2.9                | 1.0      | 2.0 | ZV418S_KS703_0240 EZ402U | 9.3                  | 16                    | 357                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00   | 3.0               | 4.6                | 1.5      | 1.4 | ZV418S_KS703_0240 EZ502U | 10                   | 16                    | 400                  | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |

10.2 Selection table 10 ZVKS rack and pinion drives

| $v_{f2N}$<br>[m/s]  | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|---|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV4KS7 (<math>n_{1N} = 6000</math> rpm, (<math>F_{f2acc,max} = 10</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 1.00  | 3.0               | 4.6                | 1.5      | 1.4 | ZV418S_KS703_0240 EZ701U | 10                   | 16                    | 400                 | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00  | 3.4               | 4.9                | 1.7      | 1.2 | ZV418S_KS703_0240 EZ404U | 10                   | 16                    | 400                 | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.00  | 3.6               | 6.2                | 1.8      | 1.1 | ZV418S_KS703_0240 EZ503U | 10                   | 16                    | 400                 | 24.00 | 0.50                   | 1.00                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20  | 1.7               | 2.2                | 2.6      | 2.4 | ZV418S_KS702_0200 EZ501U | 8.0                  | 16                    | 304                 | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20  | 2.6               | 3.9                | 4.0      | 1.6 | ZV418S_KS702_0200 EZ502U | 10                   | 16                    | 400                 | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20  | 2.6               | 3.9                | 4.0      | 1.6 | ZV418S_KS702_0200 EZ701U | 9.9                  | 16                    | 380                 | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20  | 3.1               | 5.3                | 4.8      | 1.3 | ZV418S_KS702_0200 EZ503U | 10                   | 16                    | 400                 | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.20  | 3.6               | 7.1                | 5.6      | 1.2 | ZV418S_KS702_0200 EZ702U | 10                   | 16                    | 400                 | 20.00 | 0.64                   | 1.20                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.71  | 1.2               | 1.5                | 4.1      | 3.5 | ZV418S_KS702_0140 EZ501U | 5.6                  | 16                    | 213                 | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.71  | 1.8               | 2.7                | 6.2      | 2.3 | ZV418S_KS702_0140 EZ502U | 10                   | 16                    | 400                 | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.71  | 1.8               | 2.8                | 6.2      | 2.3 | ZV418S_KS702_0140 EZ701U | 7.0                  | 16                    | 266                 | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.71  | 2.2               | 3.7                | 7.4      | 1.9 | ZV418S_KS702_0140 EZ503U | 10                   | 16                    | 400                 | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 1.71  | 2.5               | 5.0                | 8.6      | 1.6 | ZV418S_KS702_0140 EZ702U | 10                   | 16                    | 400                 | 14.00 | 0.86                   | 1.71                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.40  | 0.8               | 1.1                | 6.1      | 4.9 | ZV418S_KS702_0100 EZ501U | 4.0                  | 16                    | 152                 | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.40  | 1.3               | 1.9                | 9.3      | 3.2 | ZV418S_KS702_0100 EZ502U | 7.7                  | 16                    | 295                 | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.40  | 1.3               | 2.0                | 9.3      | 3.2 | ZV418S_KS702_0100 EZ701U | 5.0                  | 16                    | 190                 | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.40  | 1.5               | 2.6                | 11       | 2.7 | ZV418S_KS702_0100 EZ503U | 10                   | 16                    | 400                 | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |
| 2.40  | 1.8               | 3.6                | 13       | 2.3 | ZV418S_KS702_0100 EZ702U | 10                   | 16                    | 390                 | 10.00 | 1.12                   | 2.40                   | 44                 | 66                  | 4             | 18 | 76.4          |



## 10.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

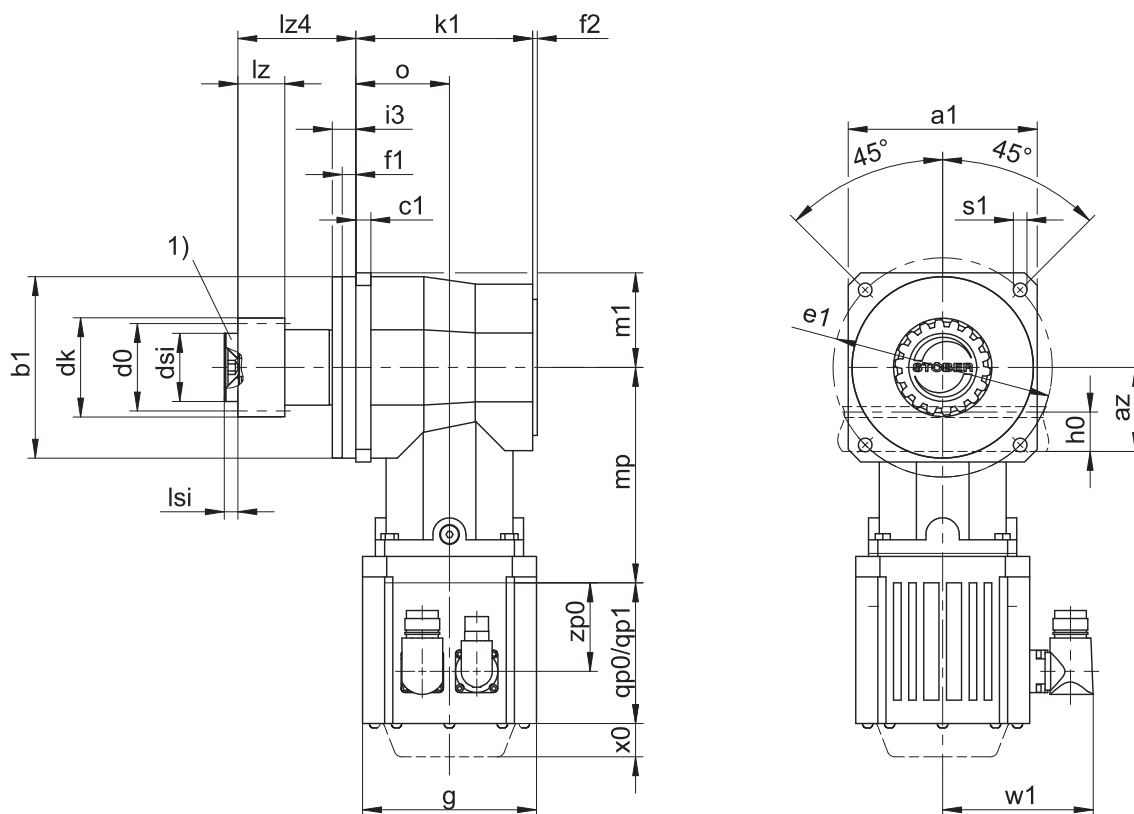
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.

### 10.3.1 Pinion position E



qp0 Applies to motors without brake.

x0 Applies to encoders using an optical measuring method.

1) Axial locking (optional)

qp1 Applies to motors with brake.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

#### Dimensions of gear units

| Type        | mn | a1  | az    | $\varnothing b1$  | c1 | $\varnothing d0$ | $\varnothing dk$ | $\varnothing dsi$ | $\varnothing e1$ | f1 | f2 | h0 | i3   | k1  | lz | lz4   | lsi | m1   | o  | $\varnothing s1$ | x   |
|-------------|----|-----|-------|-------------------|----|------------------|------------------|-------------------|------------------|----|----|----|------|-----|----|-------|-----|------|----|------------------|-----|
| ZV220SEKS4_ | 2  | 101 | 44.02 | 95 <sub>h6</sub>  | 10 | 42.44            | 47.90            | 30                | 120              | 8  | 3  | 22 | 14.0 | 101 | 26 | 54.5  | 6   | 50.5 | 53 | 6.6              | 0.4 |
| ZV225SEKS5_ | 2  | 125 | 49.33 | 120 <sub>h6</sub> | 10 | 53.05            | 58.52            | 45                | 145              | 9  | 3  | 22 | 15.5 | 117 | 26 | 78.0  | 8   | 62.5 | 62 | 9.0              | 0.4 |
| ZV318SEKS5_ | 3  | 125 | 55.55 | 120 <sub>h6</sub> | 10 | 57.30            | 65.01            | 45                | 145              | 9  | 3  | 26 | 15.5 | 117 | 31 | 78.0  | 8   | 62.5 | 62 | 9.0              | 0.3 |
| ZV322SEKS7_ | 3  | 155 | 62.21 | 150 <sub>h6</sub> | 15 | 70.03            | 78.35            | 55                | 180              | 10 | 3  | 26 | 20.0 | 145 | 31 | 107.5 | 10  | 77.5 | 78 | 11.0             | 0.4 |
| ZV418SEKS7_ | 4  | 155 | 74.40 | 150 <sub>h6</sub> | 15 | 76.40            | 86.77            | 55                | 180              | 10 | 3  | 35 | 20.0 | 145 | 41 | 107.5 | 10  | 77.5 | 78 | 11.0             | 0.3 |

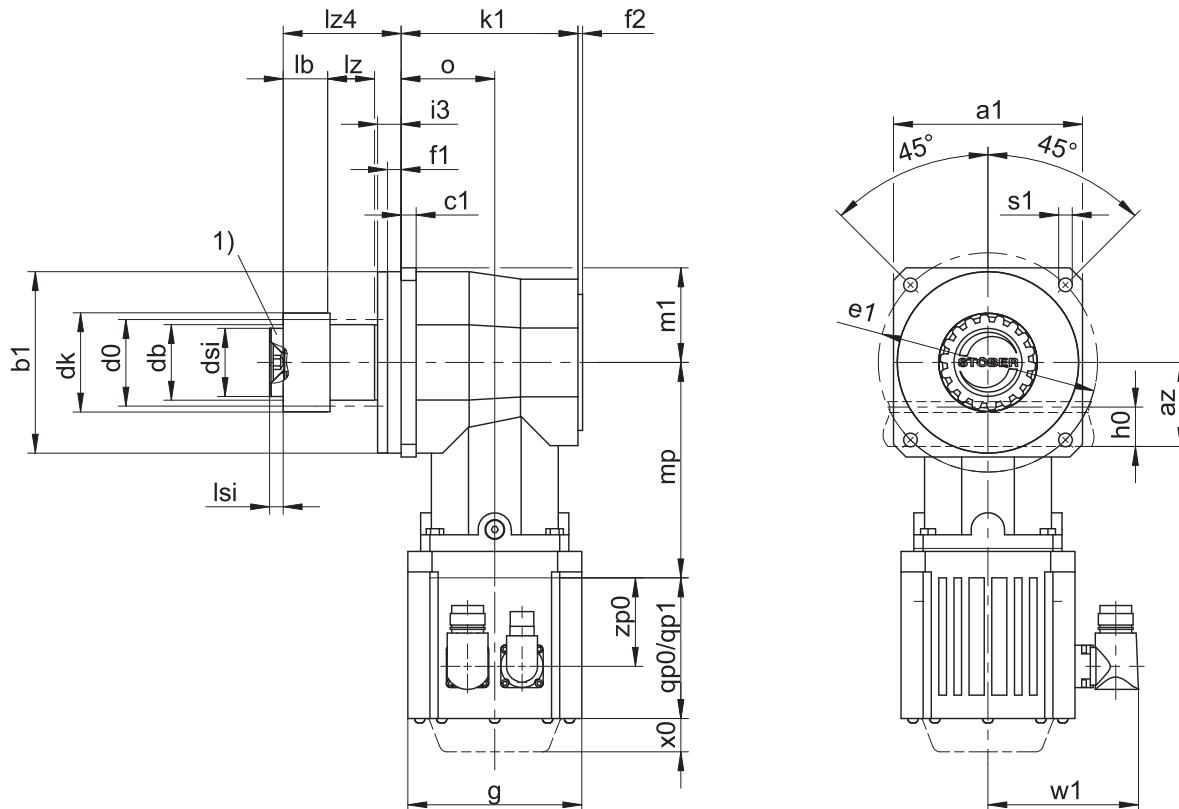
#### Dimensions of motors

| Type   | $\square g$ | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-------------|-----|-------|-------|----|-------|
| EZ202U | 55          | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55          | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72          | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72          | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72          | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98          | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98          | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98          | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115         | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115         | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115         | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115         | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145         | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145         | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145         | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145         | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190         | 197 | 274.0 | 156.5 | 22 | 143.0 |

## Dimensions of geared motors

| Type      | EZ2<br>mp | EZ3<br>mp | EZ4<br>mp | EZ5<br>mp | EZ7<br>mp | EZ8<br>mp |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| ZV_KS402_ | –         | 124.0     | 120.5     | 123.0     | –         | –         |
| ZV_KS403_ | 150.5     | 164.0     | –         | –         | –         | –         |
| ZV_KS502_ | –         | –         | 140.0     | 142.5     | 148.5     | –         |
| ZV_KS503_ | –         | 192.0     | 188.5     | 191.0     | –         | –         |
| ZV_KS702_ | –         | –         | –         | 167.0     | 173.0     | 188.0     |
| ZV_KS703_ | –         | –         | 222.5     | 225.0     | 231.0     | –         |

### 10.3.2 Pinion position S



qp0 Applies to motors without brake.

x0 Applies to encoders using an optical measuring method.

1) Axial locking (optional)

qp1 Applies to motors with brake.

w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4](#)

#### Dimensions of gear units

| Type        | mn | a1  | az    | Øb1               | c1 | Ød0   | Ødb | Ødk   | Ødsi | Øe1 | f1 | f2 | h0 | i3   | k1  | lb   | lz | lz4   | lsi | m1   | o  | Øs1  | x   |
|-------------|----|-----|-------|-------------------|----|-------|-----|-------|------|-----|----|----|----|------|-----|------|----|-------|-----|------|----|------|-----|
| ZV220SSKS4_ | 2  | 101 | 44.02 | 95 <sub>h6</sub>  | 10 | 42.44 | 38  | 47.90 | 30   | 120 | 8  | 3  | 22 | 14.0 | 101 | 12.5 | 26 | 54.5  | 6   | 50.5 | 53 | 6.6  | 0.4 |
| ZV225SSKS5_ | 2  | 125 | 49.33 | 120 <sub>h6</sub> | 10 | 53.05 | 50  | 58.52 | 45   | 145 | 9  | 3  | 22 | 15.5 | 117 | 34.5 | 26 | 78.0  | 8   | 62.5 | 62 | 9.0  | 0.4 |
| ZV318SSKS5_ | 3  | 125 | 55.55 | 120 <sub>h6</sub> | 10 | 57.30 | 50  | 65.01 | 45   | 145 | 9  | 3  | 26 | 15.5 | 117 | 29.5 | 31 | 78.0  | 8   | 62.5 | 62 | 9.0  | 0.3 |
| ZV322SSKS7_ | 3  | 155 | 62.21 | 150 <sub>h6</sub> | 15 | 70.03 | 62  | 78.35 | 55   | 180 | 10 | 3  | 26 | 20.0 | 145 | 53.5 | 31 | 107.5 | 10  | 77.5 | 78 | 11.0 | 0.4 |
| ZV418SSKS7_ | 4  | 155 | 74.40 | 150 <sub>h6</sub> | 15 | 76.40 | 62  | 86.77 | 55   | 180 | 10 | 3  | 35 | 20.0 | 145 | 43.5 | 41 | 107.5 | 10  | 77.5 | 78 | 11.0 | 0.3 |

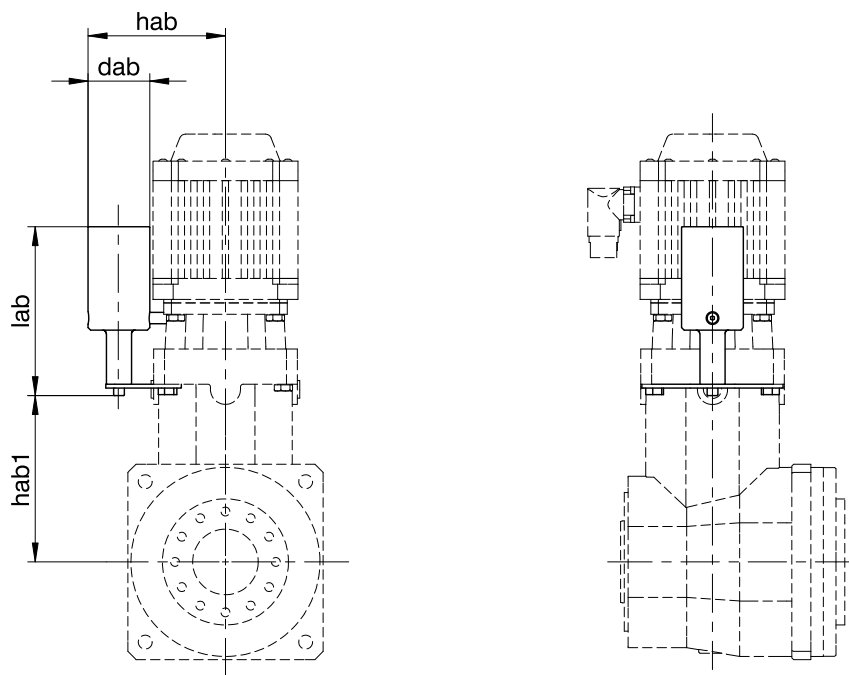
#### Dimensions of motors

| Type   | □g  | qp0 | qp1   | w1    | x0 | zp0   |
|--------|-----|-----|-------|-------|----|-------|
| EZ202U | 55  | 141 | 150.0 | 47.0  | 25 | 86.0  |
| EZ203U | 55  | 159 | 168.0 | 47.0  | 25 | 104.0 |
| EZ301U | 72  | 90  | 130.0 | 55.5  | 21 | 54.5  |
| EZ302U | 72  | 112 | 152.0 | 55.5  | 21 | 76.5  |
| EZ303U | 72  | 134 | 174.0 | 55.5  | 21 | 98.5  |
| EZ401U | 98  | 98  | 146.5 | 91.0  | 22 | 56.0  |
| EZ402U | 98  | 123 | 171.5 | 91.0  | 22 | 81.0  |
| EZ404U | 98  | 173 | 221.5 | 91.0  | 22 | 131.0 |
| EZ501U | 115 | 93  | 147.5 | 100.0 | 22 | 58.5  |
| EZ502U | 115 | 118 | 172.5 | 100.0 | 22 | 83.5  |
| EZ503U | 115 | 143 | 197.5 | 100.0 | 22 | 108.5 |
| EZ505U | 115 | 193 | 247.5 | 100.0 | 22 | 158.5 |
| EZ701U | 145 | 102 | 161.0 | 115.0 | 22 | 64.0  |
| EZ702U | 145 | 127 | 186.0 | 115.0 | 22 | 89.0  |
| EZ703U | 145 | 152 | 211.0 | 115.0 | 22 | 114.0 |
| EZ705U | 145 | 207 | 266.0 | 134.0 | 22 | 165.0 |
| EZ802U | 190 | 197 | 274.0 | 156.5 | 22 | 143.0 |

## Dimensions of geared motors

| Type      | EZ2<br>mp | EZ3<br>mp | EZ4<br>mp | EZ5<br>mp | EZ7<br>mp | EZ8<br>mp |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| ZV_KS402_ | –         | 124.0     | 120.5     | 123.0     | –         | –         |
| ZV_KS403_ | 150.5     | 164.0     | –         | –         | –         | –         |
| ZV_KS502_ | –         | –         | 140.0     | 142.5     | 148.5     | –         |
| ZV_KS503_ | –         | 192.0     | 188.5     | 191.0     | –         | –         |
| ZV_KS702_ | –         | –         | –         | 167.0     | 173.0     | 188.0     |
| ZV_KS703_ | –         | –         | 222.5     | 225.0     | 231.0     | –         |

### 10.3.3 Oil expansion tank



**Dimensions**

| Type      | EZ2 |     |      |      | EZ3 |     |      |      | EZ4 |     |       |      | EZ5 |     |       |      | EZ7 |     |       |      |
|-----------|-----|-----|------|------|-----|-----|------|------|-----|-----|-------|------|-----|-----|-------|------|-----|-----|-------|------|
|           | dab | lab | hab  | hab1 | dab | lab | hab  | hab1 | dab | lab | hab   | hab1 | dab | lab | hab   | hab1 | dab | lab | hab   | hab1 |
| ZV_KS403_ | 34  | 100 | 74.5 | 85   | 34  | 100 | 74.5 | 85   | -   | -   | -     | -    | -   | -   | -     | -    | -   | -   | -     | -    |
| ZV_KS503_ | -   | -   | -    | -    | 39  | 122 | 92.0 | 105  | 39  | 122 | 92.0  | 105  | 39  | 122 | 92.0  | 105  | -   | -   | -     | -    |
| ZV_KS703_ | -   | -   | -    | -    | -   | -   | -    | -    | 49  | 134 | 109.5 | 132  | 49  | 134 | 109.5 | 132  | 49  | 134 | 109.5 | 132  |

More information can be found in the chapter [\[> 10.6.3\]](#)

## 10.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |   |    |   |   |   |   |   |      |        |
|---|---|---|----|---|---|----|---|---|---|---|---|------|--------|
| Z | V | 2 | 20 | S | S | KS | 4 | 0 | 2 | P | F | 0080 | EZ401U |
|---|---|---|----|---|---|----|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                 | Design                          |
|--------|-----------------------------|---------------------------------|
| Z      | Type                        | Rack and pinion drive           |
| V      | Design                      | Plug-on pinion                  |
| 2      | Module                      | $m_n = 2$ (example)             |
| 20     | Number of teeth             | $z = 20$ (example)              |
| S      | Toothing                    | Helical (left-hand 19° 31' 42") |
| E      | Pinion position             | Shaft end                       |
| S      |                             | Shaft shoulder                  |
| KS     | Type                        | Right-angle servo gear unit     |
| 4      | Size                        | 4 (example)                     |
| 0      | Generation                  | Generation 0                    |
| 2      | Stages                      | Two-stage                       |
| 3      |                             | Three-stage                     |
| P      | Shaft                       | Solid shaft with feather key    |
| F      | Housing                     | Standard                        |
| 0080   | Transmission ratio (i x 10) | i = 8 (example)                 |
| EZ401U | Motor                       | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

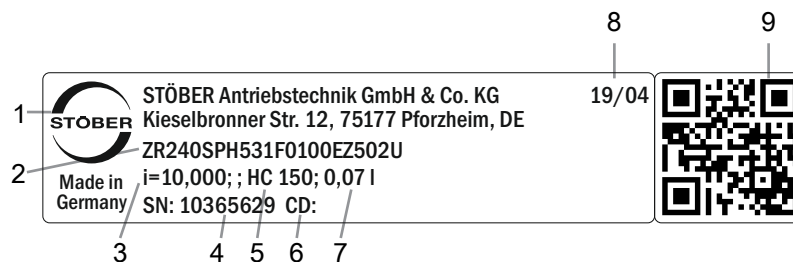
- A detailed type designation of the motor, see chapter [▶ 13](#)
- Mounting position, see chapter [▶ 10.5.4](#)
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see chapter [▶ 10.6.2](#)
- Position of the plug connectors, see chapter [▶ 10.5.6](#)
- For the attachment of oil expansion tank on gear unit side 1 or 2 (required without exception for three-stage gear units in mounting position EL5), see the chapter [▶ 10.3.3](#)
- For axial locking (optional), see the chapter [▶ 10.3](#)

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [▶ 10.5.1](#).

## 10.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 10.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 10.5 Product description

### 10.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

ME motor adapter



Catalog ID 443137\_en

The corresponding catalogs can be found at <http://www.stoeber.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 10.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 6.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material       |
|-------------------|---------------------------|--------------------------|
| 2 – 4             | 8                         | C45 inductively hardened |

Also note the project configuration of the gear rack on the Atlanta pages.

### 10.5.2.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

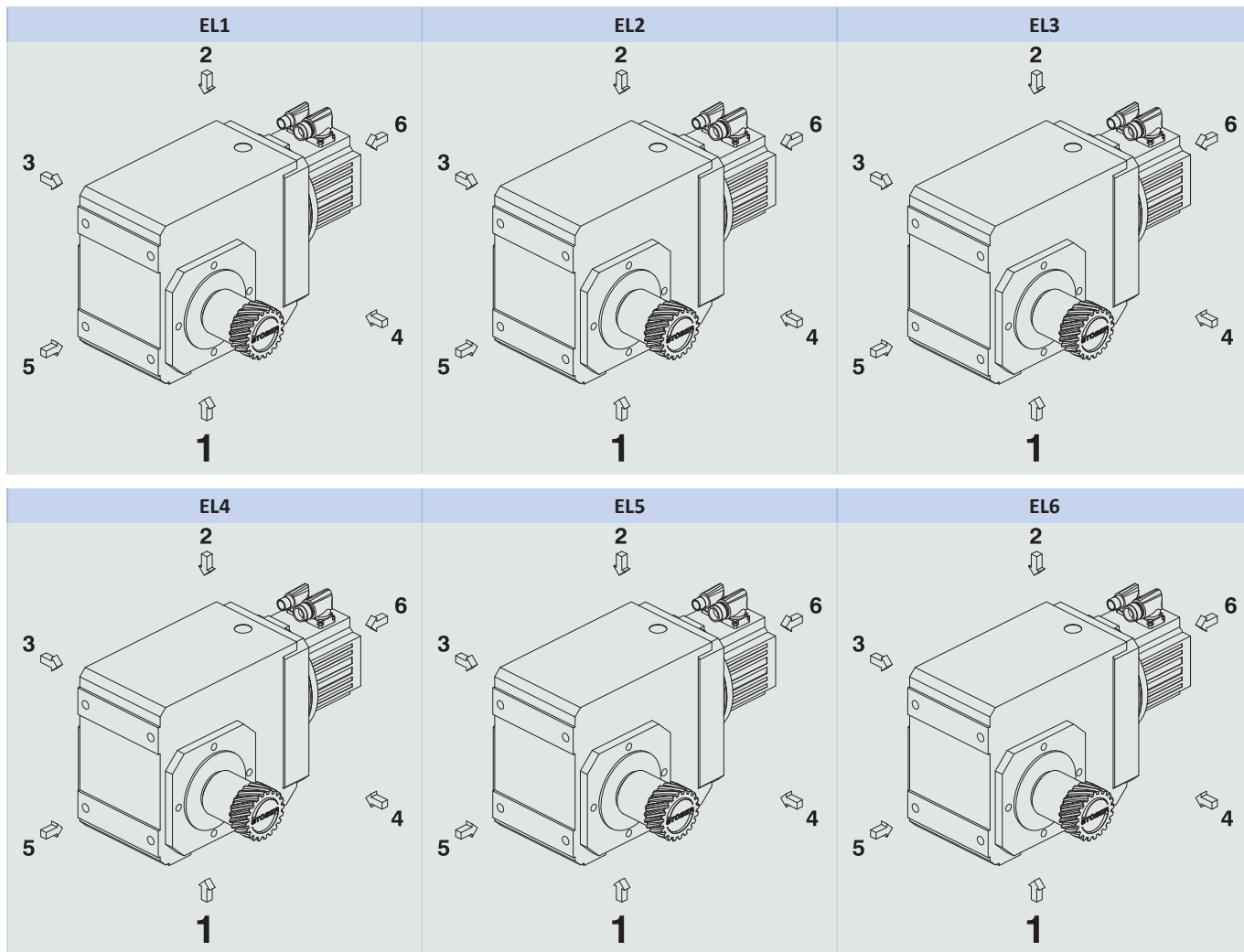
## 10.5.3 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 10.5.4 Mounting positions

The following table shows the standard mounting positions.

The numbers identify the gear unit sides. The mounting position is defined by the gear side facing downwards.



Since the lubricant filling volume of the gear unit depends on the mounting position, the mounting position must be specified when ordering.

## 10.5.5 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate. The filling volume and the structure of the gear units depend on the mounting position.

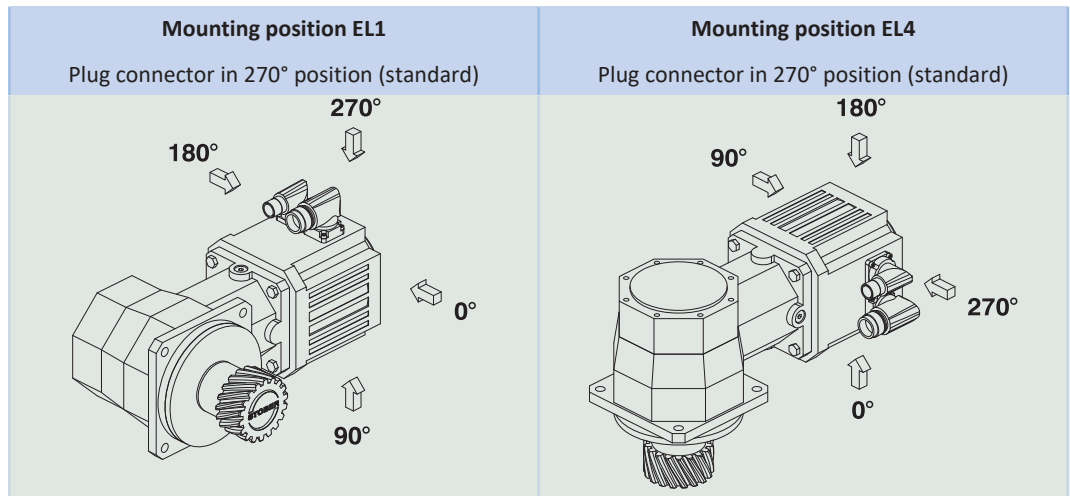
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

### 10.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 10.5.6 Position of the plug connectors



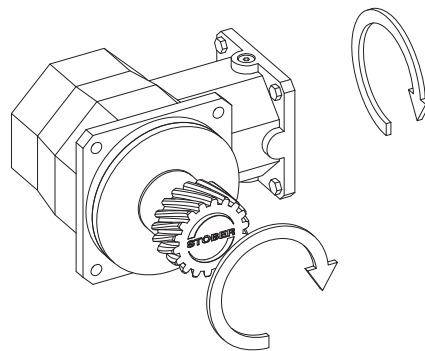
The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

Note that the plug connectors also rotate when the gear rack is rotated to a different position.

## 10.5.7 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 90 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

## 10.5.8 Direction of rotation



The pictures show mounting position EL1.

## 10.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

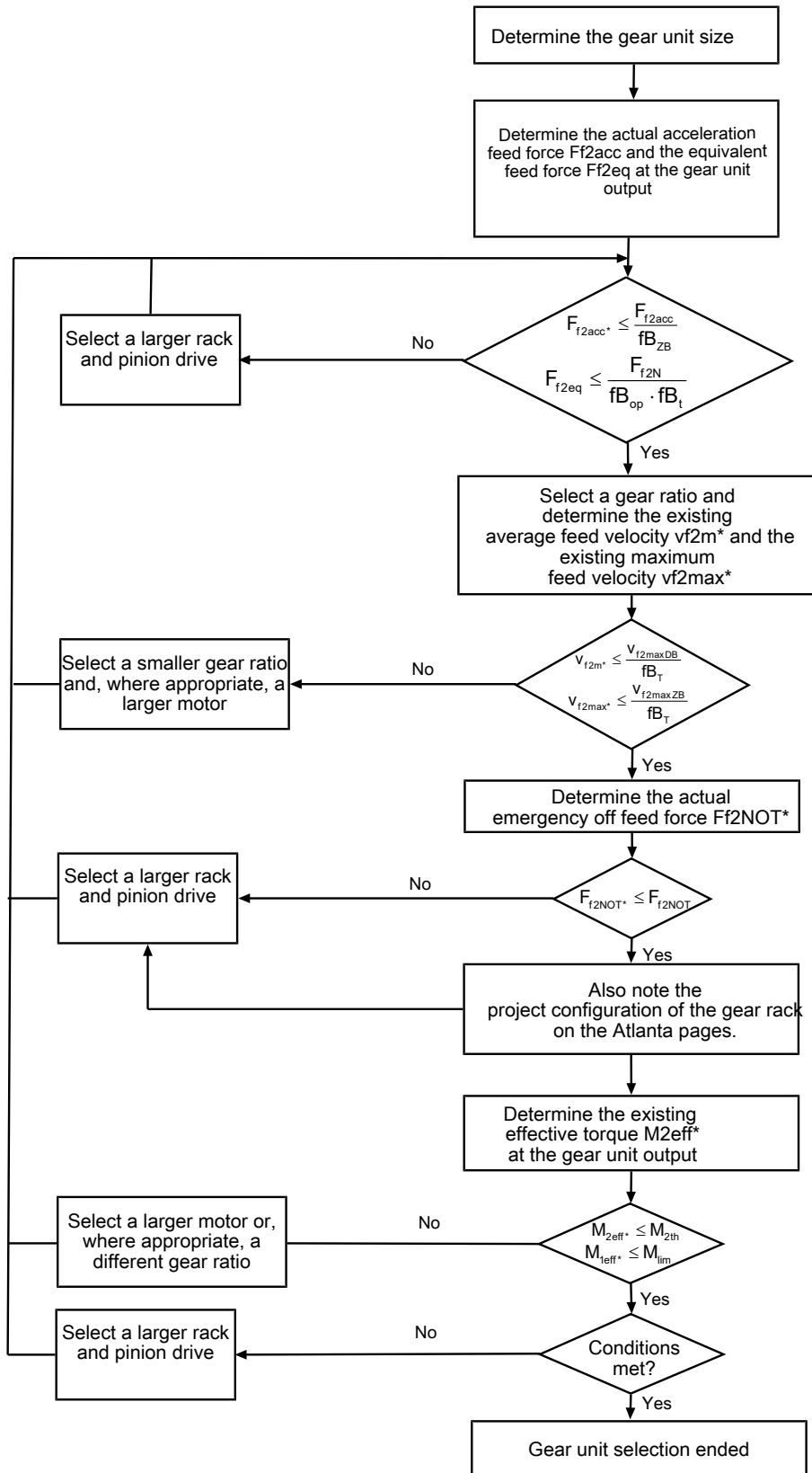
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

<sup>1</sup> Observe the protection class of all the components.

### 10.6.1 Drive selection

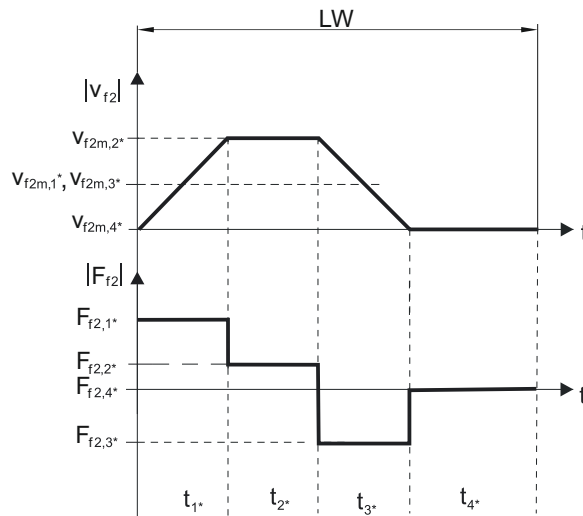


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

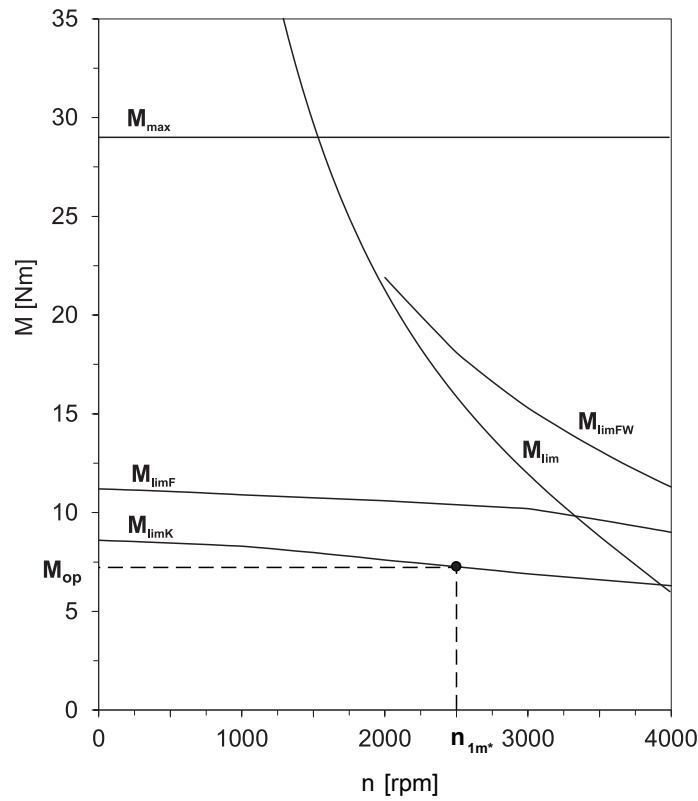
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | fB <sub>op</sub> |
|---------------------------------|-------------------------|------------------|
| Uniform continuous operation    |                         | 1.00             |
| Cyclic operation                |                         | 1.00             |
| Reversing load cyclic operation |                         | 1.00             |
| Run time                        |                         | fB <sub>t</sub>  |
| Daily runtime ≤ 8 h             |                         | 1.00             |
| Daily runtime ≤ 16 h            |                         | 1.15             |
| Daily runtime ≤ 24 h            |                         | 1.20             |
| Cyclic operation                |                         | fB <sub>ZB</sub> |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00             |
| > 1000 load changes/hour (LW/h) |                         | 1.15             |
| Temperature                     |                         | fB <sub>T</sub>  |
| Motor cooling                   | Surrounding temperature |                  |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9              |
|                                 | ≤ 30 °C                 | 1.0              |
|                                 | ≤ 40 °C                 | 1.15             |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0              |
|                                 | ≤ 30 °C                 | 1.1              |
|                                 | ≤ 40 °C                 | 1.25             |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 10.6.2 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

**Properties:**

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

## 10.6.3 Oil expansion tank

The gear units have a higher fill level in mounting position EL5. The oil expansion tank prevents oil from escaping out of the gear unit.

**Notes**

- Three-stage KS gear units in mounting position EL5 can be used only in combination with an oil expansion tank!
- It is not possible to use an oil expansion tank if the plug connector and oil expansion tank are on the same side!
- Please specify the attachment side (gear unit side 1 or 2) in the order.
- Note that mounting an oil expansion tank is not possible with every motor adapter (collision between motor adapter and oil expansion tank).

## 10.7 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

| Documentation                                    | ID        |
|--|-----------|
| Operating manual gear units, geared motors KS    | 443362_en |
| Operating manual for EZ synchronous servo motors | 443032_en |
| Operating manual for gear racks (Atlanta)        | 442455    |

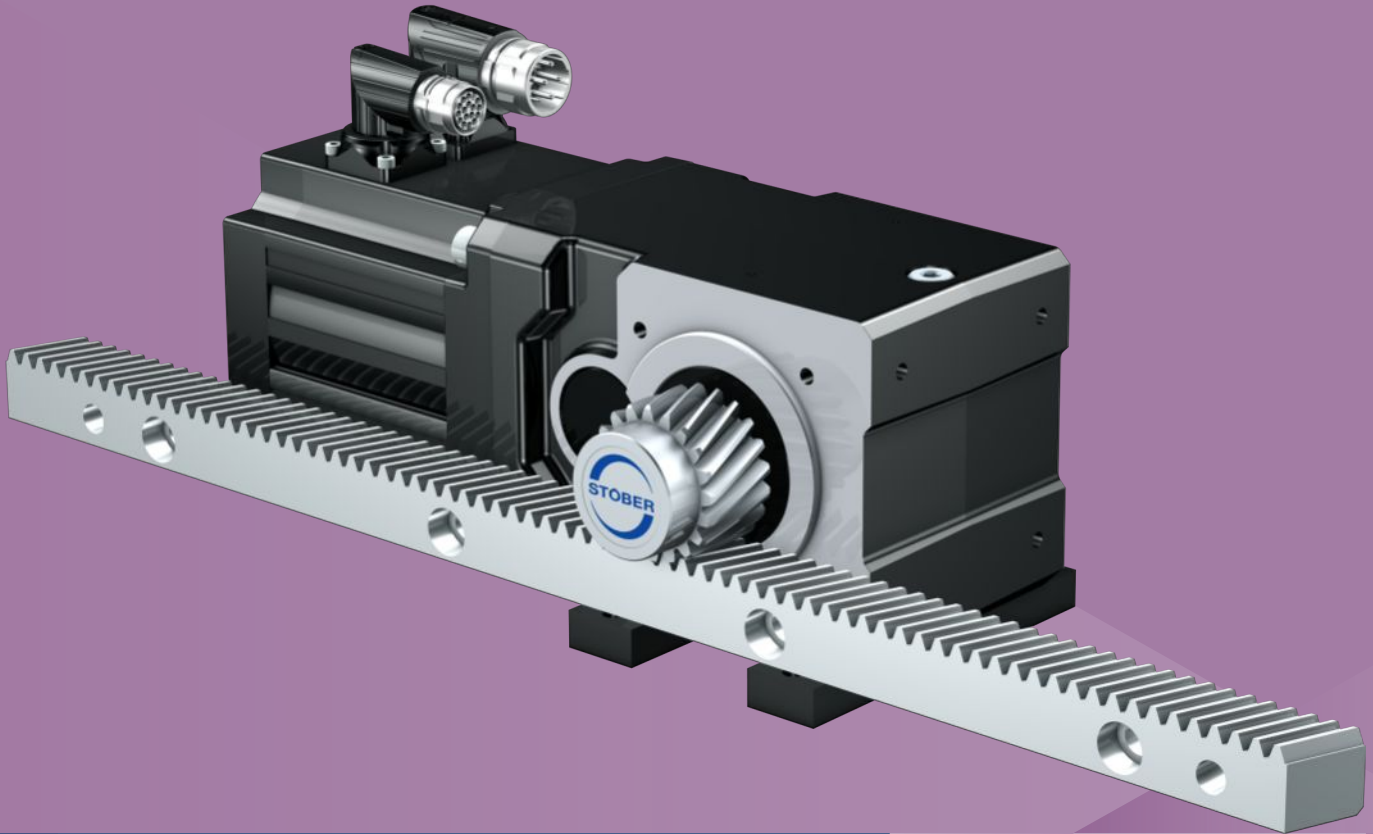




# 11 ZVKL rack and pinion drives

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# 11 Rack and pinion drives

# ZVKL

## 11.1 Overview

Compact right-angle geared motors with plug-on pinion

### Features

- Power density ★★★★★
- Linear clearance ★★★★★
- Price category €
- Smooth operation ★★★★★
- Linear rigidity ★★★★★
- Mass moment of inertia ★★★★★
- Ready-to-install drive solution ✓
- Pinion gearing quality 6 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓
- Compact and highly dynamic due to direct motor attachment ✓

Key ★☆☆☆☆ good | ★★★★★ excellent  
 € Economy | €€€€€ Premium

### Technical data

|             |                        |
|-------------|------------------------|
| $m_n$       | 2 mm                   |
| $z$         | 16 – 20                |
| $F_{f2acc}$ | 0.34 – 2.7 kN          |
| $v_{f2N}$   | 0.21 – 3.3 m/s         |
| $\Delta s$  | 99 – 123 $\mu\text{m}$ |

## 11.2 Selection table

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 11.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| $v_{f2N}$<br>[m/s]   | $F_{f2N}$<br>[kN] | $F_{f2,0}$<br>[kN] | $a_{th}$ | S   | Type                     | $F_{f2accE}$<br>[kN] | $F_{f2NOT,E}$<br>[kN] | $M_{2accE}$<br>[Nm] | i     | $v_{f2maxDB}$<br>[m/s] | $v_{f2maxZB}$<br>[m/s] | $\Delta s$<br>[μm] | $C_{lin}$<br>[N/μm] | $m_n$<br>[mm] | z  | $d_0$<br>[mm] |
|--|-------------------|--------------------|----------|-----|--------------------------|----------------------|-----------------------|---------------------|-------|------------------------|------------------------|--------------------|---------------------|---------------|----|---------------|
| <b>ZV2KL1 (<math>n_{iN} = 3000</math> rpm, (<math>F_{f2acc,max} = 1,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.33   | 0.9               | 0.9                | 16       | 1.0 | ZV216S_KL102_0160 EZ301U | 1.5                  | 3.5                   | 26                  | 16.00 | 0.44                   | 0.67                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 0.67   | 0.4               | 0.4                | 17       | 1.6 | ZV216S_KL102_0080 EZ301U | 1.3                  | 3.5                   | 22                  | 8.000 | 0.78                   | 1.33                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 1.33   | 0.2               | 0.2                | 22       | 2.6 | ZV216S_KL102_0040 EZ301U | 0.6                  | 1.7                   | 11                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| 1.33   | 0.4               | 0.4                | 37       | 1.5 | ZV216S_KL102_0040 EZ302U | 1.1                  | 1.7                   | 19                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| 1.33   | 0.5               | 0.5                | 49       | 1.2 | ZV216S_KL102_0040 EZ303U | 1.3                  | 1.7                   | 22                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| <b>ZV2KL1 (<math>n_{iN} = 6000</math> rpm, (<math>F_{f2acc,max} = 1,5</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.33   | 0.7               | 0.8                | 11       | 1.2 | ZV216S_KL102_0320 EZ202U | 1.5                  | 3.8                   | 26                  | 32.00 | 0.22                   | 0.33                   | 99                 | 5.4                 | 2             | 16 | 34.0          |
| 0.67   | 0.4               | 0.4                | 8.8      | 1.9 | ZV216S_KL102_0160 EZ202U | 1.4                  | 3.5                   | 23                  | 16.00 | 0.44                   | 0.67                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 0.67   | 0.6               | 0.6                | 13       | 1.2 | ZV216S_KL102_0160 EZ203U | 1.5                  | 3.5                   | 26                  | 16.00 | 0.44                   | 0.67                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 1.33   | 0.2               | 0.2                | 9.3      | 3.0 | ZV216S_KL102_0080 EZ202U | 0.7                  | 3.5                   | 11                  | 8.000 | 0.78                   | 1.33                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 1.33   | 0.3               | 0.3                | 14       | 2.0 | ZV216S_KL102_0080 EZ203U | 1.2                  | 3.5                   | 21                  | 8.000 | 0.78                   | 1.33                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 1.33   | 0.4               | 0.4                | 21       | 1.4 | ZV216S_KL102_0080 EZ301U | 1.3                  | 3.5                   | 22                  | 8.000 | 0.78                   | 1.33                   | 99                 | 5.5                 | 2             | 16 | 34.0          |
| 2.67   | 0.1               | 0.1                | 12       | 4.8 | ZV216S_KL102_0040 EZ202U | 0.3                  | 1.7                   | 5.7                 | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| 2.67   | 0.1               | 0.2                | 18       | 3.1 | ZV216S_KL102_0040 EZ203U | 0.6                  | 1.7                   | 10                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| 2.67   | 0.2               | 0.2                | 26       | 2.1 | ZV216S_KL102_0040 EZ301U | 0.6                  | 1.7                   | 11                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| 2.67   | 0.3               | 0.4                | 45       | 1.3 | ZV216S_KL102_0040 EZ302U | 1.1                  | 1.7                   | 19                  | 4.000 | 1.56                   | 2.67                   | 123                | 5.0                 | 2             | 16 | 34.0          |
| <b>ZV2KL2 (<math>n_{iN} = 3000</math> rpm, (<math>F_{f2acc,max} = 2,7</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.21   | 1.4               | 1.4                | 11       | 1.1 | ZV220S_KL202_0320 EZ301U | 2.7                  | 6.1                   | 57                  | 32.00 | 0.28                   | 0.42                   | 99                 | 10                  | 2             | 20 | 42.4          |
| 0.42   | 0.7               | 0.7                | 9.0      | 1.8 | ZV220S_KL202_0160 EZ301U | 2.0                  | 5.6                   | 43                  | 16.00 | 0.56                   | 0.83                   | 99                 | 11                  | 2             | 20 | 42.4          |
| 0.42   | 1.2               | 1.2                | 15       | 1.1 | ZV220S_KL202_0160 EZ302U | 2.7                  | 5.6                   | 57                  | 16.00 | 0.56                   | 0.83                   | 99                 | 11                  | 2             | 20 | 42.4          |
| 0.83   | 0.3               | 0.3                | 15       | 2.9 | ZV220S_KL202_0080 EZ301U | 1.0                  | 2.8                   | 22                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 0.83   | 0.6               | 0.6                | 26       | 1.7 | ZV220S_KL202_0080 EZ302U | 1.7                  | 2.8                   | 35                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 0.83   | 0.8               | 0.8                | 33       | 1.3 | ZV220S_KL202_0080 EZ303U | 1.7                  | 2.8                   | 35                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 1.67   | 0.5               | 0.5                | 34       | 1.5 | ZV220S_KL202_0040 EZ401U | 1.6                  | 5.1                   | 33                  | 4.000 | 1.94                   | 3.33                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| <b>ZV2KL2 (<math>n_{iN} = 6000</math> rpm, (<math>F_{f2acc,max} = 2,0</math> kN)</b> |                   |                    |          |     |                          |                      |                       |                     |       |                        |                        |                    |                     |               |    |               |
| 0.83   | 0.7               | 0.7                | 11       | 1.5 | ZV220S_KL202_0160 EZ301U | 2.0                  | 5.6                   | 43                  | 16.00 | 0.56                   | 0.83                   | 99                 | 11                  | 2             | 20 | 42.4          |
| 1.67   | 0.3               | 0.3                | 14       | 2.4 | ZV220S_KL202_0080 EZ301U | 1.0                  | 2.8                   | 22                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 1.67   | 0.5               | 0.6                | 24       | 1.4 | ZV220S_KL202_0080 EZ302U | 1.7                  | 2.8                   | 35                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 1.67   | 0.7               | 0.8                | 32       | 1.1 | ZV220S_KL202_0080 EZ303U | 1.7                  | 2.8                   | 35                  | 8.000 | 1.11                   | 1.67                   | 123                | 8.8                 | 2             | 20 | 42.4          |
| 3.33   | 0.4               | 0.5                | 35       | 1.5 | ZV220S_KL202_0040 EZ401U | 1.6                  | 5.1                   | 33                  | 4.000 | 1.94                   | 3.33                   | 123                | 8.8                 | 2             | 20 | 42.4          |

## 11.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

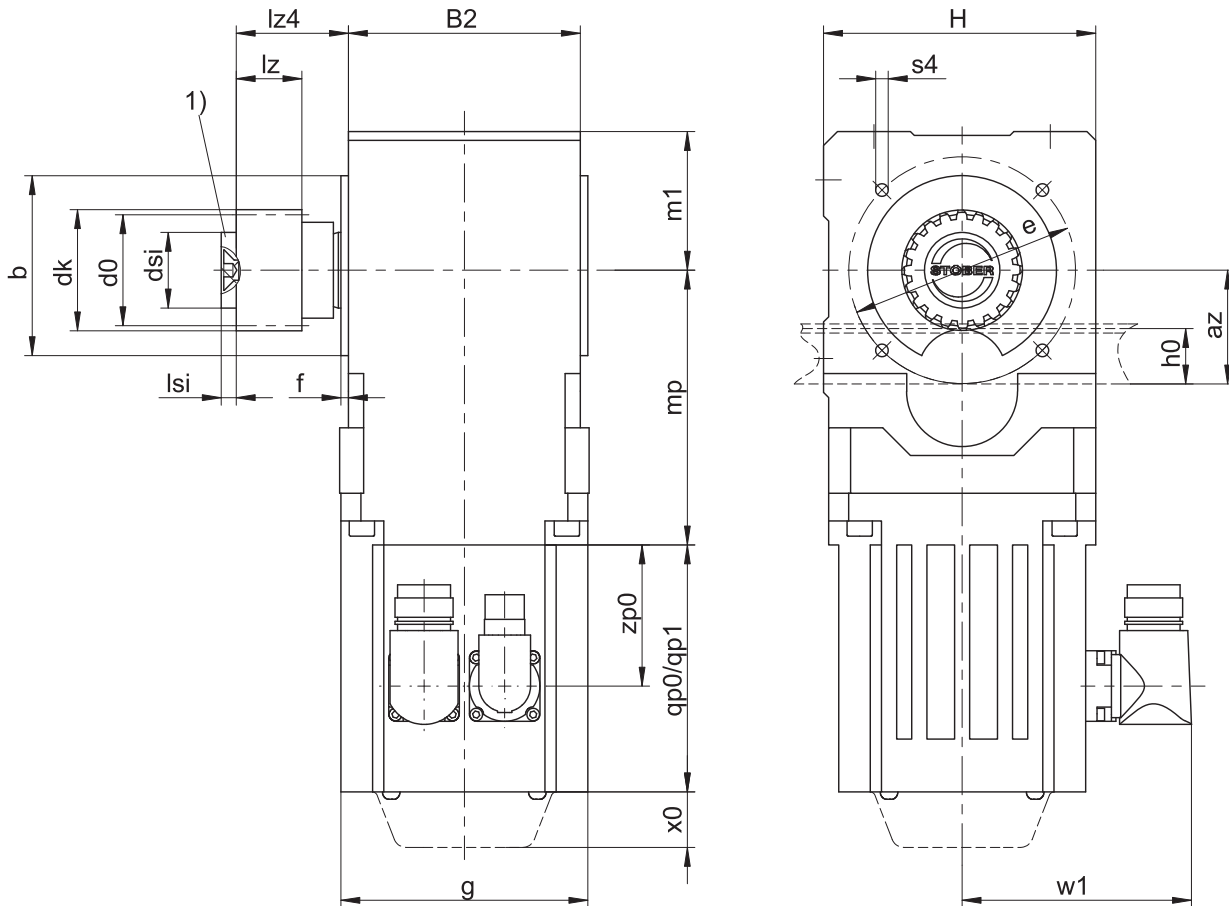
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.

### 11.3.1 Pinion position E



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type        | mn | az    | $\varnothing b$ | B2 | $\varnothing d_0$ | $\varnothing dk$ | $\varnothing d_{si}$ | $\varnothing e$ | f | h0 | H   | lz | lz4  | lsi | m1 | s4 | x   |
|-------------|----|-------|-----------------|----|-------------------|------------------|----------------------|-----------------|---|----|-----|----|------|-----|----|----|-----|
| ZV216SEKL1_ | 2  | 39.98 | 60 <sub>6</sub> | 75 | 33.95             | 39.81            | 25                   | 75              | 3 | 22 | 90  | 26 | 35.5 | 5   | 46 | M6 | 0.5 |
| ZV220SEKL2_ | 2  | 44.02 | 75 <sub>6</sub> | 92 | 42.44             | 47.90            | 30                   | 90              | 3 | 22 | 108 | 26 | 44.5 | 7   | 55 | M6 | 0.4 |

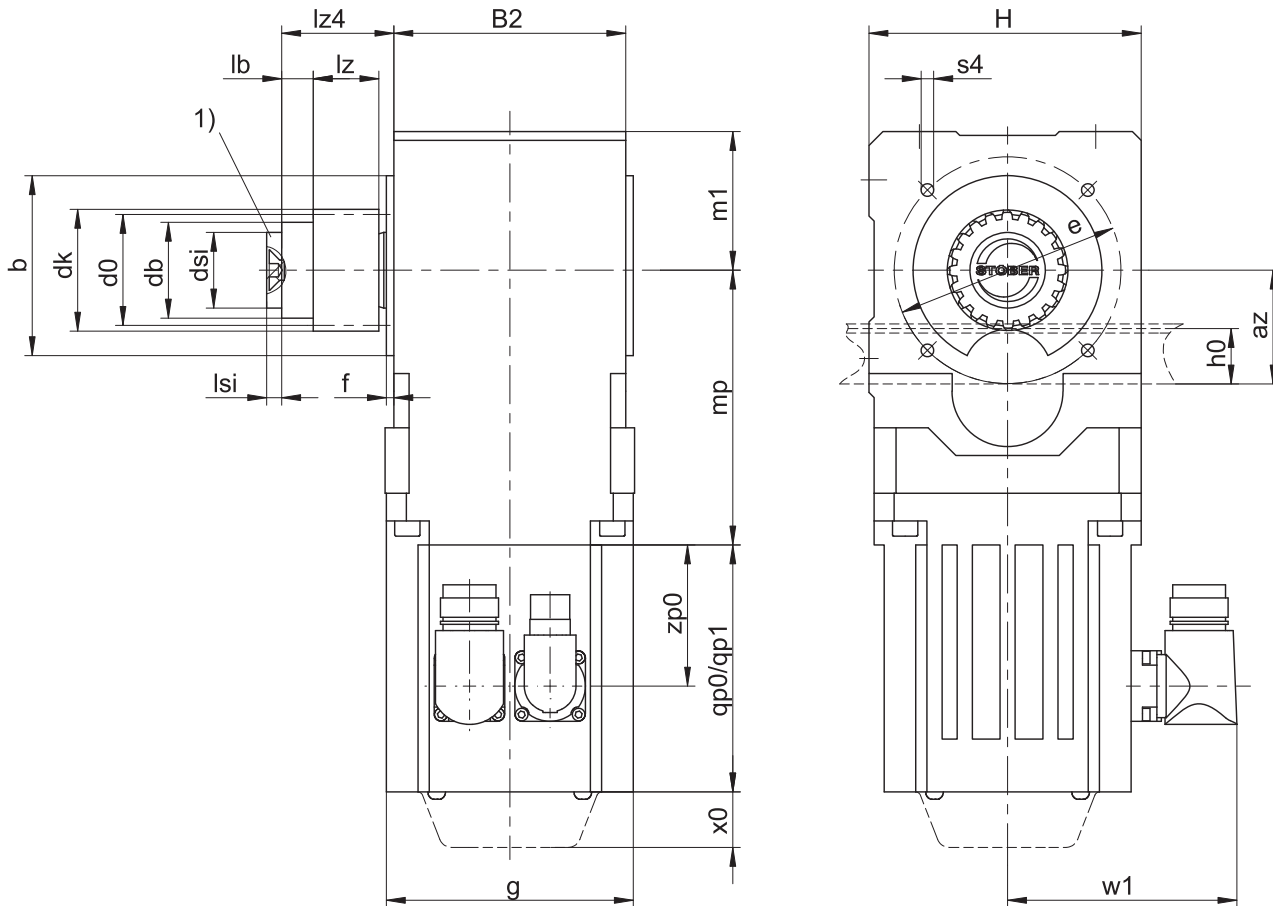
#### Dimensions of motors

| Type   | $\square g$ | qp0 | qp1   | w1   | x0 | zp0   |
|--------|-------------|-----|-------|------|----|-------|
| EZ202U | 55          | 141 | 150.0 | 47.0 | 25 | 86.0  |
| EZ203U | 55          | 159 | 168.0 | 47.0 | 25 | 104.0 |
| EZ301U | 72          | 90  | 130.0 | 55.5 | 21 | 54.5  |
| EZ302U | 72          | 112 | 152.0 | 55.5 | 21 | 76.5  |
| EZ303U | 72          | 134 | 174.0 | 55.5 | 21 | 98.5  |
| EZ401U | 98          | 98  | 146.5 | 91.0 | 22 | 56.0  |
| EZ402U | 98          | 123 | 171.5 | 91.0 | 22 | 81.0  |

#### Dimensions of geared motors

| Type      | EZ2<br>mp | EZ3<br>mp | EZ4<br>mp |
|-----------|-----------|-----------|-----------|
| ZV_KL102_ | 78.5      | 95.5      | -         |
| ZV_KL202_ | -         | 112.5     | 109.0     |

### 11.3.2 Pinion position S



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [▶ 13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type        | mn | az    | Øb              | B2 | Ød0   | Ødb | Ødk   | Ødsi | Øe | f | h0 | H   | lb   | lz | lz4  | lsi | m1 | s4 | x   |
|-------------|----|-------|-----------------|----|-------|-----|-------|------|----|---|----|-----|------|----|------|-----|----|----|-----|
| ZV216SSKL1_ | 2  | 39.98 | 60 <sub>6</sub> | 75 | 33.95 | 30  | 39.81 | 25   | 75 | 3 | 22 | 90  | 4.5  | 26 | 35.5 | 5   | 46 | M6 | 0.5 |
| ZV220SSKL2_ | 2  | 44.02 | 75 <sub>6</sub> | 92 | 42.44 | 38  | 47.90 | 30   | 90 | 3 | 22 | 108 | 12.5 | 26 | 44.5 | 7   | 55 | M6 | 0.4 |

#### Dimensions of motors

| Type   | □g | qp0 | qp1   | w1   | x0 | zp0   |
|--------|----|-----|-------|------|----|-------|
| EZ202U | 55 | 141 | 150.0 | 47.0 | 25 | 86.0  |
| EZ203U | 55 | 159 | 168.0 | 47.0 | 25 | 104.0 |
| EZ301U | 72 | 90  | 130.0 | 55.5 | 21 | 54.5  |
| EZ302U | 72 | 112 | 152.0 | 55.5 | 21 | 76.5  |
| EZ303U | 72 | 134 | 174.0 | 55.5 | 21 | 98.5  |
| EZ401U | 98 | 98  | 146.5 | 91.0 | 22 | 56.0  |
| EZ402U | 98 | 123 | 171.5 | 91.0 | 22 | 81.0  |

#### Dimensions of geared motors

| Type      | EZ2<br>mp | EZ3<br>mp | EZ4<br>mp |
|-----------|-----------|-----------|-----------|
| ZV_KL102_ | 78.5      | 95.5      | -         |
| ZV_KL202_ | -         | 112.5     | 109.0     |

## 11.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |   |    |   |   |   |   |   |      |        |
|---|---|---|----|---|---|----|---|---|---|---|---|------|--------|
| Z | V | 2 | 20 | S | S | KL | 2 | 0 | 2 | P | G | 0080 | EZ401U |
|---|---|---|----|---|---|----|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                          | Design                          |
|--------|--------------------------------------|---------------------------------|
| Z      | Type                                 | Rack and pinion drive           |
| V      | Design                               | Plug-on pinion                  |
| 2      | Module                               | $m_n = 2$ (example)             |
| 20     | Number of teeth                      | $z = 20$ (example)              |
| S      | Toothing                             | Helical (left-hand 19° 31' 42") |
| E      | Pinion position                      | Shaft end                       |
| S      |                                      | Shaft shoulder                  |
| KL     | Type                                 | Helical bevel gear unit         |
| 2      | Size                                 | 2 (example)                     |
| 0      | Generation                           | Generation 0                    |
| 2      | Stages                               | Two-stage                       |
| P      | Shaft                                | Solid shaft with feather key    |
| G      | Housing                              | Pitch circle diameter           |
| 0080   | Transmission ratio ( $i \times 10$ ) | $i = 8$ (example)               |
| EZ401U | Motor                                | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

- For a detailed type designation of the motor, see the chapter [\[ 13\]](#)
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- For the position of the plug connectors, see the chapter [\[ 11.5.6\]](#)
- For axial locking (optional), see the chapter [\[ 11.3\]](#)

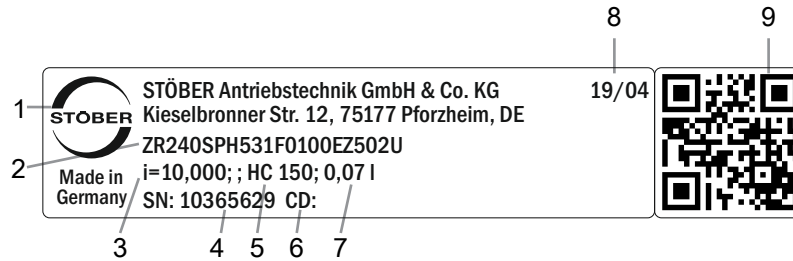
An explanation of the gear unit sides can be found in the chapter [\[ 11.5.4\]](#)

In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 11.5.1\]](#).

## 11.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 11.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 11.5 Product description

### 11.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

MQ motor adapter



Catalog ID 443137\_en

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 11.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 6.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material       |
|-------------------|---------------------------|--------------------------|
| 2 – 4             | 8                         | C45 inductively hardened |

Also note the project configuration of the gear rack on the Atlanta pages.

### 11.5.2.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

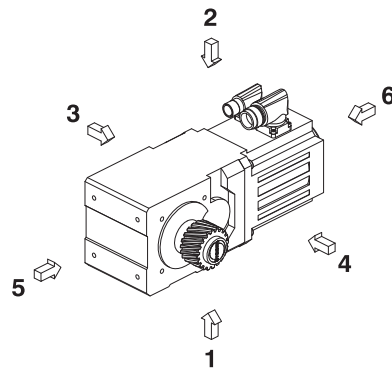
- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 11.5.3 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 11.5.4 Gear unit sides



The numbers identify the gear unit sides.

## 11.5.5 Lubricants

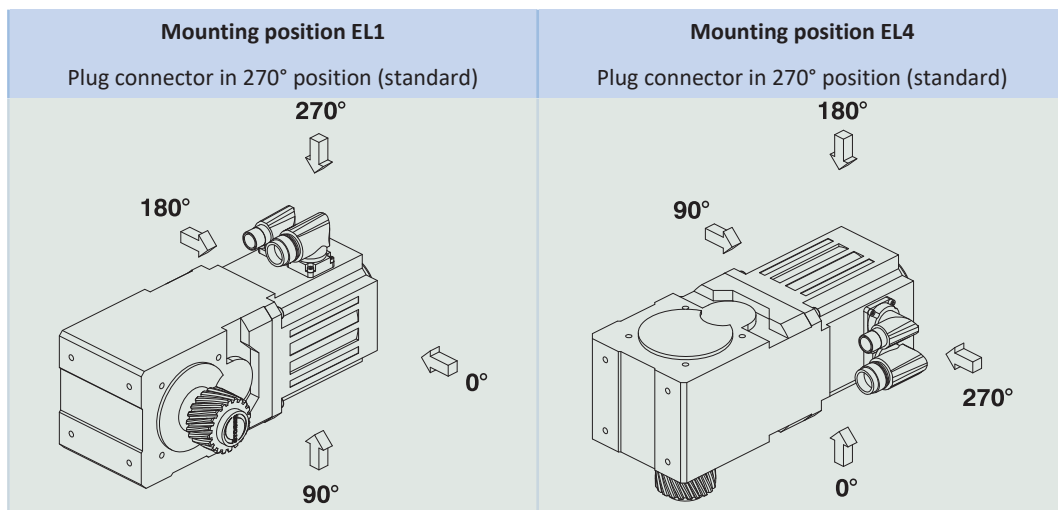
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 11.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

### 11.5.6 Position of the plug connectors



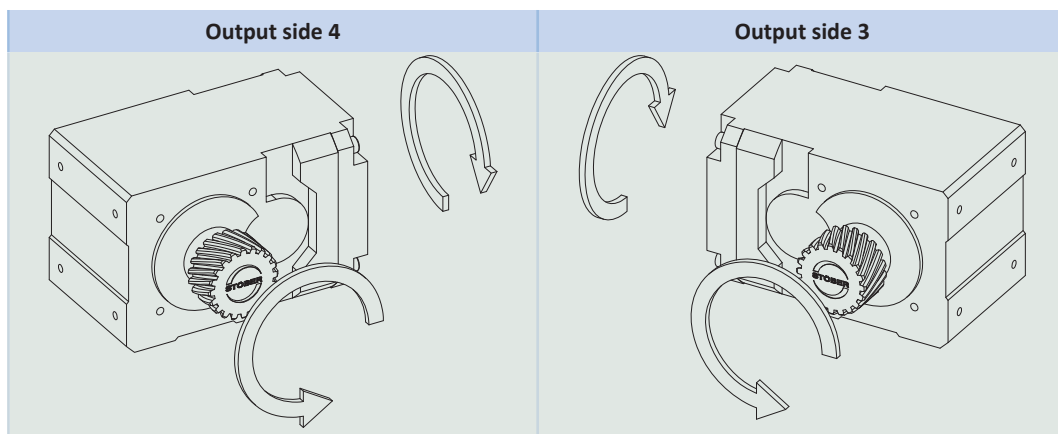
The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

Note that the plug connectors also rotate when the gear rack is rotated to a different position.

### 11.5.7 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 80 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

### 11.5.8 Direction of rotation



The pictures show mounting position EL1.

<sup>1</sup>Observe the protection class of all the components.

## 11.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

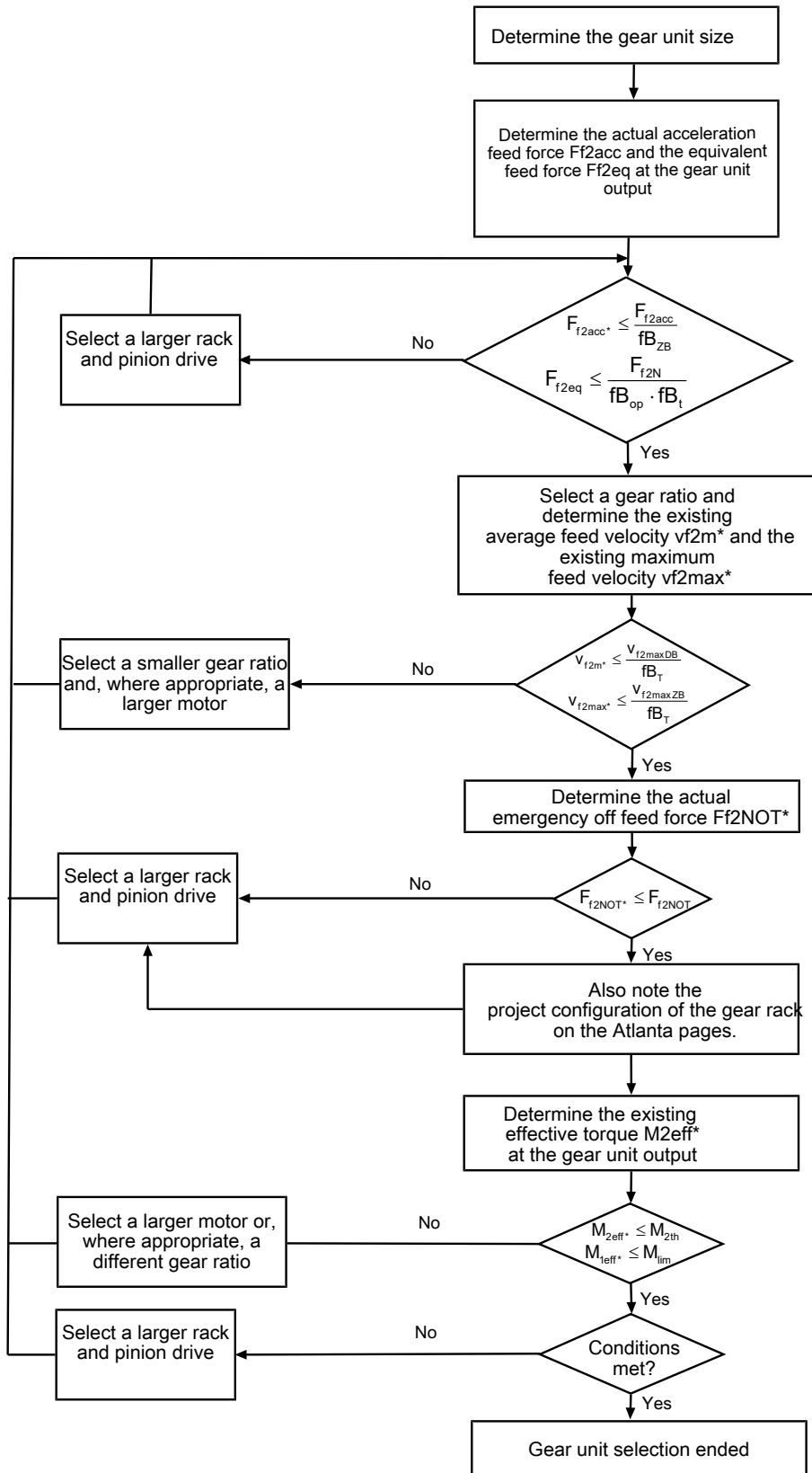
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 11.6.1 Drive selection

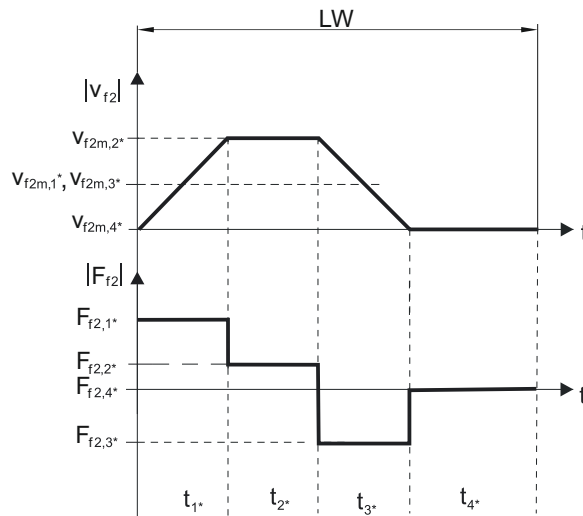


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6 \text{ min}$ , determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

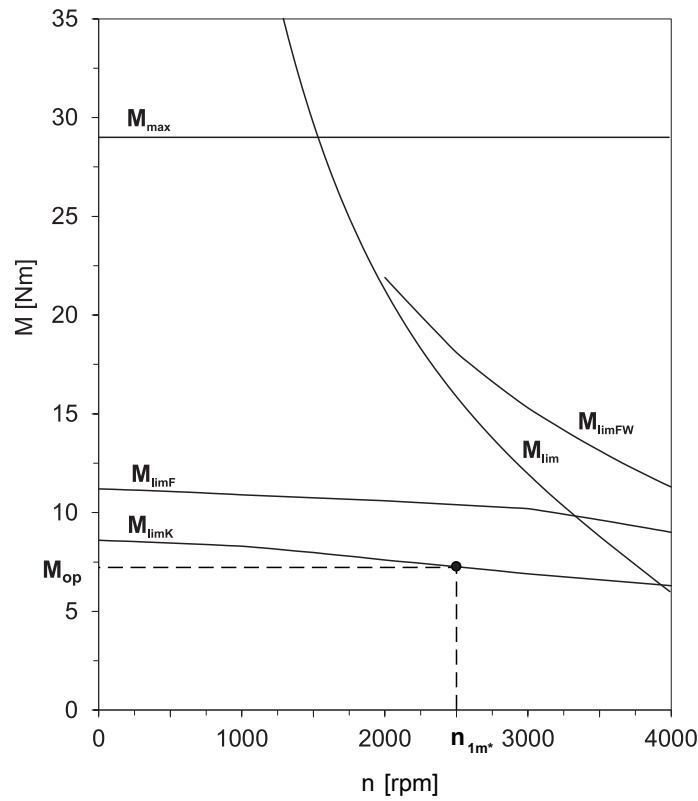
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,9 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left( \frac{n_{1m*}}{1000} \right)^2$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $fB_T$  can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

| Operating mode                  |                         | fB <sub>op</sub> |
|---------------------------------|-------------------------|------------------|
| Uniform continuous operation    |                         | 1.00             |
| Cyclic operation                |                         | 1.00             |
| Reversing load cyclic operation |                         | 1.00             |
| Run time                        |                         | fB <sub>t</sub>  |
| Daily runtime ≤ 8 h             |                         | 1.00             |
| Daily runtime ≤ 16 h            |                         | 1.15             |
| Daily runtime ≤ 24 h            |                         | 1.20             |
| Cyclic operation                |                         | fB <sub>ZB</sub> |
| ≤ 1000 load changes/hour (LW/h) |                         | 1.00             |
| > 1000 load changes/hour (LW/h) |                         | 1.15             |
| Temperature                     |                         | fB <sub>T</sub>  |
| Motor cooling                   | Surrounding temperature |                  |
| Motor with forced ventilation   | ≤ 20 °C                 | 0.9              |
|                                 | ≤ 30 °C                 | 1.0              |
|                                 | ≤ 40 °C                 | 1.15             |
| Motor with convection cooling   | ≤ 20 °C                 | 1.0              |
|                                 | ≤ 30 °C                 | 1.1              |
|                                 | ≤ 40 °C                 | 1.25             |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 11.7 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

| Documentation                                    | ID        |
|--|-----------|
| Operating manual gear units, geared motors KL    | 443363_en |
| Operating manual for EZ synchronous servo motors | 443032_en |
| Operating manual for gear racks (Atlanta)        | 442455    |

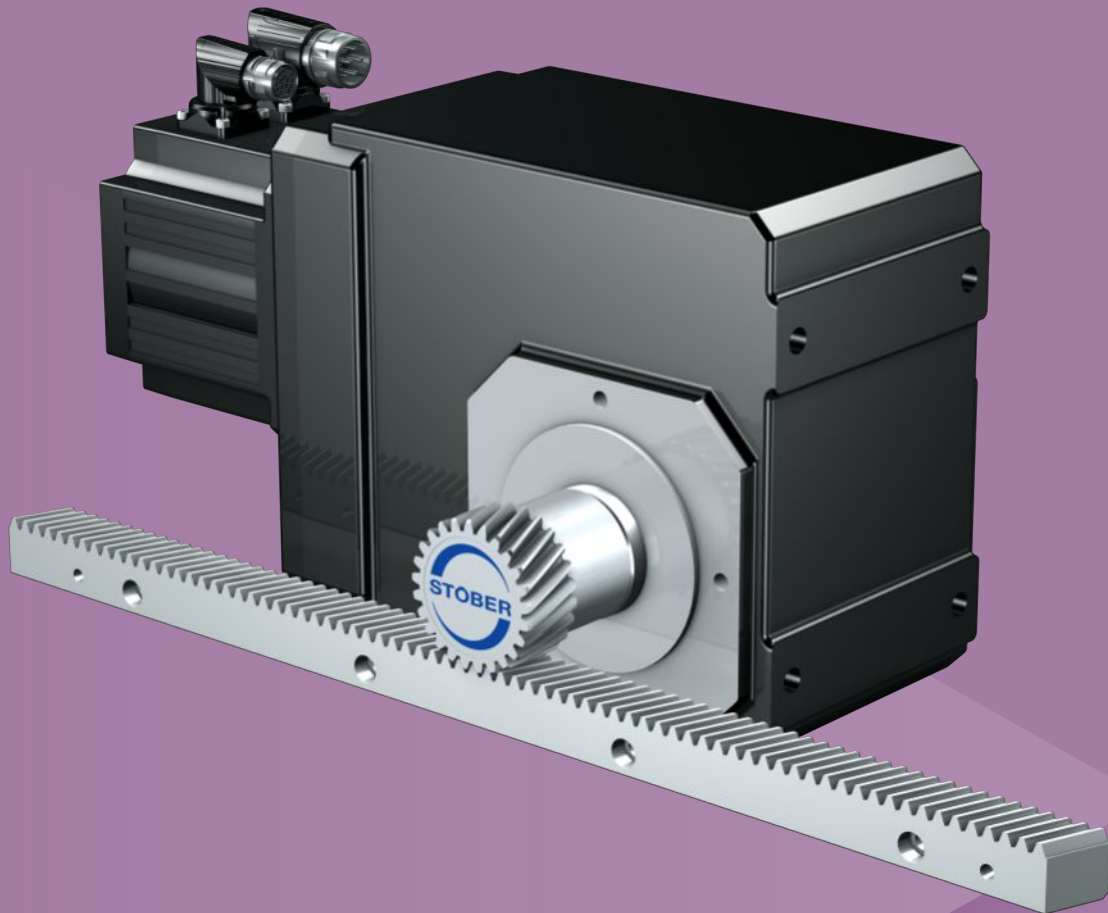




# 12 ZVK rack and pinion drives

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# 12

## Rack and pinion drives

# ZVK

### 12.1 Overview

Highly rigid right-angle geared with plug-on pinion

#### Features

- Power density ★★★★★
- Linear clearance ★★★★★
- Price category €
- Smooth operation ★★★★★
- Linear rigidity ★★★★★
- Mass moment of inertia ★★★★★
- Ready-to-install drive solution ✓
- Pinion gearing quality 6 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓
- Compact and highly dynamic due to direct motor attachment ✓

Key ★★★★★ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

|             |                  |
|-------------|------------------|
| $m_n$       | 2 – 4 mm         |
| $z$         | 18 – 25          |
| $F_{f2acc}$ | 0.91 – 15 kN     |
| $v_{f2N}$   | 0.04 – 3.4 m/s   |
| $\Delta s$  | 12 – 111 $\mu$ m |

## 12.2 Selection table

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 12.5.2](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- Drives with convection-cooled motors (e.g. EZ401U)

For the technical data on drives with forced ventilated motors (e.g. EZ401B), refer to

<https://configurator.stoeber.de/en-US/>.

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>f2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>f2accE</sub> | F <sub>f2NOT,E</sub> | M <sub>2accE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redll</sub> | Δs <sub>redl</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K1 (n<sub>1N</sub> = 3000 rpm, (F<sub>f2acc,max</sub> = 4,9 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.10  | 3.0              | 3.0               | 8.4             | 1.1 | ZV220S_K102_0700 EZ301U | 3.9                 | 6.6                  | 83                 | 70.03 | 0.13                 | 0.13      | 0.22                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.12  | 2.4              | 2.4               | 6.5             | 1.4 | ZV220S_K102_0560 EZ301U | 4.8                 | 8.1                  | 103                | 56.10 | 0.16                 | 0.16      | 0.28                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.13  | 2.1              | 2.2               | 11              | 1.1 | ZV220S_K102_0500 EZ301U | 2.8                 | 4.7                  | 60                 | 50.31 | 0.18                 | 0.18      | 0.31                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.14  | 2.0              | 2.0               | 5.2             | 1.6 | ZV220S_K102_0470 EZ301U | 4.9                 | 9.6                  | 105                | 46.92 | 0.19                 | 0.19      | 0.33                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.17  | 1.7              | 1.8               | 8.3             | 1.7 | ZV220S_K102_0400 EZ301U | 3.5                 | 5.8                  | 74                 | 40.30 | 0.22                 | 0.22      | 0.39                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.19  | 1.5              | 1.5               | 4.6             | 2.2 | ZV220S_K102_0350 EZ301U | 4.5                 | 9.2                  | 95                 | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.19  | 2.6              | 2.7               | 7.9             | 1.3 | ZV220S_K102_0350 EZ302U | 4.9                 | 9.2                  | 105                | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.20  | 1.4              | 1.5               | 6.7             | 2.3 | ZV220S_K102_0340 EZ301U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.20  | 2.4              | 2.6               | 11              | 1.3 | ZV220S_K102_0340 EZ302U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.20  | 3.2              | 3.4               | 15              | 1.0 | ZV220S_K102_0340 EZ303U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24  | 1.2              | 1.2               | 4.7             | 2.7 | ZV220S_K102_0280 EZ301U | 3.6                 | 7.9                  | 76                 | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24  | 2.0              | 2.2               | 8.1             | 1.6 | ZV220S_K102_0280 EZ302U | 4.9                 | 7.9                  | 105                | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24  | 2.7              | 2.8               | 11              | 1.2 | ZV220S_K102_0280 EZ303U | 4.9                 | 7.9                  | 105                | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.26  | 1.1              | 1.1               | 4.8             | 3.0 | ZV220S_K102_0250 EZ301U | 3.2                 | 6.6                  | 68                 | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.26  | 1.8              | 1.9               | 8.1             | 1.8 | ZV220S_K102_0250 EZ302U | 4.9                 | 6.6                  | 105                | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.26  | 2.4              | 2.5               | 11              | 1.4 | ZV220S_K102_0250 EZ303U | 4.9                 | 6.6                  | 105                | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.29  | 1.0              | 1.0               | 4.8             | 3.3 | ZV220S_K102_0230 EZ301U | 3.0                 | 7.5                  | 63                 | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.29  | 1.7              | 1.8               | 8.2             | 1.9 | ZV220S_K102_0230 EZ302U | 4.9                 | 7.5                  | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.29  | 2.2              | 2.3               | 11              | 1.5 | ZV220S_K102_0230 EZ303U | 4.9                 | 7.5                  | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.29  | 3.0              | 3.2               | 14              | 1.1 | ZV220S_K102_0230 EZ401U | 4.9                 | 11                   | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 0.9              | 0.9               | 4.9             | 3.8 | ZV220S_K102_0200 EZ301U | 2.6                 | 5.7                  | 55                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 1.5              | 1.5               | 8.3             | 2.2 | ZV220S_K102_0200 EZ302U | 4.6                 | 5.7                  | 97                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 1.9              | 2.0               | 11              | 1.7 | ZV220S_K102_0200 EZ303U | 4.6                 | 5.7                  | 97                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 2.6              | 2.8               | 15              | 1.3 | ZV220S_K102_0200 EZ401U | 4.9                 | 10                   | 105                | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 0.7              | 0.8               | 4.9             | 4.3 | ZV220S_K102_0175 EZ301U | 2.2                 | 6.0                  | 48                 | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 1.3              | 1.3               | 8.4             | 2.5 | ZV220S_K102_0175 EZ302U | 4.0                 | 6.0                  | 85                 | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 1.7              | 1.8               | 11              | 1.9 | ZV220S_K102_0175 EZ303U | 4.8                 | 6.0                  | 102                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 2.2              | 2.4               | 15              | 1.4 | ZV220S_K102_0175 EZ401U | 4.9                 | 11                   | 105                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 0.7              | 0.7               | 4.9             | 4.5 | ZV220S_K102_0165 EZ301U | 2.1                 | 5.4                  | 45                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 1.2              | 1.3               | 8.4             | 2.7 | ZV220S_K102_0165 EZ302U | 3.8                 | 5.4                  | 81                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 1.6              | 1.7               | 11              | 2.0 | ZV220S_K102_0165 EZ303U | 4.3                 | 5.4                  | 91                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 2.1              | 2.3               | 15              | 1.5 | ZV220S_K102_0165 EZ401U | 4.9                 | 10                   | 105                | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.47  | 1.0              | 1.1               | 8.5             | 3.1 | ZV220S_K102_0140 EZ302U | 3.2                 | 4.8                  | 68                 | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.47  | 1.3              | 1.4               | 11              | 2.4 | ZV220S_K102_0140 EZ303U | 3.9                 | 4.8                  | 82                 | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.47  | 1.8              | 1.9               | 15              | 1.8 | ZV220S_K102_0140 EZ401U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.47  | 2.8              | 3.0               | 23              | 1.2 | ZV220S_K102_0140 EZ501U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.47  | 3.0              | 3.4               | 25              | 1.1 | ZV220S_K102_0140 EZ402U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 0.9              | 1.0               | 8.9             | 3.5 | ZV220S_K102_0125 EZ302U | 2.9                 | 4.3                  | 61                 | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 1.2              | 1.3               | 12              | 2.7 | ZV220S_K102_0125 EZ303U | 3.5                 | 4.3                  | 73                 | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 1.6              | 1.7               | 15              | 2.0 | ZV220S_K102_0125 EZ401U | 4.9                 | 10                   | 104                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 2.5              | 2.7               | 23              | 1.3 | ZV220S_K102_0125 EZ501U | 4.9                 | 10                   | 105                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 2.7              | 3.0               | 25              | 1.2 | ZV220S_K102_0125 EZ402U | 4.9                 | 10                   | 105                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.58  | 0.8              | 0.9               | 9.5             | 3.8 | ZV220S_K102_0115 EZ302U | 2.6                 | 4.0                  | 56                 | 11.57 | 0.69                 | 0.63      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.58  | 1.1              | 1.2               | 12              | 2.9 | ZV220S_K102_0115 EZ303U | 3.2                 | 4.0                  | 67                 | 11.57 | 0.69                 | 0.63      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.58  | 1.5              | 1.6               | 15              | 2.2 | ZV220S_K102_0115 EZ401U | 4.5                 | 11                   | 95                 | 11.57 | 0.69                 | 0.63      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.58  | 2.3              | 2.5               | 23              | 1.4 | ZV220S_K102_0115 EZ501U | 4.9                 | 11                   | 105                | 11.57 | 0.69                 | 0.63      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K1 (n<sub>n</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 4,9 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.58   | 2.5              | 2.7               | 26              | 1.3 | ZV220S_K102_0115 EZ402U | 4.9                 | 11                   | 105                | 11.57 | 0.69                 | 0.63      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 0.7              | 0.8               | 10              | 3.8 | ZV220S_K102_0100 EZ302U | 2.3                 | 3.5                  | 49                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 1.0              | 1.0               | 14              | 2.9 | ZV220S_K102_0100 EZ303U | 2.8                 | 3.5                  | 59                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 1.3              | 1.4               | 15              | 2.5 | ZV220S_K102_0100 EZ401U | 3.9                 | 10                   | 84                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 2.0              | 2.2               | 24              | 1.6 | ZV220S_K102_0100 EZ501U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 2.2              | 2.4               | 26              | 1.5 | ZV220S_K102_0100 EZ402U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66   | 3.2              | 4.0               | 38              | 1.0 | ZV220S_K102_0100 EZ404U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 0.7              | 0.7               | 11              | 3.8 | ZV220S_K102_0092 EZ302U | 2.1                 | 3.2                  | 45                 | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 0.9              | 0.9               | 15              | 2.9 | ZV220S_K102_0092 EZ303U | 2.5                 | 3.2                  | 54                 | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 1.2              | 1.3               | 16              | 2.7 | ZV220S_K102_0092 EZ401U | 3.6                 | 11                   | 76                 | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 1.8              | 2.0               | 24              | 1.8 | ZV220S_K102_0092 EZ501U | 4.9                 | 11                   | 105                | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 2.0              | 2.2               | 26              | 1.6 | ZV220S_K102_0092 EZ402U | 4.9                 | 11                   | 105                | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 2.9              | 3.6               | 38              | 1.1 | ZV220S_K102_0092 EZ404U | 4.9                 | 11                   | 105                | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 3.1              | 3.4               | 41              | 1.0 | ZV220S_K102_0092 EZ502U | 4.9                 | 11                   | 105                | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.72   | 3.1              | 3.5               | 41              | 1.0 | ZV220S_K102_0092 EZ701U | 4.9                 | 11                   | 105                | 9.249 | 0.87                 | 0.79      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 0.6              | 0.6               | 12              | 3.8 | ZV220S_K102_0083 EZ302U | 1.9                 | 2.8                  | 40                 | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 0.8              | 0.8               | 16              | 2.9 | ZV220S_K102_0083 EZ303U | 2.3                 | 2.8                  | 48                 | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 1.1              | 1.1               | 16              | 2.9 | ZV220S_K102_0083 EZ401U | 3.2                 | 10                   | 69                 | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 1.6              | 1.8               | 24              | 1.9 | ZV220S_K102_0083 EZ501U | 4.9                 | 10                   | 105                | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 1.8              | 2.0               | 26              | 1.7 | ZV220S_K102_0083 EZ402U | 4.9                 | 10                   | 105                | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 2.6              | 3.3               | 39              | 1.2 | ZV220S_K102_0083 EZ404U | 4.9                 | 10                   | 105                | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 2.8              | 3.0               | 42              | 1.1 | ZV220S_K102_0083 EZ502U | 4.9                 | 10                   | 105                | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80   | 2.8              | 3.2               | 42              | 1.1 | ZV220S_K102_0083 EZ701U | 4.9                 | 10                   | 105                | 8.309 | 0.96                 | 0.88      | 1.47                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 0.5              | 0.5               | 14              | 3.8 | ZV220S_K102_0066 EZ302U | 1.5                 | 2.3                  | 32                 | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 0.6              | 0.7               | 19              | 2.9 | ZV220S_K102_0066 EZ303U | 1.8                 | 2.3                  | 39                 | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 0.9              | 0.9               | 16              | 3.4 | ZV220S_K102_0066 EZ401U | 2.6                 | 9.1                  | 55                 | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 1.3              | 1.4               | 25              | 2.2 | ZV220S_K102_0066 EZ501U | 4.9                 | 9.1                  | 103                | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 1.4              | 1.6               | 27              | 2.0 | ZV220S_K102_0066 EZ402U | 4.9                 | 9.1                  | 103                | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 2.1              | 2.6               | 39              | 1.4 | ZV220S_K102_0066 EZ404U | 4.9                 | 9.1                  | 105                | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 2.2              | 2.4               | 42              | 1.3 | ZV220S_K102_0066 EZ502U | 4.9                 | 9.1                  | 105                | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.00   | 2.2              | 2.5               | 42              | 1.3 | ZV220S_K102_0066 EZ701U | 4.9                 | 9.1                  | 105                | 6.644 | 1.20                 | 1.10      | 1.84                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 0.8              | 0.8               | 16              | 3.6 | ZV220S_K102_0060 EZ401U | 2.3                 | 8.2                  | 49                 | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 1.2              | 1.3               | 25              | 2.4 | ZV220S_K102_0060 EZ501U | 4.4                 | 8.2                  | 93                 | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 1.3              | 1.4               | 27              | 2.2 | ZV220S_K102_0060 EZ402U | 4.4                 | 8.2                  | 93                 | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 1.9              | 2.4               | 40              | 1.5 | ZV220S_K102_0060 EZ404U | 4.9                 | 8.2                  | 105                | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 2.0              | 2.2               | 43              | 1.4 | ZV220S_K102_0060 EZ502U | 4.9                 | 8.2                  | 105                | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 2.0              | 2.3               | 43              | 1.4 | ZV220S_K102_0060 EZ701U | 4.9                 | 8.2                  | 105                | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.11   | 2.7              | 3.0               | 56              | 1.0 | ZV220S_K102_0060 EZ503U | 4.9                 | 8.2                  | 105                | 6.000 | 1.22                 | 1.04      | 1.85                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 0.4              | 0.4               | 16              | 3.8 | ZV220S_K102_0056 EZ302U | 1.3                 | 1.9                  | 27                 | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 0.5              | 0.6               | 21              | 2.9 | ZV220S_K102_0056 EZ303U | 1.5                 | 1.9                  | 32                 | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 0.7              | 0.8               | 16              | 3.8 | ZV220S_K102_0056 EZ401U | 2.2                 | 7.6                  | 46                 | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 1.1              | 1.2               | 25              | 2.5 | ZV220S_K102_0056 EZ501U | 4.1                 | 7.6                  | 86                 | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 1.2              | 1.3               | 27              | 2.3 | ZV220S_K102_0056 EZ402U | 4.1                 | 7.6                  | 86                 | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 1.8              | 2.2               | 40              | 1.5 | ZV220S_K102_0056 EZ404U | 4.9                 | 7.6                  | 105                | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 1.9              | 2.0               | 43              | 1.4 | ZV220S_K102_0056 EZ502U | 4.9                 | 7.6                  | 105                | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 1.9              | 2.1               | 43              | 1.4 | ZV220S_K102_0056 EZ701U | 4.9                 | 7.6                  | 105                | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.20   | 2.5              | 2.8               | 56              | 1.1 | ZV220S_K102_0056 EZ503U | 4.9                 | 7.6                  | 105                | 5.568 | 1.32                 | 1.12      | 2.00                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 0.3              | 0.3               | 21              | 3.8 | ZV220S_K102_0040 EZ302U | 0.9                 | 1.4                  | 19                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 0.4              | 0.4               | 27              | 2.9 | ZV220S_K102_0040 EZ303U | 1.1                 | 1.4                  | 23                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 0.5              | 0.5               | 17              | 4.8 | ZV220S_K102_0040 EZ401U | 1.6                 | 5.5                  | 33                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 0.8              | 0.9               | 26              | 3.1 | ZV220S_K102_0040 EZ501U | 2.9                 | 5.5                  | 62                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 0.9              | 1.0               | 28              | 2.8 | ZV220S_K102_0040 EZ402U | 2.9                 | 5.5                  | 62                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 1.3              | 1.6               | 41              | 1.9 | ZV220S_K102_0040 EZ404U | 4.4                 | 5.5                  | 93                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 1.4              | 1.5               | 44              | 1.8 | ZV220S_K102_0040 EZ502U | 4.4                 | 5.5                  | 93                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 1.4              | 1.5               | 44              | 1.8 | ZV220S_K102_0040 EZ701U | 3.7                 | 5.5                  | 78                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.67   | 1.8              | 2.0               | 58              | 1.4 | ZV220S_K102_0040 EZ503U | 4.4                 | 5.5                  | 93                 | 4.000 | 1.83                 | 1.56      | 2.78                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| <b>ZV2K1 (n<sub>n</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 4,9 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.19   | 1.3              | 1.4               | 3.6             | 2.5 | ZV220S_K102_0700 EZ202U | 3.9                 | 6.6                  | 83                 | 70.03 | 0.13                 | 0.13      | 0.22                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.19   | 2.0              | 2.2               | 5.5             | 1.7 | ZV220S_K102_0700 EZ203U | 3.9                 | 6.6                  | 83                 | 70.03 | 0.13                 | 0.13      | 0.22                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.19   | 2.8              | 3.0               | 8.1             | 1.1 | ZV220S_K102_0700 EZ301U | 3.9                 | 6.6                  | 83                 | 70.03 | 0.13                 | 0.13      | 0.22                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24   | 1.0              | 1.1               | 2.8             | 3.1 | ZV220S_K102_0560 EZ202U | 3.8                 | 8.1                  | 81                 | 56.10 | 0.16                 | 0.16      | 0.28                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24   | 1.6              | 1.8               | 4.3             | 2.1 | ZV220S_K102_0560 EZ203U | 4.8                 | 8.1                  | 103                | 56.10 | 0.16                 | 0.16      | 0.28                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.24   | 2.3              | 2.4               | 6.2             | 1.4 | ZV220S_K102_0560 EZ301U | 4.8                 | 8.1                  | 103                | 56.10 | 0.16                 | 0.16      | 0.28                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.27   | 0.9              | 1.0               | 4.7             | 2.6 | ZV220S_K102_0500 EZ202U | 2.8                 | 4.7                  | 60                 | 50.31 | 0.18                 | 0.18      | 0.31                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K1 (n<sub>in</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 4,9 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.27  | 1.4              | 1.6               | 7.1             | 1.7 | ZV220S_K102_0500 EZ203U | 2.8                 | 4.7                  | 60                 | 50.31 | 0.18                 | 0.18      | 0.31                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.27  | 2.0              | 2.2               | 10              | 1.2 | ZV220S_K102_0500 EZ301U | 2.8                 | 4.7                  | 60                 | 50.31 | 0.18                 | 0.18      | 0.31                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.28  | 0.9              | 0.9               | 2.5             | 3.8 | ZV220S_K102_0470 EZ202U | 3.2                 | 9.6                  | 67                 | 46.92 | 0.19                 | 0.19      | 0.33                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.28  | 1.3              | 1.5               | 3.7             | 2.5 | ZV220S_K102_0470 EZ203U | 4.9                 | 9.6                  | 105                | 46.92 | 0.19                 | 0.19      | 0.33                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.28  | 1.9              | 2.0               | 5.5             | 1.7 | ZV220S_K102_0470 EZ301U | 4.9                 | 9.6                  | 105                | 46.92 | 0.19                 | 0.19      | 0.33                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.28  | 3.2              | 3.6               | 9.2             | 1.0 | ZV220S_K102_0470 EZ302U | 4.9                 | 9.6                  | 105                | 46.92 | 0.19                 | 0.19      | 0.33                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 0.7              | 0.8               | 3.6             | 3.9 | ZV220S_K102_0400 EZ202U | 2.7                 | 5.8                  | 58                 | 40.30 | 0.22                 | 0.22      | 0.39                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 1.1              | 1.3               | 5.5             | 2.6 | ZV220S_K102_0400 EZ203U | 3.5                 | 5.8                  | 74                 | 40.30 | 0.22                 | 0.22      | 0.39                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 1.6              | 1.8               | 8.0             | 1.8 | ZV220S_K102_0400 EZ301U | 3.5                 | 5.8                  | 74                 | 40.30 | 0.22                 | 0.22      | 0.39                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.33  | 2.8              | 3.1               | 13              | 1.0 | ZV220S_K102_0400 EZ302U | 3.5                 | 5.8                  | 74                 | 40.30 | 0.22                 | 0.22      | 0.39                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 1.0              | 1.1               | 3.8             | 3.3 | ZV220S_K102_0350 EZ203U | 4.3                 | 9.2                  | 92                 | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 1.4              | 1.5               | 5.6             | 2.3 | ZV220S_K102_0350 EZ301U | 4.5                 | 9.2                  | 95                 | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 2.4              | 2.7               | 9.4             | 1.3 | ZV220S_K102_0350 EZ302U | 4.9                 | 9.2                  | 105                | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.38  | 3.1              | 3.6               | 12              | 1.0 | ZV220S_K102_0350 EZ303U | 4.9                 | 9.2                  | 105                | 35.11 | 0.25                 | 0.25      | 0.44                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 0.9              | 1.1               | 4.4             | 3.4 | ZV220S_K102_0340 EZ203U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 1.4              | 1.5               | 6.4             | 2.4 | ZV220S_K102_0340 EZ301U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 2.3              | 2.6               | 11              | 1.4 | ZV220S_K102_0340 EZ302U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.40  | 3.0              | 3.5               | 14              | 1.1 | ZV220S_K102_0340 EZ303U | 4.1                 | 6.9                  | 88                 | 33.71 | 0.26                 | 0.26      | 0.46                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.48  | 0.8              | 0.9               | 3.9             | 4.1 | ZV220S_K102_0280 EZ203U | 3.5                 | 7.9                  | 73                 | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.48  | 1.1              | 1.2               | 5.7             | 2.8 | ZV220S_K102_0280 EZ301U | 3.6                 | 7.9                  | 76                 | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.48  | 1.9              | 2.2               | 9.6             | 1.7 | ZV220S_K102_0280 EZ302U | 4.9                 | 7.9                  | 105                | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.48  | 2.5              | 2.9               | 13              | 1.3 | ZV220S_K102_0280 EZ303U | 4.9                 | 7.9                  | 105                | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.48  | 2.9              | 3.6               | 15              | 1.1 | ZV220S_K102_0280 EZ401U | 4.9                 | 11                   | 105                | 28.05 | 0.32                 | 0.32      | 0.56                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 0.7              | 0.8               | 3.9             | 4.6 | ZV220S_K102_0250 EZ203U | 3.1                 | 6.6                  | 66                 | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 1.0              | 1.1               | 5.7             | 3.1 | ZV220S_K102_0250 EZ301U | 3.2                 | 6.6                  | 68                 | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 1.7              | 1.9               | 9.7             | 1.9 | ZV220S_K102_0250 EZ302U | 4.9                 | 6.6                  | 105                | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 2.3              | 2.6               | 13              | 1.4 | ZV220S_K102_0250 EZ303U | 4.9                 | 6.6                  | 105                | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.53  | 2.7              | 3.2               | 15              | 1.2 | ZV220S_K102_0250 EZ401U | 4.9                 | 9.1                  | 105                | 25.22 | 0.35                 | 0.35      | 0.62                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.57  | 0.6              | 0.7               | 4.0             | 5.0 | ZV220S_K102_0230 EZ203U | 2.9                 | 7.5                  | 61                 | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.57  | 0.9              | 1.0               | 5.8             | 3.4 | ZV220S_K102_0230 EZ301U | 3.0                 | 7.5                  | 63                 | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.57  | 1.6              | 1.8               | 9.7             | 2.0 | ZV220S_K102_0230 EZ302U | 4.9                 | 7.5                  | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.57  | 2.1              | 2.4               | 13              | 1.5 | ZV220S_K102_0230 EZ303U | 4.9                 | 7.5                  | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.57  | 2.4              | 3.0               | 15              | 1.3 | ZV220S_K102_0230 EZ401U | 4.9                 | 11                   | 105                | 23.27 | 0.38                 | 0.38      | 0.67                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 0.8              | 0.9               | 5.9             | 3.9 | ZV220S_K102_0200 EZ301U | 2.6                 | 5.7                  | 55                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 1.4              | 1.5               | 9.9             | 2.3 | ZV220S_K102_0200 EZ302U | 4.6                 | 5.7                  | 97                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 1.8              | 2.1               | 13              | 1.8 | ZV220S_K102_0200 EZ303U | 4.6                 | 5.7                  | 97                 | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 2.1              | 2.6               | 15              | 1.5 | ZV220S_K102_0200 EZ401U | 4.9                 | 10                   | 105                | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 3.1              | 4.1               | 22              | 1.0 | ZV220S_K102_0200 EZ501U | 4.9                 | 10                   | 105                | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.66  | 3.2              | 4.5               | 23              | 1.0 | ZV220S_K102_0200 EZ402U | 4.9                 | 10                   | 105                | 20.15 | 0.44                 | 0.44      | 0.77                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 0.7              | 0.8               | 5.9             | 4.4 | ZV220S_K102_0175 EZ301U | 2.2                 | 6.0                  | 48                 | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 1.2              | 1.3               | 10              | 2.6 | ZV220S_K102_0175 EZ302U | 4.0                 | 6.0                  | 85                 | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 1.6              | 1.8               | 13              | 2.0 | ZV220S_K102_0175 EZ303U | 4.8                 | 6.0                  | 102                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 1.8              | 2.2               | 15              | 1.7 | ZV220S_K102_0175 EZ401U | 4.9                 | 11                   | 105                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 2.7              | 3.5               | 23              | 1.2 | ZV220S_K102_0175 EZ501U | 4.9                 | 11                   | 105                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.76  | 2.8              | 3.9               | 23              | 1.1 | ZV220S_K102_0175 EZ402U | 4.9                 | 11                   | 105                | 17.56 | 0.51                 | 0.48      | 0.76                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 0.7              | 0.7               | 5.9             | 4.6 | ZV220S_K102_0165 EZ301U | 2.1                 | 5.4                  | 45                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 1.1              | 1.3               | 10              | 2.7 | ZV220S_K102_0165 EZ302U | 3.8                 | 5.4                  | 81                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 1.5              | 1.7               | 13              | 2.1 | ZV220S_K102_0165 EZ303U | 4.3                 | 5.4                  | 91                 | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 1.8              | 2.1               | 15              | 1.8 | ZV220S_K102_0165 EZ401U | 4.9                 | 10                   | 105                | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 2.6              | 3.4               | 23              | 1.2 | ZV220S_K102_0165 EZ501U | 4.9                 | 10                   | 105                | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.80  | 2.7              | 3.7               | 23              | 1.2 | ZV220S_K102_0165 EZ402U | 4.9                 | 10                   | 105                | 16.71 | 0.53                 | 0.53      | 0.93                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.95  | 1.0              | 1.1               | 10              | 3.0 | ZV220S_K102_0140 EZ302U | 3.2                 | 4.8                  | 68                 | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.95  | 1.3              | 1.5               | 13              | 2.3 | ZV220S_K102_0140 EZ303U | 3.9                 | 4.8                  | 82                 | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.95  | 1.5              | 1.8               | 16              | 2.0 | ZV220S_K102_0140 EZ401U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.95  | 2.2              | 2.8               | 23              | 1.3 | ZV220S_K102_0140 EZ501U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 0.95  | 2.3              | 3.2               | 24              | 1.3 | ZV220S_K102_0140 EZ402U | 4.9                 | 11                   | 105                | 14.11 | 0.63                 | 0.60      | 0.95                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.06  | 0.9              | 1.0               | 10              | 3.3 | ZV220S_K102_0125 EZ302U | 2.9                 | 4.3                  | 61                 | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.06  | 1.1              | 1.3               | 13              | 2.5 | ZV220S_K102_0125 EZ303U | 3.5                 | 4.3                  | 73                 | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.06  | 1.3              | 1.6               | 16              | 2.1 | ZV220S_K102_0125 EZ401U | 4.9                 | 10                   | 104                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.06  | 2.0              | 2.5               | 23              | 1.4 | ZV220S_K102_0125 EZ501U | 4.9                 | 10                   | 105                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.06  | 2.0              | 2.8               | 24              | 1.4 | ZV220S_K102_0125 EZ402U | 4.9                 | 10                   | 105                | 12.62 | 0.70                 | 0.67      | 1.06                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 0.7              | 0.8               | 10              | 3.8 | ZV220S_K102_0100 EZ302U | 2.3                 | 3.5                  | 49                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 0.9              | 1.0               | 14              | 2.9 | ZV220S_K102_0100 EZ303U | 2.8                 | 3.5                  | 59                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 1.1              | 1.3               | 16              | 2.5 | ZV220S_K102_0100 EZ401U | 3.9                 | 10                   | 84                 | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K1 (n<sub>fN</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 4,9 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 1.32  | 1.6              | 2.0               | 24              | 1.7 | ZV220S_K102_0100 EZ501U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 1.6              | 2.3               | 24              | 1.6 | ZV220S_K102_0100 EZ402U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 2.4              | 3.6               | 36              | 1.1 | ZV220S_K102_0100 EZ502U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| 1.32  | 2.4              | 3.7               | 36              | 1.1 | ZV220S_K102_0100 EZ701U | 4.9                 | 10                   | 105                | 10.14 | 0.88                 | 0.83      | 1.32                 | 74   | 37                  | –                  | 17               | 2              | 20 | 42.4           |
| <b>ZV2K2 (n<sub>fN</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.06  | 4.5              | 4.6               | 3.8             | 1.1 | ZV225S_K203_1350 EZ301U | 8.3                 | 15                   | 220                | 135.3 | 0.08                 | 0.08      | 0.13                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.08  | 3.7              | 3.7               | 3.6             | 1.4 | ZV225S_K203_1090 EZ301U | 8.3                 | 15                   | 220                | 109.5 | 0.10                 | 0.10      | 0.17                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.09  | 3.0              | 3.1               | 3.4             | 1.7 | ZV225S_K203_0910 EZ301U | 8.3                 | 15                   | 220                | 90.79 | 0.12                 | 0.12      | 0.20                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.09  | 5.2              | 5.5               | 5.9             | 1.0 | ZV225S_K203_0910 EZ302U | 8.3                 | 15                   | 220                | 90.79 | 0.12                 | 0.12      | 0.20                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.11  | 2.7              | 2.7               | 3.3             | 2.0 | ZV225S_K203_0800 EZ301U | 8.0                 | 15                   | 213                | 79.62 | 0.14                 | 0.14      | 0.23                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.11  | 4.6              | 4.8               | 5.7             | 1.1 | ZV225S_K203_0800 EZ302U | 8.3                 | 15                   | 220                | 79.62 | 0.14                 | 0.14      | 0.23                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.12  | 2.4              | 2.4               | 4.9             | 2.1 | ZV225S_K202_0690 EZ301U | 6.0                 | 9.5                  | 159                | 69.43 | 0.16                 | 0.16      | 0.26                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.12  | 4.0              | 4.3               | 8.4             | 1.2 | ZV225S_K202_0690 EZ302U | 6.0                 | 9.5                  | 159                | 69.43 | 0.16                 | 0.16      | 0.26                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.12  | 2.3              | 2.3               | 3.2             | 2.3 | ZV225S_K203_0680 EZ301U | 6.9                 | 15                   | 183                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.12  | 3.9              | 4.1               | 5.5             | 1.3 | ZV225S_K203_0680 EZ302U | 8.3                 | 15                   | 220                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.12  | 5.1              | 5.4               | 7.1             | 1.0 | ZV225S_K203_0680 EZ303U | 8.3                 | 15                   | 220                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.13  | 2.2              | 2.3               | 3.2             | 2.4 | ZV225S_K203_0660 EZ301U | 6.7                 | 15                   | 177                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.13  | 3.8              | 4.0               | 5.4             | 1.4 | ZV225S_K203_0660 EZ302U | 8.3                 | 15                   | 220                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.13  | 4.9              | 5.2               | 7.1             | 1.1 | ZV225S_K203_0660 EZ303U | 8.3                 | 15                   | 220                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 1.9              | 1.9               | 3.9             | 2.8 | ZV225S_K202_0560 EZ301U | 5.7                 | 10                   | 151                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 3.2              | 3.4               | 6.6             | 1.6 | ZV225S_K202_0560 EZ302U | 7.2                 | 10                   | 191                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 4.2              | 4.4               | 8.6             | 1.2 | ZV225S_K202_0560 EZ303U | 7.2                 | 10                   | 191                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 1.8              | 1.9               | 3.0             | 2.9 | ZV225S_K203_0540 EZ301U | 5.5                 | 13                   | 145                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 3.1              | 3.3               | 5.2             | 1.7 | ZV225S_K203_0540 EZ302U | 8.3                 | 13                   | 220                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 4.0              | 4.3               | 6.7             | 1.3 | ZV225S_K203_0540 EZ303U | 8.3                 | 13                   | 220                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 1.7              | 1.8               | 6.2             | 2.1 | ZV225S_K202_0500 EZ301U | 4.4                 | 6.9                  | 116                | 50.49 | 0.22                 | 0.22      | 0.36                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 2.9              | 3.1               | 11              | 1.2 | ZV225S_K202_0500 EZ302U | 4.4                 | 6.9                  | 116                | 50.49 | 0.22                 | 0.22      | 0.36                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 1.7              | 1.7               | 3.0             | 3.1 | ZV225S_K203_0500 EZ301U | 5.0                 | 12                   | 133                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 2.9              | 3.0               | 5.0             | 1.8 | ZV225S_K203_0500 EZ302U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 3.7              | 3.9               | 6.6             | 1.4 | ZV225S_K203_0500 EZ303U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.17  | 5.0              | 5.4               | 8.9             | 1.0 | ZV225S_K203_0500 EZ401U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 1.6              | 1.6               | 2.9             | 3.3 | ZV225S_K202_0460 EZ301U | 4.7                 | 9.7                  | 126                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 2.7              | 2.8               | 5.0             | 1.9 | ZV225S_K202_0460 EZ302U | 7.8                 | 9.7                  | 206                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 3.5              | 3.7               | 6.5             | 1.5 | ZV225S_K202_0460 EZ303U | 7.8                 | 9.7                  | 206                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 4.7              | 5.1               | 8.9             | 1.1 | ZV225S_K202_0460 EZ401U | 8.3                 | 15                   | 220                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 1.5              | 1.5               | 2.9             | 3.4 | ZV225S_K203_0450 EZ301U | 4.6                 | 11                   | 121                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 2.6              | 2.7               | 4.9             | 2.0 | ZV225S_K203_0450 EZ302U | 8.1                 | 11                   | 216                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 3.4              | 3.6               | 6.4             | 1.5 | ZV225S_K203_0450 EZ303U | 8.3                 | 11                   | 220                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 4.6              | 4.9               | 8.7             | 1.1 | ZV225S_K203_0450 EZ401U | 8.3                 | 11                   | 220                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 1.4              | 1.4               | 4.9             | 3.2 | ZV225S_K202_0400 EZ301U | 4.1                 | 7.4                  | 110                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 2.3              | 2.5               | 8.4             | 1.9 | ZV225S_K202_0400 EZ302U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 3.1              | 3.2               | 11              | 1.4 | ZV225S_K202_0400 EZ303U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 4.1              | 4.4               | 15              | 1.1 | ZV225S_K202_0400 EZ401U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 1.3              | 1.4               | 2.8             | 3.9 | ZV225S_K203_0390 EZ301U | 4.0                 | 9.5                  | 106                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 2.3              | 2.4               | 4.8             | 2.3 | ZV225S_K203_0390 EZ302U | 7.1                 | 9.5                  | 189                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 2.9              | 3.1               | 6.3             | 1.8 | ZV225S_K203_0390 EZ303U | 7.6                 | 9.5                  | 202                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 4.0              | 4.3               | 8.5             | 1.3 | ZV225S_K203_0390 EZ401U | 7.6                 | 9.5                  | 202                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 1.2              | 1.2               | 3.2             | 4.4 | ZV225S_K202_0350 EZ301U | 3.5                 | 8.1                  | 94                 | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 2.0              | 2.1               | 5.5             | 2.6 | ZV225S_K202_0350 EZ302U | 6.3                 | 8.1                  | 168                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 2.6              | 2.8               | 7.1             | 2.0 | ZV225S_K202_0350 EZ303U | 6.5                 | 8.1                  | 171                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 3.5              | 3.8               | 8.7             | 1.5 | ZV225S_K202_0350 EZ401U | 8.3                 | 15                   | 220                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 1.1              | 1.2               | 3.6             | 4.6 | ZV225S_K202_0340 EZ301U | 3.4                 | 7.1                  | 91                 | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 2.0              | 2.1               | 6.2             | 2.7 | ZV225S_K202_0340 EZ302U | 5.7                 | 7.1                  | 150                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 2.5              | 2.7               | 8.1             | 2.0 | ZV225S_K202_0340 EZ303U | 5.7                 | 7.1                  | 150                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 3.4              | 3.7               | 11              | 1.5 | ZV225S_K202_0340 EZ401U | 7.0                 | 12                   | 185                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 2.9              | 3.1               | 8.8             | 1.8 | ZV225S_K202_0280 EZ401U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 4.4              | 4.8               | 14              | 1.2 | ZV225S_K202_0280 EZ501U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 4.8              | 5.3               | 15              | 1.1 | ZV225S_K202_0280 EZ402U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 1.5              | 1.5               | 6.9             | 3.2 | ZV225S_K202_0250 EZ302U | 4.6                 | 5.9                  | 122                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 1.9              | 2.0               | 9.0             | 2.5 | ZV225S_K202_0250 EZ303U | 4.7                 | 5.9                  | 125                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 2.6              | 2.8               | 8.9             | 2.0 | ZV225S_K202_0250 EZ401U | 7.8                 | 15                   | 207                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 4.0              | 4.3               | 14              | 1.3 | ZV225S_K202_0250 EZ501U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 4.3              | 4.8               | 15              | 1.2 | ZV225S_K202_0250 EZ402U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 1.3              | 1.4               | 6.3             | 3.8 | ZV225S_K202_0230 EZ302U | 4.2                 | 6.4                  | 112                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |



| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K2 (n<sub>in</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.36  | 1.8              | 1.9               | 8.2             | 2.9 | ZV225S_K202_0230 EZ303U | 5.1                 | 6.4                  | 135                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 2.4              | 2.5               | 9.0             | 2.2 | ZV225S_K202_0230 EZ401U | 7.2                 | 15                   | 191                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 3.6              | 4.0               | 14              | 1.4 | ZV225S_K202_0230 EZ501U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 4.0              | 4.4               | 15              | 1.3 | ZV225S_K202_0230 EZ402U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 2.1              | 2.2               | 9.1             | 2.5 | ZV225S_K202_0200 EZ401U | 6.3                 | 15                   | 168                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 3.2              | 3.5               | 14              | 1.6 | ZV225S_K202_0200 EZ501U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 3.5              | 3.9               | 15              | 1.5 | ZV225S_K202_0200 EZ402U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 5.1              | 6.4               | 22              | 1.0 | ZV225S_K202_0200 EZ404U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 1.0              | 1.1               | 7.8             | 3.8 | ZV225S_K202_0175 EZ302U | 3.2                 | 4.8                  | 85                 | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 1.3              | 1.4               | 10              | 2.9 | ZV225S_K202_0175 EZ303U | 3.8                 | 4.8                  | 102                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 1.8              | 1.9               | 9.2             | 2.9 | ZV225S_K202_0175 EZ401U | 5.4                 | 15                   | 144                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 2.7              | 3.0               | 14              | 1.9 | ZV225S_K202_0175 EZ501U | 8.3                 | 15                   | 220                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 3.0              | 3.3               | 15              | 1.7 | ZV225S_K202_0175 EZ402U | 8.3                 | 15                   | 220                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 4.4              | 5.5               | 23              | 1.2 | ZV225S_K202_0175 EZ404U | 8.3                 | 15                   | 220                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 4.7              | 5.1               | 24              | 1.1 | ZV225S_K202_0175 EZ502U | 8.3                 | 15                   | 220                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 4.7              | 5.3               | 24              | 1.1 | ZV225S_K202_0175 EZ701U | 8.3                 | 15                   | 220                | 17.47 | 0.62                 | 0.56      | 0.88                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 1.0              | 1.0               | 8.0             | 3.8 | ZV225S_K202_0170 EZ302U | 3.1                 | 4.6                  | 82                 | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 1.3              | 1.4               | 10              | 2.9 | ZV225S_K202_0170 EZ303U | 3.7                 | 4.6                  | 98                 | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 1.7              | 1.8               | 9.2             | 3.0 | ZV225S_K202_0170 EZ401U | 5.2                 | 15                   | 139                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 2.7              | 2.9               | 14              | 2.0 | ZV225S_K202_0170 EZ501U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 2.9              | 3.2               | 15              | 1.8 | ZV225S_K202_0170 EZ402U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 4.3              | 5.3               | 23              | 1.2 | ZV225S_K202_0170 EZ404U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 4.6              | 4.9               | 24              | 1.1 | ZV225S_K202_0170 EZ502U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.49  | 4.6              | 5.1               | 24              | 1.1 | ZV225S_K202_0170 EZ701U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 1.4              | 1.5               | 9.4             | 3.5 | ZV225S_K202_0140 EZ401U | 4.3                 | 15                   | 114                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 2.2              | 2.4               | 14              | 2.3 | ZV225S_K202_0140 EZ501U | 8.1                 | 15                   | 215                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 2.4              | 2.6               | 16              | 2.1 | ZV225S_K202_0140 EZ402U | 8.1                 | 15                   | 215                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 3.5              | 4.4               | 23              | 1.4 | ZV225S_K202_0140 EZ404U | 8.3                 | 15                   | 220                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 3.7              | 4.1               | 25              | 1.3 | ZV225S_K202_0140 EZ502U | 8.3                 | 15                   | 220                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 3.7              | 4.2               | 25              | 1.3 | ZV225S_K202_0140 EZ701U | 8.3                 | 15                   | 220                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 4.9              | 5.6               | 32              | 1.0 | ZV225S_K202_0140 EZ503U | 8.3                 | 15                   | 220                | 13.85 | 0.78                 | 0.70      | 1.10                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 0.7              | 0.8               | 9.8             | 3.8 | ZV225S_K202_0125 EZ302U | 2.3                 | 3.5                  | 62                 | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 1.0              | 1.0               | 13              | 2.9 | ZV225S_K202_0125 EZ303U | 2.8                 | 3.5                  | 74                 | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 1.3              | 1.4               | 9.4             | 3.7 | ZV225S_K202_0125 EZ401U | 3.9                 | 14                   | 105                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 2.0              | 2.2               | 15              | 2.4 | ZV225S_K202_0125 EZ501U | 7.4                 | 14                   | 197                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 2.2              | 2.4               | 16              | 2.2 | ZV225S_K202_0125 EZ402U | 7.4                 | 14                   | 197                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 3.2              | 4.0               | 23              | 1.5 | ZV225S_K202_0125 EZ404U | 8.3                 | 14                   | 220                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 3.4              | 3.7               | 25              | 1.4 | ZV225S_K202_0125 EZ502U | 8.3                 | 14                   | 220                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 3.4              | 3.9               | 25              | 1.4 | ZV225S_K202_0125 EZ701U | 8.3                 | 15                   | 220                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 4.5              | 5.2               | 33              | 1.1 | ZV225S_K202_0125 EZ503U | 8.3                 | 14                   | 220                | 12.71 | 0.85                 | 0.77      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 0.7              | 0.7               | 11              | 3.8 | ZV225S_K202_0115 EZ302U | 2.1                 | 3.2                  | 56                 | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 0.9              | 0.9               | 14              | 2.9 | ZV225S_K202_0115 EZ303U | 2.5                 | 3.2                  | 67                 | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 1.2              | 1.3               | 9.5             | 3.9 | ZV225S_K202_0115 EZ401U | 3.6                 | 13                   | 95                 | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 1.8              | 2.0               | 15              | 2.6 | ZV225S_K202_0115 EZ501U | 6.8                 | 13                   | 179                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 2.0              | 2.2               | 16              | 2.4 | ZV225S_K202_0115 EZ402U | 6.8                 | 13                   | 179                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 2.9              | 3.6               | 23              | 1.6 | ZV225S_K202_0115 EZ404U | 8.3                 | 13                   | 220                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 3.1              | 3.4               | 25              | 1.5 | ZV225S_K202_0115 EZ502U | 8.3                 | 13                   | 220                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 3.1              | 3.5               | 25              | 1.5 | ZV225S_K202_0115 EZ701U | 8.3                 | 15                   | 220                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 4.1              | 4.7               | 33              | 1.1 | ZV225S_K202_0115 EZ503U | 8.3                 | 13                   | 220                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 1.0              | 1.1               | 9.6             | 4.3 | ZV225S_K202_0100 EZ401U | 3.1                 | 11                   | 83                 | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 1.6              | 1.7               | 15              | 2.8 | ZV225S_K202_0100 EZ501U | 5.9                 | 11                   | 156                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 1.7              | 1.9               | 16              | 2.6 | ZV225S_K202_0100 EZ402U | 5.9                 | 11                   | 156                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 2.5              | 3.2               | 24              | 1.8 | ZV225S_K202_0100 EZ404U | 8.3                 | 11                   | 220                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 2.7              | 2.9               | 25              | 1.6 | ZV225S_K202_0100 EZ502U | 8.3                 | 11                   | 220                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 2.7              | 3.1               | 25              | 1.6 | ZV225S_K202_0100 EZ701U | 7.4                 | 15                   | 195                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 3.6              | 4.1               | 33              | 1.2 | ZV225S_K202_0100 EZ503U | 8.3                 | 11                   | 220                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.83  | 4.4              | 5.3               | 41              | 1.0 | ZV225S_K202_0100 EZ702U | 8.3                 | 15                   | 220                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 0.9              | 1.0               | 9.7             | 4.6 | ZV225S_K202_0092 EZ401U | 2.9                 | 10                   | 76                 | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 1.4              | 1.6               | 15              | 3.0 | ZV225S_K202_0092 EZ501U | 5.4                 | 10                   | 143                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 1.6              | 1.7               | 16              | 2.7 | ZV225S_K202_0092 EZ402U | 5.4                 | 10                   | 143                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 2.3              | 2.9               | 24              | 1.9 | ZV225S_K202_0092 EZ404U | 8.1                 | 10                   | 214                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 2.5              | 2.7               | 26              | 1.7 | ZV225S_K202_0092 EZ502U | 8.1                 | 10                   | 214                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 2.5              | 2.8               | 26              | 1.7 | ZV225S_K202_0092 EZ701U | 6.7                 | 15                   | 178                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.91  | 3.3              | 3.7               | 34              | 1.3 | ZV225S_K202_0092 EZ503U | 8.1                 | 10                   | 214                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K2 (n<sub>1N</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.91  | 4.0              | 4.8               | 42              | 1.1 | ZV225S_K202_0092 EZ702U | 8.3                 | 15                   | 220                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 0.5              | 0.5               | 13              | 3.8 | ZV225S_K202_0084 EZ302U | 1.5                 | 2.3                  | 41                 | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 0.6              | 0.7               | 17              | 2.9 | ZV225S_K202_0084 EZ303U | 1.8                 | 2.3                  | 49                 | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 0.9              | 0.9               | 9.8             | 4.9 | ZV225S_K202_0084 EZ401U | 2.6                 | 9.2                  | 69                 | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 1.3              | 1.4               | 15              | 3.2 | ZV225S_K202_0084 EZ501U | 4.9                 | 9.2                  | 130                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 1.4              | 1.6               | 16              | 2.9 | ZV225S_K202_0084 EZ402U | 4.9                 | 9.2                  | 130                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 2.1              | 2.6               | 24              | 2.0 | ZV225S_K202_0084 EZ404U | 7.4                 | 9.2                  | 196                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 2.3              | 2.5               | 26              | 1.8 | ZV225S_K202_0084 EZ502U | 7.4                 | 9.2                  | 196                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 2.3              | 2.5               | 26              | 1.8 | ZV225S_K202_0084 EZ701U | 6.1                 | 15                   | 163                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.0              | 3.4               | 34              | 1.4 | ZV225S_K202_0084 EZ503U | 7.4                 | 9.2                  | 196                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.7              | 4.4               | 42              | 1.1 | ZV225S_K202_0084 EZ702U | 8.3                 | 15                   | 220                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 4.1              | 4.9               | 47              | 1.0 | ZV225S_K202_0084 EZ505U | 8.3                 | 15                   | 220                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.17  | 1.9              | 2.2               | 26              | 2.1 | ZV225S_K202_0071 EZ701U | 5.2                 | 15                   | 138                | 7.118 | 1.17                 | 1.02      | 1.76                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.17  | 3.1              | 3.7               | 42              | 1.3 | ZV225S_K202_0071 EZ702U | 8.0                 | 15                   | 211                | 7.118 | 1.17                 | 1.02      | 1.76                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.17  | 3.5              | 4.2               | 48              | 1.1 | ZV225S_K202_0071 EZ505U | 8.0                 | 15                   | 211                | 7.118 | 1.17                 | 1.02      | 1.76                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 1.1              | 1.1               | 15              | 3.7 | ZV225S_K202_0067 EZ501U | 3.9                 | 7.3                  | 104                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 1.1              | 1.3               | 17              | 3.4 | ZV225S_K202_0067 EZ402U | 3.9                 | 7.3                  | 104                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 1.7              | 2.1               | 25              | 2.3 | ZV225S_K202_0067 EZ404U | 5.9                 | 7.3                  | 156                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 1.8              | 2.0               | 26              | 2.1 | ZV225S_K202_0067 EZ502U | 5.9                 | 7.3                  | 156                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 1.8              | 2.0               | 26              | 2.1 | ZV225S_K202_0067 EZ701U | 4.9                 | 15                   | 130                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 2.4              | 2.7               | 35              | 1.6 | ZV225S_K202_0067 EZ503U | 5.9                 | 7.3                  | 156                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 2.9              | 3.5               | 43              | 1.3 | ZV225S_K202_0067 EZ702U | 7.8                 | 15                   | 207                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.25  | 3.3              | 3.9               | 48              | 1.2 | ZV225S_K202_0067 EZ505U | 7.8                 | 15                   | 207                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 0.9              | 1.0               | 15              | 4.0 | ZV225S_K202_0060 EZ501U | 3.5                 | 6.6                  | 93                 | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 1.0              | 1.1               | 17              | 3.6 | ZV225S_K202_0060 EZ402U | 3.5                 | 6.6                  | 93                 | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 1.5              | 1.9               | 25              | 2.5 | ZV225S_K202_0060 EZ404U | 5.3                 | 6.6                  | 140                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 1.6              | 1.8               | 27              | 2.3 | ZV225S_K202_0060 EZ502U | 5.3                 | 6.6                  | 140                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 1.6              | 1.8               | 27              | 2.3 | ZV225S_K202_0060 EZ701U | 4.4                 | 15                   | 116                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 2.1              | 2.4               | 35              | 1.8 | ZV225S_K202_0060 EZ503U | 5.3                 | 6.6                  | 140                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 2.6              | 3.2               | 43              | 1.4 | ZV225S_K202_0060 EZ702U | 7.5                 | 15                   | 200                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 3.0              | 3.5               | 48              | 1.3 | ZV225S_K202_0060 EZ505U | 7.5                 | 15                   | 200                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.39  | 3.6              | 4.6               | 59              | 1.0 | ZV225S_K202_0060 EZ703U | 7.5                 | 15                   | 200                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.61  | 1.4              | 1.6               | 27              | 2.5 | ZV225S_K202_0052 EZ701U | 3.8                 | 14                   | 100                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.61  | 2.3              | 2.7               | 44              | 1.6 | ZV225S_K202_0052 EZ702U | 7.2                 | 14                   | 190                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.61  | 2.6              | 3.0               | 49              | 1.4 | ZV225S_K202_0052 EZ505U | 7.2                 | 14                   | 190                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.61  | 3.1              | 3.9               | 60              | 1.1 | ZV225S_K202_0052 EZ703U | 7.2                 | 14                   | 190                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 0.7              | 0.8               | 16              | 4.9 | ZV225S_K202_0044 EZ501U | 2.6                 | 4.8                  | 68                 | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 0.8              | 0.8               | 17              | 4.5 | ZV225S_K202_0044 EZ402U | 2.6                 | 4.8                  | 68                 | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 1.1              | 1.4               | 25              | 3.1 | ZV225S_K202_0044 EZ404U | 3.8                 | 4.8                  | 102                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 1.2              | 1.3               | 27              | 2.9 | ZV225S_K202_0044 EZ502U | 3.8                 | 4.8                  | 102                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 1.2              | 1.3               | 27              | 2.9 | ZV225S_K202_0044 EZ701U | 3.2                 | 12                   | 85                 | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 1.5              | 1.8               | 36              | 2.2 | ZV225S_K202_0044 EZ503U | 3.8                 | 4.8                  | 102                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 1.9              | 2.3               | 44              | 1.8 | ZV225S_K202_0044 EZ702U | 6.5                 | 12                   | 174                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 2.2              | 2.6               | 50              | 1.6 | ZV225S_K202_0044 EZ505U | 6.8                 | 12                   | 180                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.91  | 2.6              | 3.3               | 61              | 1.3 | ZV225S_K202_0044 EZ703U | 6.8                 | 12                   | 180                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 1.1              | 1.2               | 27              | 3.0 | ZV225S_K202_0040 EZ701U | 2.9                 | 11                   | 78                 | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 1.8              | 2.1               | 45              | 1.9 | ZV225S_K202_0040 EZ702U | 6.0                 | 11                   | 159                | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 2.0              | 2.3               | 50              | 1.7 | ZV225S_K202_0040 EZ505U | 6.6                 | 11                   | 174                | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 2.4              | 3.0               | 61              | 1.4 | ZV225S_K202_0040 EZ703U | 6.6                 | 11                   | 174                | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| <b>ZV2K2 (n<sub>1N</sub> = 4500 rpm, (F<sub>fzacc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 1.08  | 4.0              | 6.5               | 37              | 1.0 | ZV225S_K202_0115 EZ505U | 8.3                 | 15                   | 220                | 11.55 | 0.84                 | 0.75      | 1.20                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.24  | 3.5              | 5.6               | 37              | 1.1 | ZV225S_K202_0100 EZ505U | 8.3                 | 15                   | 220                | 10.07 | 1.08                 | 0.97      | 1.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.36  | 3.2              | 5.1               | 38              | 1.2 | ZV225S_K202_0092 EZ505U | 8.3                 | 15                   | 220                | 9.190 | 1.06                 | 0.94      | 1.51                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.49  | 2.9              | 4.7               | 38              | 1.3 | ZV225S_K202_0084 EZ505U | 8.3                 | 15                   | 220                | 8.397 | 1.16                 | 1.03      | 1.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.76  | 2.5              | 4.0               | 39              | 1.4 | ZV225S_K202_0071 EZ505U | 8.0                 | 15                   | 211                | 7.118 | 1.17                 | 1.02      | 1.76                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.76  | 3.1              | 5.2               | 49              | 1.1 | ZV225S_K202_0071 EZ703U | 8.0                 | 15                   | 211                | 7.118 | 1.17                 | 1.02      | 1.76                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.87  | 2.3              | 3.7               | 39              | 1.5 | ZV225S_K202_0067 EZ505U | 7.8                 | 15                   | 207                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 1.87  | 3.0              | 4.9               | 49              | 1.1 | ZV225S_K202_0067 EZ703U | 7.8                 | 15                   | 207                | 6.683 | 1.46                 | 1.29      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 2.1              | 3.4               | 39              | 1.6 | ZV225S_K202_0060 EZ505U | 7.5                 | 15                   | 200                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.08  | 2.7              | 4.4               | 50              | 1.2 | ZV225S_K202_0060 EZ703U | 7.5                 | 15                   | 200                | 6.000 | 1.39                 | 1.20      | 2.08                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.41  | 1.8              | 2.9               | 40              | 1.7 | ZV225S_K202_0052 EZ505U | 7.2                 | 14                   | 190                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.41  | 2.3              | 3.8               | 50              | 1.4 | ZV225S_K202_0052 EZ703U | 7.2                 | 14                   | 190                | 5.177 | 1.61                 | 1.40      | 2.41                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.86  | 1.5              | 2.4               | 40              | 1.9 | ZV225S_K202_0044 EZ505U | 6.8                 | 12                   | 180                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 2.86  | 1.9              | 3.2               | 51              | 1.5 | ZV225S_K202_0044 EZ703U | 6.8                 | 12                   | 180                | 4.364 | 1.91                 | 1.66      | 2.86                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |



| v <sub>F2N</sub>  | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2maxDB</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K2 (n<sub>1N</sub> = 4500 rpm, (F<sub>F2acc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 3.13  | 1.4              | 2.2               | 40              | 2.1 | ZV225S_K202_0040 EZ505U | 6.6                 | 11                   | 174                | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 3.13  | 1.8              | 2.9               | 51              | 1.6 | ZV225S_K202_0040 EZ703U | 6.6                 | 11                   | 174                | 4.000 | 2.08                 | 1.81      | 3.13                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| <b>ZV2K2 (n<sub>1N</sub> = 6000 rpm, (F<sub>F2acc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.12  | 4.3              | 4.6               | 3.6             | 1.2 | ZV225S_K203_1350 EZ301U | 8.3                 | 15                   | 220                | 135.3 | 0.08                 | 0.08      | 0.13                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.15  | 3.5              | 3.7               | 3.4             | 1.5 | ZV225S_K203_1090 EZ301U | 8.3                 | 15                   | 220                | 109.5 | 0.10                 | 0.10      | 0.17                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 2.9              | 3.1               | 3.3             | 1.8 | ZV225S_K203_0910 EZ301U | 8.3                 | 15                   | 220                | 90.79 | 0.12                 | 0.12      | 0.20                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.18  | 4.9              | 5.5               | 5.5             | 1.1 | ZV225S_K203_0910 EZ302U | 8.3                 | 15                   | 220                | 90.79 | 0.12                 | 0.12      | 0.20                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 2.6              | 2.7               | 3.2             | 2.0 | ZV225S_K203_0800 EZ301U | 8.0                 | 15                   | 213                | 79.62 | 0.14                 | 0.14      | 0.23                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.21  | 4.3              | 4.8               | 5.4             | 1.2 | ZV225S_K203_0800 EZ302U | 8.3                 | 15                   | 220                | 79.62 | 0.14                 | 0.14      | 0.23                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 2.3              | 2.4               | 4.7             | 2.2 | ZV225S_K202_0690 EZ301U | 6.0                 | 9.5                  | 159                | 69.43 | 0.16                 | 0.16      | 0.26                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 3.8              | 4.3               | 7.9             | 1.3 | ZV225S_K202_0690 EZ302U | 6.0                 | 9.5                  | 159                | 69.43 | 0.16                 | 0.16      | 0.26                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 5.0              | 5.7               | 10              | 1.0 | ZV225S_K202_0690 EZ303U | 6.0                 | 9.5                  | 159                | 69.43 | 0.16                 | 0.16      | 0.26                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 2.2              | 2.3               | 3.2             | 2.4 | ZV225S_K203_0680 EZ301U | 6.9                 | 15                   | 183                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 3.7              | 4.1               | 5.5             | 1.4 | ZV225S_K203_0680 EZ302U | 8.3                 | 15                   | 220                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.24  | 4.8              | 5.5               | 7.1             | 1.1 | ZV225S_K203_0680 EZ303U | 8.3                 | 15                   | 220                | 68.42 | 0.16                 | 0.16      | 0.26                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 2.1              | 2.3               | 3.3             | 2.5 | ZV225S_K203_0660 EZ301U | 6.7                 | 15                   | 177                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 3.6              | 4.0               | 5.5             | 1.5 | ZV225S_K203_0660 EZ302U | 8.3                 | 15                   | 220                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.25  | 4.7              | 5.4               | 7.2             | 1.1 | ZV225S_K203_0660 EZ303U | 8.3                 | 15                   | 220                | 66.03 | 0.17                 | 0.16      | 0.27                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 1.8              | 1.9               | 3.7             | 2.9 | ZV225S_K202_0560 EZ301U | 5.7                 | 10                   | 151                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 3.0              | 3.4               | 6.3             | 1.7 | ZV225S_K202_0560 EZ302U | 7.2                 | 10                   | 191                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 4.0              | 4.6               | 8.2             | 1.3 | ZV225S_K202_0560 EZ303U | 7.2                 | 10                   | 191                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.30  | 4.7              | 5.7               | 9.6             | 1.1 | ZV225S_K202_0560 EZ401U | 7.2                 | 10                   | 191                | 55.54 | 0.20                 | 0.20      | 0.33                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.31  | 1.7              | 1.9               | 3.3             | 3.0 | ZV225S_K203_0540 EZ301U | 5.5                 | 13                   | 145                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.31  | 2.9              | 3.3               | 5.6             | 1.8 | ZV225S_K203_0540 EZ302U | 8.3                 | 13                   | 220                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.31  | 3.8              | 4.4               | 7.3             | 1.4 | ZV225S_K203_0540 EZ303U | 8.3                 | 13                   | 220                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.31  | 4.5              | 5.5               | 8.5             | 1.2 | ZV225S_K203_0540 EZ401U | 8.3                 | 13                   | 220                | 54.25 | 0.21                 | 0.20      | 0.33                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 1.6              | 1.8               | 6.0             | 2.2 | ZV225S_K202_0500 EZ301U | 4.4                 | 6.9                  | 116                | 50.49 | 0.22                 | 0.22      | 0.36                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 2.8              | 3.1               | 10              | 1.3 | ZV225S_K202_0500 EZ302U | 4.4                 | 6.9                  | 116                | 50.49 | 0.22                 | 0.22      | 0.36                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.33  | 3.6              | 4.2               | 13              | 1.0 | ZV225S_K202_0500 EZ303U | 4.4                 | 6.9                  | 116                | 50.49 | 0.22                 | 0.22      | 0.36                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.34  | 1.6              | 1.7               | 3.3             | 3.3 | ZV225S_K203_0500 EZ301U | 5.0                 | 12                   | 133                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.34  | 2.7              | 3.0               | 5.6             | 1.9 | ZV225S_K203_0500 EZ302U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.34  | 3.5              | 4.0               | 7.3             | 1.5 | ZV225S_K203_0500 EZ303U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.34  | 4.1              | 5.0               | 8.6             | 1.3 | ZV225S_K203_0500 EZ401U | 8.3                 | 12                   | 220                | 49.76 | 0.22                 | 0.22      | 0.36                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 1.5              | 1.6               | 3.4             | 3.5 | ZV225S_K202_0460 EZ301U | 4.7                 | 9.7                  | 126                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 2.5              | 2.8               | 5.7             | 2.1 | ZV225S_K202_0460 EZ302U | 7.8                 | 9.7                  | 206                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 3.3              | 3.8               | 7.5             | 1.6 | ZV225S_K202_0460 EZ303U | 7.8                 | 9.7                  | 206                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.36  | 3.9              | 4.7               | 8.8             | 1.3 | ZV225S_K202_0460 EZ401U | 8.3                 | 15                   | 220                | 46.23 | 0.24                 | 0.23      | 0.39                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.37  | 1.5              | 1.5               | 3.4             | 3.6 | ZV225S_K203_0450 EZ301U | 4.6                 | 11                   | 121                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.37  | 2.4              | 2.7               | 5.7             | 2.1 | ZV225S_K203_0450 EZ302U | 8.1                 | 11                   | 216                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.37  | 3.2              | 3.7               | 7.4             | 1.6 | ZV225S_K203_0450 EZ303U | 8.3                 | 11                   | 220                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.37  | 3.7              | 4.6               | 8.7             | 1.4 | ZV225S_K203_0450 EZ401U | 8.3                 | 11                   | 220                | 45.22 | 0.25                 | 0.24      | 0.40                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 1.3              | 1.4               | 4.7             | 3.3 | ZV225S_K202_0400 EZ301U | 4.1                 | 7.4                  | 110                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 2.2              | 2.5               | 7.9             | 2.0 | ZV225S_K202_0400 EZ302U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 2.9              | 3.3               | 10              | 1.5 | ZV225S_K202_0400 EZ303U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.41  | 3.4              | 4.1               | 12              | 1.3 | ZV225S_K202_0400 EZ401U | 5.2                 | 7.4                  | 139                | 40.39 | 0.28                 | 0.27      | 0.45                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.42  | 1.3              | 1.4               | 3.4             | 4.1 | ZV225S_K203_0390 EZ301U | 4.0                 | 9.5                  | 106                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.42  | 2.1              | 2.4               | 5.7             | 2.4 | ZV225S_K203_0390 EZ302U | 7.1                 | 9.5                  | 189                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.42  | 2.8              | 3.2               | 7.5             | 1.9 | ZV225S_K203_0390 EZ303U | 7.6                 | 9.5                  | 202                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.42  | 3.3              | 4.0               | 8.8             | 1.6 | ZV225S_K203_0390 EZ401U | 7.6                 | 9.5                  | 202                | 39.45 | 0.28                 | 0.28      | 0.46                 | 77   | 46                  | 19                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 1.1              | 1.2               | 3.5             | 4.6 | ZV225S_K202_0350 EZ301U | 3.5                 | 8.1                  | 94                 | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 1.9              | 2.1               | 5.9             | 2.8 | ZV225S_K202_0350 EZ302U | 6.3                 | 8.1                  | 168                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 2.5              | 2.8               | 7.7             | 2.1 | ZV225S_K202_0350 EZ303U | 6.5                 | 8.1                  | 171                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 2.9              | 3.5               | 9.0             | 1.8 | ZV225S_K202_0350 EZ401U | 8.3                 | 15                   | 220                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 4.3              | 5.6               | 13              | 1.2 | ZV225S_K202_0350 EZ501U | 8.3                 | 15                   | 220                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.48  | 4.4              | 6.2               | 14              | 1.2 | ZV225S_K202_0350 EZ402U | 8.3                 | 15                   | 220                | 34.55 | 0.32                 | 0.31      | 0.52                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 1.1              | 1.2               | 3.5             | 4.8 | ZV225S_K202_0340 EZ301U | 3.4                 | 7.1                  | 91                 | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 1.8              | 2.1               | 5.9             | 2.8 | ZV225S_K202_0340 EZ302U | 5.7                 | 7.1                  | 150                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 2.4              | 2.8               | 7.7             | 2.2 | ZV225S_K202_0340 EZ303U | 5.7                 | 7.1                  | 150                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 2.8              | 3.4               | 9.0             | 1.8 | ZV225S_K202_0340 EZ401U | 7.0                 | 12                   | 185                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 4.2              | 5.4               | 13              | 1.2 | ZV225S_K202_0340 EZ501U | 7.0                 | 12                   | 185                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.50  | 4.3              | 6.0               | 14              | 1.2 | ZV225S_K202_0340 EZ402U | 7.0                 | 12                   | 185                | 33.62 | 0.33                 | 0.32      | 0.54                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 2.4              | 2.9               | 9.2             | 2.1 | ZV225S_K202_0280 EZ401U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 3.5              | 4.5               | 14              | 1.4 | ZV225S_K202_0280 EZ501U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.60  | 3.6              | 5.0               | 14              | 1.4 | ZV225S_K202_0280 EZ402U | 8.3                 | 15                   | 220                | 27.95 | 0.40                 | 0.39      | 0.65                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K2 (n<sub>in</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 8,3 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.66  | 1.4              | 1.5               | 6.5             | 3.4 | ZV225S_K202_0250 EZ302U | 4.6                 | 5.9                  | 122                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 1.8              | 2.1               | 8.5             | 2.6 | ZV225S_K202_0250 EZ303U | 4.7                 | 5.9                  | 125                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 2.1              | 2.6               | 9.2             | 2.3 | ZV225S_K202_0250 EZ401U | 7.8                 | 15                   | 207                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 3.1              | 4.0               | 14              | 1.5 | ZV225S_K202_0250 EZ501U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 3.2              | 4.5               | 14              | 1.5 | ZV225S_K202_0250 EZ402U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 4.8              | 7.2               | 21              | 1.0 | ZV225S_K202_0250 EZ502U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.66  | 4.8              | 7.3               | 21              | 1.0 | ZV225S_K202_0250 EZ701U | 8.3                 | 15                   | 220                | 25.13 | 0.44                 | 0.43      | 0.72                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 1.3              | 1.4               | 6.1             | 3.7 | ZV225S_K202_0230 EZ302U | 4.2                 | 6.4                  | 112                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 1.7              | 1.9               | 7.9             | 2.8 | ZV225S_K202_0230 EZ303U | 5.1                 | 6.4                  | 135                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 1.9              | 2.4               | 9.3             | 2.4 | ZV225S_K202_0230 EZ401U | 7.2                 | 15                   | 191                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 2.9              | 3.7               | 14              | 1.6 | ZV225S_K202_0230 EZ501U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 3.0              | 4.2               | 14              | 1.6 | ZV225S_K202_0230 EZ402U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 4.4              | 6.6               | 21              | 1.1 | ZV225S_K202_0230 EZ502U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.72  | 4.4              | 6.7               | 21              | 1.1 | ZV225S_K202_0230 EZ701U | 8.3                 | 15                   | 220                | 23.18 | 0.48                 | 0.47      | 0.78                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 1.7              | 2.1               | 9.4             | 2.6 | ZV225S_K202_0200 EZ401U | 6.3                 | 15                   | 168                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 2.5              | 3.3               | 14              | 1.8 | ZV225S_K202_0200 EZ501U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 2.6              | 3.6               | 14              | 1.7 | ZV225S_K202_0200 EZ402U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 3.9              | 5.8               | 21              | 1.2 | ZV225S_K202_0200 EZ502U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 3.9              | 5.9               | 21              | 1.2 | ZV225S_K202_0200 EZ701U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.82  | 4.3              | 6.2               | 24              | 1.0 | ZV225S_K202_0200 EZ404U | 8.3                 | 15                   | 220                | 20.33 | 0.55                 | 0.53      | 0.89                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 0.9              | 1.0               | 7.5             | 4.0 | ZV225S_K202_0170 EZ302U | 3.1                 | 4.6                  | 82                 | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 1.2              | 1.4               | 9.8             | 3.1 | ZV225S_K202_0170 EZ303U | 3.7                 | 4.6                  | 98                 | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 1.4              | 1.7               | 9.5             | 3.0 | ZV225S_K202_0170 EZ401U | 5.2                 | 15                   | 139                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 2.1              | 2.7               | 14              | 2.0 | ZV225S_K202_0170 EZ501U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 2.2              | 3.0               | 15              | 1.9 | ZV225S_K202_0170 EZ402U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.2              | 4.8               | 22              | 1.3 | ZV225S_K202_0170 EZ502U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.2              | 4.9               | 22              | 1.3 | ZV225S_K202_0170 EZ701U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.6              | 5.2               | 24              | 1.2 | ZV225S_K202_0170 EZ404U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| 0.99  | 3.8              | 6.5               | 26              | 1.1 | ZV225S_K202_0170 EZ503U | 8.3                 | 15                   | 220                | 16.86 | 0.66                 | 0.64      | 1.07                 | 77   | 39                  | 12                 | 24               | 2              | 25 | 53.1           |
| <b>ZV3K2 (n<sub>in</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.07  | 4.2              | 4.3               | 3.8             | 1.3 | ZV318S_K203_1350 EZ301U | 7.7                 | 14                   | 220                | 135.3 | 0.09                 | 0.09      | 0.14                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.08  | 3.4              | 3.5               | 3.6             | 1.6 | ZV318S_K203_1090 EZ301U | 7.7                 | 14                   | 220                | 109.5 | 0.11                 | 0.11      | 0.18                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.10  | 2.8              | 2.9               | 3.4             | 1.9 | ZV318S_K203_0910 EZ301U | 7.7                 | 14                   | 220                | 90.79 | 0.13                 | 0.13      | 0.22                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.10  | 4.8              | 5.1               | 5.9             | 1.1 | ZV318S_K203_0910 EZ302U | 7.7                 | 14                   | 220                | 90.79 | 0.13                 | 0.13      | 0.22                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.11  | 2.5              | 2.5               | 3.3             | 2.2 | ZV318S_K203_0800 EZ301U | 7.4                 | 14                   | 213                | 79.62 | 0.15                 | 0.15      | 0.25                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.11  | 4.2              | 4.5               | 5.7             | 1.3 | ZV318S_K203_0800 EZ302U | 7.7                 | 14                   | 220                | 79.62 | 0.15                 | 0.15      | 0.25                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.13  | 2.2              | 2.2               | 4.9             | 2.1 | ZV318S_K202_0690 EZ301U | 5.5                 | 8.8                  | 159                | 69.43 | 0.17                 | 0.17      | 0.28                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.13  | 3.7              | 3.9               | 8.4             | 1.2 | ZV318S_K202_0690 EZ302U | 5.5                 | 8.8                  | 159                | 69.43 | 0.17                 | 0.17      | 0.28                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.13  | 2.1              | 2.2               | 3.2             | 2.5 | ZV318S_K203_0680 EZ301U | 6.4                 | 14                   | 183                | 68.42 | 0.18                 | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.13  | 3.6              | 3.8               | 5.5             | 1.5 | ZV318S_K203_0680 EZ302U | 7.7                 | 14                   | 220                | 68.42 | 0.18                 | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.13  | 4.7              | 5.0               | 7.1             | 1.1 | ZV318S_K203_0680 EZ303U | 7.7                 | 14                   | 220                | 68.42 | 0.18                 | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.14  | 2.0              | 2.1               | 3.2             | 2.6 | ZV318S_K203_0660 EZ301U | 6.2                 | 14                   | 177                | 66.03 | 0.18                 | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.14  | 3.5              | 3.7               | 5.4             | 1.5 | ZV318S_K203_0660 EZ302U | 7.7                 | 14                   | 220                | 66.03 | 0.18                 | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.14  | 4.6              | 4.8               | 7.1             | 1.2 | ZV318S_K203_0660 EZ303U | 7.7                 | 14                   | 220                | 66.03 | 0.18                 | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.16  | 1.7              | 1.8               | 3.9             | 3.1 | ZV318S_K202_0560 EZ301U | 5.3                 | 9.4                  | 151                | 55.54 | 0.22                 | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.16  | 3.0              | 3.2               | 6.6             | 1.8 | ZV318S_K202_0560 EZ302U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22                 | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.16  | 3.9              | 4.1               | 8.6             | 1.4 | ZV318S_K202_0560 EZ303U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22                 | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.16  | 5.3              | 5.6               | 12              | 1.0 | ZV318S_K202_0560 EZ401U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22                 | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.17  | 1.7              | 1.7               | 3.0             | 3.2 | ZV318S_K203_0540 EZ301U | 5.1                 | 12                   | 145                | 54.25 | 0.22                 | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.17  | 2.9              | 3.0               | 5.2             | 1.9 | ZV318S_K203_0540 EZ302U | 7.7                 | 12                   | 220                | 54.25 | 0.22                 | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.17  | 3.7              | 4.0               | 6.7             | 1.4 | ZV318S_K203_0540 EZ303U | 7.7                 | 12                   | 220                | 54.25 | 0.22                 | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.17  | 5.1              | 5.4               | 9.1             | 1.1 | ZV318S_K203_0540 EZ401U | 7.7                 | 12                   | 220                | 54.25 | 0.22                 | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 1.6              | 1.6               | 6.2             | 2.1 | ZV318S_K202_0500 EZ301U | 4.0                 | 6.4                  | 116                | 50.49 | 0.24                 | 0.23      | 0.39                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 2.7              | 2.9               | 11              | 1.2 | ZV318S_K202_0500 EZ302U | 4.0                 | 6.4                  | 116                | 50.49 | 0.24                 | 0.23      | 0.39                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 1.5              | 1.6               | 3.0             | 3.5 | ZV318S_K203_0500 EZ301U | 4.6                 | 11                   | 133                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 2.6              | 2.8               | 5.0             | 2.0 | ZV318S_K203_0500 EZ302U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 3.4              | 3.6               | 6.6             | 1.6 | ZV318S_K203_0500 EZ303U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.18  | 4.6              | 5.0               | 8.9             | 1.2 | ZV318S_K203_0500 EZ401U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 1.5              | 1.5               | 2.9             | 3.7 | ZV318S_K202_0460 EZ301U | 4.4                 | 9.0                  | 126                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 2.5              | 2.6               | 5.0             | 2.2 | ZV318S_K202_0460 EZ302U | 7.2                 | 9.0                  | 206                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 3.2              | 3.4               | 6.5             | 1.7 | ZV318S_K202_0460 EZ303U | 7.2                 | 9.0                  | 206                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 4.4              | 4.7               | 8.9             | 1.2 | ZV318S_K202_0460 EZ401U | 7.7                 | 14                   | 220                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 1.4              | 1.4               | 2.9             | 3.8 | ZV318S_K203_0450 EZ301U | 4.2                 | 10                   | 121                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 2.4              | 2.5               | 4.9             | 2.2 | ZV318S_K203_0450 EZ302U | 7.5                 | 10                   | 216                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redll</sub> | Δs <sub>redl</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K2 (n<sub>in</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.20  | 3.1              | 3.3               | 6.4             | 1.7 | ZV318S_K203_0450 EZ303U | 7.7                 | 10                   | 220                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 4.2              | 4.5               | 8.7             | 1.3 | ZV318S_K203_0450 EZ401U | 7.7                 | 10                   | 220                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.22  | 1.3              | 1.3               | 4.9             | 3.2 | ZV318S_K202_0400 EZ301U | 3.8                 | 6.9                  | 110                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.22  | 2.2              | 2.3               | 8.4             | 1.9 | ZV318S_K202_0400 EZ302U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.22  | 2.8              | 3.0               | 11              | 1.4 | ZV318S_K202_0400 EZ303U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.22  | 3.8              | 4.1               | 15              | 1.1 | ZV318S_K202_0400 EZ401U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 1.2              | 1.3               | 2.8             | 4.4 | ZV318S_K203_0390 EZ301U | 3.7                 | 8.8                  | 106                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 2.1              | 2.2               | 4.8             | 2.6 | ZV318S_K203_0390 EZ302U | 6.6                 | 8.8                  | 189                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 2.7              | 2.9               | 6.3             | 2.0 | ZV318S_K203_0390 EZ303U | 7.1                 | 8.8                  | 202                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 3.7              | 3.9               | 8.5             | 1.5 | ZV318S_K203_0390 EZ401U | 7.1                 | 8.8                  | 202                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 1.1              | 1.1               | 3.2             | 4.9 | ZV318S_K202_0350 EZ301U | 3.3                 | 7.5                  | 94                 | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 1.9              | 2.0               | 5.5             | 2.9 | ZV318S_K202_0350 EZ302U | 5.8                 | 7.5                  | 168                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 2.4              | 2.6               | 7.1             | 2.2 | ZV318S_K202_0350 EZ303U | 6.0                 | 7.5                  | 171                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 3.3              | 3.5               | 8.7             | 1.6 | ZV318S_K202_0350 EZ401U | 7.7                 | 14                   | 220                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 5.0              | 5.5               | 13              | 1.1 | ZV318S_K202_0350 EZ501U | 7.7                 | 14                   | 220                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 1.1              | 1.1               | 3.6             | 4.9 | ZV318S_K202_0340 EZ301U | 3.2                 | 6.5                  | 91                 | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 1.8              | 1.9               | 6.2             | 2.9 | ZV318S_K202_0340 EZ302U | 5.2                 | 6.5                  | 150                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 2.4              | 2.5               | 8.1             | 2.2 | ZV318S_K202_0340 EZ303U | 5.2                 | 6.5                  | 150                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 3.2              | 3.4               | 11              | 1.7 | ZV318S_K202_0340 EZ401U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 4.9              | 5.3               | 16              | 1.1 | ZV318S_K202_0340 EZ501U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 5.3              | 5.9               | 18              | 1.0 | ZV318S_K202_0340 EZ402U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 2.6              | 2.8               | 8.8             | 2.0 | ZV318S_K202_0280 EZ401U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 4.1              | 4.4               | 14              | 1.3 | ZV318S_K202_0280 EZ501U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 4.4              | 4.9               | 15              | 1.2 | ZV318S_K202_0280 EZ402U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 1.4              | 1.4               | 6.9             | 3.2 | ZV318S_K202_0250 EZ302U | 4.3                 | 5.4                  | 122                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 1.8              | 1.9               | 9.0             | 2.5 | ZV318S_K202_0250 EZ303U | 4.4                 | 5.4                  | 125                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 2.4              | 2.6               | 8.9             | 2.3 | ZV318S_K202_0250 EZ401U | 7.2                 | 14                   | 207                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 3.7              | 4.0               | 14              | 1.5 | ZV318S_K202_0250 EZ501U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 4.0              | 4.4               | 15              | 1.3 | ZV318S_K202_0250 EZ402U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 1.2              | 1.3               | 6.3             | 3.8 | ZV318S_K202_0230 EZ302U | 3.9                 | 5.9                  | 112                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 1.6              | 1.7               | 8.2             | 2.9 | ZV318S_K202_0230 EZ303U | 4.7                 | 5.9                  | 135                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 2.2              | 2.4               | 9.0             | 2.4 | ZV318S_K202_0230 EZ401U | 6.7                 | 14                   | 191                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 3.4              | 3.7               | 14              | 1.6 | ZV318S_K202_0230 EZ501U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 3.7              | 4.1               | 15              | 1.5 | ZV318S_K202_0230 EZ402U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 1.9              | 2.1               | 9.1             | 2.8 | ZV318S_K202_0200 EZ401U | 5.9                 | 14                   | 168                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 3.0              | 3.2               | 14              | 1.8 | ZV318S_K202_0200 EZ501U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 3.2              | 3.6               | 15              | 1.7 | ZV318S_K202_0200 EZ402U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 4.7              | 5.9               | 22              | 1.1 | ZV318S_K202_0200 EZ404U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 5.1              | 5.5               | 24              | 1.1 | ZV318S_K202_0200 EZ502U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.44  | 5.1              | 5.7               | 24              | 1.1 | ZV318S_K202_0200 EZ701U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 0.9              | 1.0               | 7.8             | 3.8 | ZV318S_K202_0175 EZ302U | 3.0                 | 4.4                  | 85                 | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 1.2              | 1.3               | 10              | 2.9 | ZV318S_K202_0175 EZ303U | 3.5                 | 4.4                  | 102                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 1.7              | 1.8               | 9.2             | 3.2 | ZV318S_K202_0175 EZ401U | 5.0                 | 14                   | 144                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 2.5              | 2.8               | 14              | 2.1 | ZV318S_K202_0175 EZ501U | 7.7                 | 14                   | 220                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 2.8              | 3.1               | 15              | 1.9 | ZV318S_K202_0175 EZ402U | 7.7                 | 14                   | 220                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 4.1              | 5.1               | 23              | 1.3 | ZV318S_K202_0175 EZ404U | 7.7                 | 14                   | 220                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 4.4              | 4.7               | 24              | 1.2 | ZV318S_K202_0175 EZ502U | 7.7                 | 14                   | 220                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 4.4              | 4.9               | 24              | 1.2 | ZV318S_K202_0175 EZ701U | 7.7                 | 14                   | 220                | 17.47 | 0.67                 | 0.60      | 0.95                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 0.9              | 1.0               | 8.0             | 3.8 | ZV318S_K202_0170 EZ302U | 2.9                 | 4.3                  | 82                 | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 1.2              | 1.3               | 10              | 2.9 | ZV318S_K202_0170 EZ303U | 3.4                 | 4.3                  | 98                 | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 1.6              | 1.7               | 9.2             | 3.3 | ZV318S_K202_0170 EZ401U | 4.9                 | 14                   | 139                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 2.5              | 2.7               | 14              | 2.1 | ZV318S_K202_0170 EZ501U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 2.7              | 3.0               | 15              | 1.9 | ZV318S_K202_0170 EZ402U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 3.9              | 4.9               | 23              | 1.3 | ZV318S_K202_0170 EZ404U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 4.2              | 4.6               | 24              | 1.2 | ZV318S_K202_0170 EZ502U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.53  | 4.2              | 4.7               | 24              | 1.2 | ZV318S_K202_0170 EZ701U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 1.3              | 1.4               | 9.4             | 3.7 | ZV318S_K202_0140 EZ401U | 4.0                 | 14                   | 114                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 2.0              | 2.2               | 14              | 2.4 | ZV318S_K202_0140 EZ501U | 7.5                 | 14                   | 215                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 2.2              | 2.4               | 16              | 2.2 | ZV318S_K202_0140 EZ402U | 7.5                 | 14                   | 215                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 3.2              | 4.0               | 23              | 1.5 | ZV318S_K202_0140 EZ404U | 7.7                 | 14                   | 220                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 3.5              | 3.8               | 25              | 1.4 | ZV318S_K202_0140 EZ502U | 7.7                 | 14                   | 220                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 3.5              | 3.9               | 25              | 1.4 | ZV318S_K202_0140 EZ701U | 7.7                 | 14                   | 220                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.65  | 4.5              | 5.2               | 32              | 1.1 | ZV318S_K202_0140 EZ503U | 7.7                 | 14                   | 220                | 13.85 | 0.85                 | 0.76      | 1.19                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71  | 0.7              | 0.7               | 9.8             | 3.8 | ZV318S_K202_0125 EZ302U | 2.2                 | 3.2                  | 62                 | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>F2N</sub>   | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2maxDB</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K2 (n<sub>n</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.71   | 0.9              | 0.9               | 13              | 2.9 | ZV318S_K202_0125 EZ303U | 2.6                 | 3.2                  | 74                 | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 1.2              | 1.3               | 9.4             | 3.9 | ZV318S_K202_0125 EZ401U | 3.7                 | 13                   | 105                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 1.8              | 2.0               | 15              | 2.6 | ZV318S_K202_0125 EZ501U | 6.9                 | 13                   | 197                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 2.0              | 2.2               | 16              | 2.3 | ZV318S_K202_0125 EZ402U | 6.9                 | 13                   | 197                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 3.0              | 3.7               | 23              | 1.6 | ZV318S_K202_0125 EZ404U | 7.7                 | 13                   | 220                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 3.2              | 3.4               | 25              | 1.5 | ZV318S_K202_0125 EZ502U | 7.7                 | 13                   | 220                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 3.2              | 3.6               | 25              | 1.5 | ZV318S_K202_0125 EZ701U | 7.7                 | 14                   | 220                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.71   | 4.2              | 4.8               | 33              | 1.1 | ZV318S_K202_0125 EZ503U | 7.7                 | 13                   | 220                | 12.71 | 0.92                 | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 0.6              | 0.7               | 11              | 3.8 | ZV318S_K202_0115 EZ302U | 2.0                 | 2.9                  | 56                 | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 0.8              | 0.9               | 14              | 2.9 | ZV318S_K202_0115 EZ303U | 2.3                 | 2.9                  | 67                 | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 1.1              | 1.2               | 9.5             | 4.2 | ZV318S_K202_0115 EZ401U | 3.3                 | 12                   | 95                 | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 1.7              | 1.8               | 15              | 2.7 | ZV318S_K202_0115 EZ501U | 6.3                 | 12                   | 179                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 1.8              | 2.0               | 16              | 2.5 | ZV318S_K202_0115 EZ402U | 6.3                 | 12                   | 179                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 2.7              | 3.4               | 23              | 1.7 | ZV318S_K202_0115 EZ404U | 7.7                 | 12                   | 220                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 2.9              | 3.1               | 25              | 1.6 | ZV318S_K202_0115 EZ502U | 7.7                 | 12                   | 220                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 2.9              | 3.2               | 25              | 1.6 | ZV318S_K202_0115 EZ701U | 7.7                 | 14                   | 220                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78   | 3.8              | 4.3               | 33              | 1.2 | ZV318S_K202_0115 EZ503U | 7.7                 | 12                   | 220                | 11.55 | 0.91                 | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 1.0              | 1.0               | 9.6             | 4.6 | ZV318S_K202_0100 EZ401U | 2.9                 | 10                   | 83                 | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 1.5              | 1.6               | 15              | 3.0 | ZV318S_K202_0100 EZ501U | 5.5                 | 10                   | 156                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 1.6              | 1.8               | 16              | 2.7 | ZV318S_K202_0100 EZ402U | 5.5                 | 10                   | 156                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 2.4              | 2.9               | 24              | 1.9 | ZV318S_K202_0100 EZ404U | 7.7                 | 10                   | 220                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 2.5              | 2.7               | 25              | 1.7 | ZV318S_K202_0100 EZ502U | 7.7                 | 10                   | 220                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 2.5              | 2.8               | 25              | 1.7 | ZV318S_K202_0100 EZ701U | 6.8                 | 14                   | 195                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 3.3              | 3.8               | 33              | 1.3 | ZV318S_K202_0100 EZ503U | 7.7                 | 10                   | 220                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89   | 4.1              | 4.9               | 41              | 1.1 | ZV318S_K202_0100 EZ702U | 7.7                 | 14                   | 220                | 10.07 | 1.16                 | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 0.9              | 0.9               | 9.7             | 4.9 | ZV318S_K202_0092 EZ401U | 2.6                 | 9.3                  | 76                 | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 1.3              | 1.5               | 15              | 3.2 | ZV318S_K202_0092 EZ501U | 5.0                 | 9.3                  | 143                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 1.5              | 1.6               | 16              | 2.9 | ZV318S_K202_0092 EZ402U | 5.0                 | 9.3                  | 143                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 2.1              | 2.7               | 24              | 2.0 | ZV318S_K202_0092 EZ404U | 7.5                 | 9.3                  | 214                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 2.3              | 2.5               | 26              | 1.8 | ZV318S_K202_0092 EZ502U | 7.5                 | 9.3                  | 214                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 2.3              | 2.6               | 26              | 1.8 | ZV318S_K202_0092 EZ701U | 6.2                 | 14                   | 178                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 3.0              | 3.5               | 34              | 1.4 | ZV318S_K202_0092 EZ503U | 7.5                 | 9.3                  | 214                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 3.7              | 4.5               | 42              | 1.1 | ZV318S_K202_0092 EZ702U | 7.7                 | 14                   | 220                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.98   | 4.2              | 5.0               | 47              | 1.0 | ZV318S_K202_0092 EZ505U | 7.7                 | 14                   | 220                | 9.190 | 1.14                 | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 0.5              | 0.5               | 13              | 3.8 | ZV318S_K202_0084 EZ302U | 1.4                 | 2.1                  | 41                 | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 0.6              | 0.6               | 17              | 2.9 | ZV318S_K202_0084 EZ303U | 1.7                 | 2.1                  | 49                 | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 1.2              | 1.3               | 15              | 3.4 | ZV318S_K202_0084 EZ501U | 4.5                 | 8.5                  | 130                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 1.3              | 1.5               | 16              | 3.1 | ZV318S_K202_0084 EZ402U | 4.5                 | 8.5                  | 130                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 2.0              | 2.4               | 24              | 2.1 | ZV318S_K202_0084 EZ404U | 6.8                 | 8.5                  | 196                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 2.1              | 2.3               | 26              | 2.0 | ZV318S_K202_0084 EZ502U | 6.8                 | 8.5                  | 196                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 2.1              | 2.4               | 26              | 2.0 | ZV318S_K202_0084 EZ701U | 5.7                 | 14                   | 163                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 2.8              | 3.2               | 34              | 1.5 | ZV318S_K202_0084 EZ503U | 6.8                 | 8.5                  | 196                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 3.4              | 4.1               | 42              | 1.2 | ZV318S_K202_0084 EZ702U | 7.7                 | 14                   | 220                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 3.8              | 4.5               | 47              | 1.1 | ZV318S_K202_0084 EZ505U | 7.7                 | 14                   | 220                | 8.397 | 1.25                 | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.26   | 1.8              | 2.0               | 26              | 2.2 | ZV318S_K202_0071 EZ701U | 4.8                 | 14                   | 138                | 7.118 | 1.26                 | 1.10      | 1.90                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.26   | 2.9              | 3.5               | 42              | 1.4 | ZV318S_K202_0071 EZ702U | 7.4                 | 14                   | 211                | 7.118 | 1.26                 | 1.10      | 1.90                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.26   | 3.3              | 3.9               | 48              | 1.2 | ZV318S_K202_0071 EZ505U | 7.4                 | 14                   | 211                | 7.118 | 1.26                 | 1.10      | 1.90                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 1.0              | 1.1               | 15              | 3.9 | ZV318S_K202_0067 EZ501U | 3.6                 | 6.8                  | 104                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 1.1              | 1.2               | 17              | 3.6 | ZV318S_K202_0067 EZ402U | 3.6                 | 6.8                  | 104                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 1.6              | 1.9               | 25              | 2.4 | ZV318S_K202_0067 EZ404U | 5.4                 | 6.8                  | 156                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 1.7              | 1.8               | 26              | 2.3 | ZV318S_K202_0067 EZ502U | 5.4                 | 6.8                  | 156                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 1.7              | 1.9               | 26              | 2.3 | ZV318S_K202_0067 EZ701U | 4.5                 | 14                   | 130                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 2.2              | 2.5               | 35              | 1.7 | ZV318S_K202_0067 EZ503U | 5.4                 | 6.8                  | 156                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 2.7              | 3.3               | 43              | 1.4 | ZV318S_K202_0067 EZ702U | 7.2                 | 14                   | 207                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 3.1              | 3.6               | 48              | 1.3 | ZV318S_K202_0067 EZ505U | 7.2                 | 14                   | 207                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.35   | 3.7              | 4.7               | 59              | 1.0 | ZV318S_K202_0067 EZ703U | 7.2                 | 14                   | 207                | 6.683 | 1.57                 | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 0.9              | 1.0               | 15              | 4.2 | ZV318S_K202_0060 EZ501U | 3.3                 | 6.1                  | 93                 | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 1.0              | 1.1               | 17              | 3.9 | ZV318S_K202_0060 EZ402U | 3.3                 | 6.1                  | 93                 | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 1.4              | 1.7               | 25              | 2.6 | ZV318S_K202_0060 EZ404U | 4.9                 | 6.1                  | 140                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 1.5              | 1.6               | 27              | 2.5 | ZV318S_K202_0060 EZ502U | 4.9                 | 6.1                  | 140                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 1.5              | 1.7               | 27              | 2.5 | ZV318S_K202_0060 EZ701U | 4.1                 | 14                   | 116                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 2.0              | 2.3               | 35              | 1.9 | ZV318S_K202_0060 EZ503U | 4.9                 | 6.1                  | 140                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 2.4              | 2.9               | 43              | 1.5 | ZV318S_K202_0060 EZ702U | 7.0                 | 14                   | 200                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.50   | 2.7              | 3.3               | 48              | 1.3 | ZV318S_K202_0060 EZ505U | 7.0                 | 14                   | 200                | 6.000 | 1.50                 | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |



| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>fzmax</sub> |           | v <sub>fzmaxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|--------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2              | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]              | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K2 (n<sub>1N</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 1.50  | 3.4              | 4.2               | 59              | 1.1 | ZV318S_K202_0060 EZ703U | 7.0                 | 14                   | 200                | 6.000 | 1.50               | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.74  | 1.3              | 1.5               | 27              | 2.7 | ZV318S_K202_0052 EZ701U | 3.5                 | 13                   | 100                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.74  | 2.1              | 2.5               | 44              | 1.7 | ZV318S_K202_0052 EZ702U | 6.6                 | 13                   | 190                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.74  | 2.4              | 2.8               | 49              | 1.5 | ZV318S_K202_0052 EZ505U | 6.6                 | 13                   | 190                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.74  | 2.9              | 3.6               | 60              | 1.2 | ZV318S_K202_0052 EZ703U | 6.6                 | 13                   | 190                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 0.7              | 0.8               | 17              | 4.8 | ZV318S_K202_0044 EZ402U | 2.4                 | 4.4                  | 68                 | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 1.0              | 1.3               | 25              | 3.3 | ZV318S_K202_0044 EZ404U | 3.5                 | 4.4                  | 102                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 1.1              | 1.2               | 27              | 3.0 | ZV318S_K202_0044 EZ502U | 3.5                 | 4.4                  | 102                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 1.1              | 1.2               | 27              | 3.0 | ZV318S_K202_0044 EZ701U | 3.0                 | 11                   | 85                 | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 1.4              | 1.6               | 36              | 2.3 | ZV318S_K202_0044 EZ503U | 3.5                 | 4.4                  | 102                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 1.8              | 2.1               | 44              | 1.9 | ZV318S_K202_0044 EZ702U | 6.1                 | 11                   | 174                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 2.0              | 2.4               | 50              | 1.7 | ZV318S_K202_0044 EZ505U | 6.3                 | 11                   | 180                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.06  | 2.4              | 3.1               | 61              | 1.4 | ZV318S_K202_0044 EZ703U | 6.3                 | 11                   | 180                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 1.0              | 1.1               | 27              | 3.2 | ZV318S_K202_0040 EZ701U | 2.7                 | 10                   | 78                 | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 1.6              | 2.0               | 45              | 2.0 | ZV318S_K202_0040 EZ702U | 5.6                 | 10                   | 159                | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 1.8              | 2.2               | 50              | 1.8 | ZV318S_K202_0040 EZ505U | 6.1                 | 10                   | 174                | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 2.2              | 2.8               | 61              | 1.4 | ZV318S_K202_0040 EZ703U | 6.1                 | 10                   | 174                | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| <b>ZV3K2 (n<sub>1N</sub> = 4500 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 1.06  | 4.1              | 6.6               | 37              | 1.0 | ZV318S_K202_0125 EZ505U | 7.7                 | 14                   | 220                | 12.71 | 0.92               | 0.83      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.17  | 3.7              | 6.0               | 37              | 1.1 | ZV318S_K202_0115 EZ505U | 7.7                 | 14                   | 220                | 11.55 | 0.91               | 0.81      | 1.30                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.34  | 3.2              | 5.2               | 37              | 1.2 | ZV318S_K202_0100 EZ505U | 7.7                 | 14                   | 220                | 10.07 | 1.16               | 1.04      | 1.64                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.47  | 3.0              | 4.8               | 38              | 1.3 | ZV318S_K202_0092 EZ505U | 7.7                 | 14                   | 220                | 9.190 | 1.14               | 1.01      | 1.63                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.61  | 2.7              | 4.4               | 38              | 1.3 | ZV318S_K202_0084 EZ505U | 7.7                 | 14                   | 220                | 8.397 | 1.25               | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.61  | 3.4              | 5.7               | 48              | 1.0 | ZV318S_K202_0084 EZ703U | 7.7                 | 14                   | 220                | 8.397 | 1.25               | 1.11      | 1.79                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.90  | 2.3              | 3.7               | 39              | 1.5 | ZV318S_K202_0071 EZ505U | 7.4                 | 14                   | 211                | 7.118 | 1.26               | 1.10      | 1.90                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.90  | 2.9              | 4.8               | 49              | 1.2 | ZV318S_K202_0071 EZ703U | 7.4                 | 14                   | 211                | 7.118 | 1.26               | 1.10      | 1.90                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.02  | 2.1              | 3.5               | 39              | 1.6 | ZV318S_K202_0067 EZ505U | 7.2                 | 14                   | 207                | 6.683 | 1.57               | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.02  | 2.7              | 4.5               | 49              | 1.2 | ZV318S_K202_0067 EZ703U | 7.2                 | 14                   | 207                | 6.683 | 1.57               | 1.39      | 2.24                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 1.9              | 3.1               | 39              | 1.7 | ZV318S_K202_0060 EZ505U | 7.0                 | 14                   | 200                | 6.000 | 1.50               | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.25  | 2.5              | 4.1               | 50              | 1.3 | ZV318S_K202_0060 EZ703U | 7.0                 | 14                   | 200                | 6.000 | 1.50               | 1.30      | 2.25                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.61  | 1.7              | 2.7               | 40              | 1.8 | ZV318S_K202_0052 EZ505U | 6.6                 | 13                   | 190                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 2.61  | 2.1              | 3.5               | 50              | 1.4 | ZV318S_K202_0052 EZ703U | 6.6                 | 13                   | 190                | 5.177 | 1.74               | 1.51      | 2.61                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 3.09  | 1.4              | 2.3               | 40              | 2.1 | ZV318S_K202_0044 EZ505U | 6.3                 | 11                   | 180                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 3.09  | 1.8              | 3.0               | 51              | 1.6 | ZV318S_K202_0044 EZ703U | 6.3                 | 11                   | 180                | 4.364 | 2.06               | 1.79      | 3.09                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 3.38  | 1.3              | 2.1               | 40              | 2.2 | ZV318S_K202_0040 EZ505U | 6.1                 | 10                   | 174                | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 3.38  | 1.6              | 2.7               | 51              | 1.7 | ZV318S_K202_0040 EZ703U | 6.1                 | 10                   | 174                | 4.000 | 2.25               | 1.95      | 3.38                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| <b>ZV3K2 (n<sub>1N</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 0.13  | 4.0              | 4.3               | 3.6             | 1.3 | ZV318S_K203_1350 EZ301U | 7.7                 | 14                   | 220                | 135.3 | 0.09               | 0.09      | 0.14                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.16  | 3.3              | 3.5               | 3.4             | 1.7 | ZV318S_K203_1090 EZ301U | 7.7                 | 14                   | 220                | 109.5 | 0.11               | 0.11      | 0.18                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 2.7              | 2.9               | 3.3             | 2.0 | ZV318S_K203_0910 EZ301U | 7.7                 | 14                   | 220                | 90.79 | 0.13               | 0.13      | 0.22                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.20  | 4.5              | 5.1               | 5.5             | 1.2 | ZV318S_K203_0910 EZ302U | 7.7                 | 14                   | 220                | 90.79 | 0.13               | 0.13      | 0.22                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 2.4              | 2.5               | 3.2             | 2.3 | ZV318S_K203_0800 EZ301U | 7.4                 | 14                   | 213                | 79.62 | 0.15               | 0.15      | 0.25                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 4.0              | 4.5               | 5.4             | 1.3 | ZV318S_K203_0800 EZ302U | 7.7                 | 14                   | 220                | 79.62 | 0.15               | 0.15      | 0.25                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.23  | 5.2              | 6.0               | 7.0             | 1.0 | ZV318S_K203_0800 EZ303U | 7.7                 | 14                   | 220                | 79.62 | 0.15               | 0.15      | 0.25                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 2.1              | 2.2               | 4.7             | 2.2 | ZV318S_K202_0690 EZ301U | 5.5                 | 8.8                  | 159                | 69.43 | 0.17               | 0.17      | 0.28                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 3.5              | 3.9               | 7.9             | 1.3 | ZV318S_K202_0690 EZ302U | 5.5                 | 8.8                  | 159                | 69.43 | 0.17               | 0.17      | 0.28                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 4.6              | 5.3               | 10              | 1.0 | ZV318S_K202_0690 EZ303U | 5.5                 | 8.8                  | 159                | 69.43 | 0.17               | 0.17      | 0.28                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 2.0              | 2.2               | 3.2             | 2.6 | ZV318S_K203_0680 EZ301U | 6.4                 | 14                   | 183                | 68.42 | 0.18               | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 3.4              | 3.8               | 5.5             | 1.6 | ZV318S_K203_0680 EZ302U | 7.7                 | 14                   | 220                | 68.42 | 0.18               | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 4.5              | 5.1               | 7.1             | 1.2 | ZV318S_K203_0680 EZ303U | 7.7                 | 14                   | 220                | 68.42 | 0.18               | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.26  | 5.3              | 6.4               | 8.4             | 1.0 | ZV318S_K203_0680 EZ401U | 7.7                 | 14                   | 220                | 68.42 | 0.18               | 0.17      | 0.29                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 2.0              | 2.1               | 3.3             | 2.7 | ZV318S_K203_0660 EZ301U | 6.2                 | 14                   | 177                | 66.03 | 0.18               | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 3.3              | 3.7               | 5.5             | 1.6 | ZV318S_K203_0660 EZ302U | 7.7                 | 14                   | 220                | 66.03 | 0.18               | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 4.3              | 5.0               | 7.2             | 1.2 | ZV318S_K203_0660 EZ303U | 7.7                 | 14                   | 220                | 66.03 | 0.18               | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.27  | 5.1              | 6.2               | 8.4             | 1.1 | ZV318S_K203_0660 EZ401U | 7.7                 | 14                   | 220                | 66.03 | 0.18               | 0.18      | 0.30                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 1.7              | 1.8               | 3.7             | 3.2 | ZV318S_K202_0560 EZ301U | 5.3                 | 9.4                  | 151                | 55.54 | 0.22               | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 2.8              | 3.2               | 6.3             | 1.9 | ZV318S_K202_0560 EZ302U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22               | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 3.7              | 4.2               | 8.2             | 1.5 | ZV318S_K202_0560 EZ303U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22               | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.32  | 4.3              | 5.3               | 9.6             | 1.2 | ZV318S_K202_0560 EZ401U | 6.7                 | 9.4                  | 191                | 55.54 | 0.22               | 0.21      | 0.35                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.33  | 1.6              | 1.7               | 3.3             | 3.3 | ZV318S_K203_0540 EZ301U | 5.1                 | 12                   | 145                | 54.25 | 0.22               | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.33  | 2.7              | 3.0               | 5.6             | 2.0 | ZV318S_K203_0540 EZ302U | 7.7                 | 12                   | 220                | 54.25 | 0.22               | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.33  | 3.5              | 4.1               | 7.3             | 1.5 | ZV318S_K203_0540 EZ303U | 7.7                 | 12                   | 220                | 54.25 | 0.22               | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.33  | 4.2              | 5.1               | 8.5             | 1.3 | ZV318S_K203_0540 EZ401U | 7.7                 | 12                   | 220                | 54.25 | 0.22               | 0.22      | 0.36                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 1.5              | 1.6               | 6.0             | 2.2 | ZV318S_K202_0500 EZ301U | 4.0                 | 6.4                  | 116                | 50.49 | 0.24               | 0.23      | 0.39                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K2 (n<sub>in</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.36  | 2.6              | 2.9               | 10              | 1.3 | ZV318S_K202_0500 EZ302U | 4.0                 | 6.4                  | 116                | 50.49 | 0.24                 | 0.23      | 0.39                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 3.4              | 3.8               | 13              | 1.0 | ZV318S_K202_0500 EZ303U | 4.0                 | 6.4                  | 116                | 50.49 | 0.24                 | 0.23      | 0.39                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 1.5              | 1.6               | 3.3             | 3.6 | ZV318S_K203_0500 EZ301U | 4.6                 | 11                   | 133                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 2.5              | 2.8               | 5.6             | 2.2 | ZV318S_K203_0500 EZ302U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 3.3              | 3.7               | 7.3             | 1.7 | ZV318S_K203_0500 EZ303U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.36  | 3.8              | 4.6               | 8.6             | 1.4 | ZV318S_K203_0500 EZ401U | 7.7                 | 11                   | 220                | 49.76 | 0.24                 | 0.24      | 0.39                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 1.4              | 1.5               | 3.4             | 3.9 | ZV318S_K202_0460 EZ301U | 4.4                 | 9.0                  | 126                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 2.3              | 2.6               | 5.7             | 2.3 | ZV318S_K202_0460 EZ302U | 7.2                 | 9.0                  | 206                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 3.1              | 3.5               | 7.5             | 1.8 | ZV318S_K202_0460 EZ303U | 7.2                 | 9.0                  | 206                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 3.6              | 4.4               | 8.8             | 1.5 | ZV318S_K202_0460 EZ401U | 7.7                 | 14                   | 220                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.39  | 5.3              | 6.9               | 13              | 1.0 | ZV318S_K202_0460 EZ501U | 7.7                 | 14                   | 220                | 46.23 | 0.26                 | 0.25      | 0.42                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.40  | 1.3              | 1.4               | 3.4             | 4.0 | ZV318S_K203_0450 EZ301U | 4.2                 | 10                   | 121                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.40  | 2.3              | 2.5               | 5.7             | 2.4 | ZV318S_K203_0450 EZ302U | 7.5                 | 10                   | 216                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.40  | 3.0              | 3.4               | 7.4             | 1.8 | ZV318S_K203_0450 EZ303U | 7.7                 | 10                   | 220                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.40  | 3.5              | 4.2               | 8.7             | 1.5 | ZV318S_K203_0450 EZ401U | 7.7                 | 10                   | 220                | 45.22 | 0.27                 | 0.26      | 0.43                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.45  | 1.2              | 1.3               | 4.7             | 3.3 | ZV318S_K202_0400 EZ301U | 3.8                 | 6.9                  | 110                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.45  | 2.1              | 2.3               | 7.9             | 2.0 | ZV318S_K202_0400 EZ302U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.45  | 2.7              | 3.1               | 10              | 1.5 | ZV318S_K202_0400 EZ303U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.45  | 3.1              | 3.8               | 12              | 1.3 | ZV318S_K202_0400 EZ401U | 4.8                 | 6.9                  | 139                | 40.39 | 0.30                 | 0.29      | 0.48                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.46  | 1.2              | 1.3               | 3.4             | 4.6 | ZV318S_K203_0390 EZ301U | 3.7                 | 8.8                  | 106                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.46  | 2.0              | 2.2               | 5.7             | 2.7 | ZV318S_K203_0390 EZ302U | 6.6                 | 8.8                  | 189                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.46  | 2.6              | 3.0               | 7.5             | 2.1 | ZV318S_K203_0390 EZ303U | 7.1                 | 8.8                  | 202                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.46  | 3.0              | 3.7               | 8.8             | 1.8 | ZV318S_K203_0390 EZ401U | 7.1                 | 8.8                  | 202                | 39.45 | 0.30                 | 0.30      | 0.49                 | 83   | 50                  | 21                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 1.8              | 2.0               | 5.9             | 3.0 | ZV318S_K202_0350 EZ302U | 5.8                 | 7.5                  | 168                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 2.3              | 2.6               | 7.7             | 2.3 | ZV318S_K202_0350 EZ303U | 6.0                 | 7.5                  | 171                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 2.7              | 3.3               | 9.0             | 2.0 | ZV318S_K202_0350 EZ401U | 7.7                 | 14                   | 220                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 4.0              | 5.1               | 13              | 1.3 | ZV318S_K202_0350 EZ501U | 7.7                 | 14                   | 220                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.52  | 4.1              | 5.7               | 14              | 1.3 | ZV318S_K202_0350 EZ402U | 7.7                 | 14                   | 220                | 34.55 | 0.35                 | 0.34      | 0.56                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.54  | 1.7              | 1.9               | 5.9             | 3.0 | ZV318S_K202_0340 EZ302U | 5.2                 | 6.5                  | 150                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.54  | 2.2              | 2.6               | 7.7             | 2.3 | ZV318S_K202_0340 EZ303U | 5.2                 | 6.5                  | 150                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.54  | 2.6              | 3.2               | 9.0             | 2.0 | ZV318S_K202_0340 EZ401U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.54  | 3.9              | 5.0               | 13              | 1.3 | ZV318S_K202_0340 EZ501U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.54  | 4.0              | 5.6               | 14              | 1.3 | ZV318S_K202_0340 EZ402U | 6.5                 | 11                   | 185                | 33.62 | 0.36                 | 0.35      | 0.58                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.64  | 2.2              | 2.6               | 9.2             | 2.2 | ZV318S_K202_0280 EZ401U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.64  | 3.2              | 4.2               | 14              | 1.5 | ZV318S_K202_0280 EZ501U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.64  | 3.3              | 4.6               | 14              | 1.5 | ZV318S_K202_0280 EZ402U | 7.7                 | 14                   | 220                | 27.95 | 0.43                 | 0.42      | 0.70                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 1.3              | 1.4               | 6.5             | 3.4 | ZV318S_K202_0250 EZ302U | 4.3                 | 5.4                  | 122                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 1.7              | 1.9               | 8.5             | 2.6 | ZV318S_K202_0250 EZ303U | 4.4                 | 5.4                  | 125                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 2.0              | 2.4               | 9.2             | 2.4 | ZV318S_K202_0250 EZ401U | 7.2                 | 14                   | 207                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 2.9              | 3.7               | 14              | 1.6 | ZV318S_K202_0250 EZ501U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 3.0              | 4.2               | 14              | 1.6 | ZV318S_K202_0250 EZ402U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 4.4              | 6.6               | 21              | 1.1 | ZV318S_K202_0250 EZ502U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.72  | 4.4              | 6.7               | 21              | 1.1 | ZV318S_K202_0250 EZ701U | 7.7                 | 14                   | 220                | 25.13 | 0.48                 | 0.47      | 0.78                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 1.2              | 1.3               | 6.1             | 3.9 | ZV318S_K202_0230 EZ302U | 3.9                 | 5.9                  | 112                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 1.5              | 1.8               | 7.9             | 3.0 | ZV318S_K202_0230 EZ303U | 4.7                 | 5.9                  | 135                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 1.8              | 2.2               | 9.3             | 2.5 | ZV318S_K202_0230 EZ401U | 6.7                 | 14                   | 191                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 2.7              | 3.5               | 14              | 1.7 | ZV318S_K202_0230 EZ501U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 2.7              | 3.8               | 14              | 1.7 | ZV318S_K202_0230 EZ402U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 4.1              | 6.1               | 21              | 1.1 | ZV318S_K202_0230 EZ502U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 4.1              | 6.2               | 21              | 1.1 | ZV318S_K202_0230 EZ701U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.78  | 4.6              | 6.6               | 23              | 1.0 | ZV318S_K202_0230 EZ404U | 7.7                 | 14                   | 220                | 23.18 | 0.52                 | 0.51      | 0.84                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 1.6              | 1.9               | 9.4             | 2.8 | ZV318S_K202_0200 EZ401U | 5.9                 | 14                   | 168                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 2.3              | 3.0               | 14              | 1.9 | ZV318S_K202_0200 EZ501U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 2.4              | 3.4               | 14              | 1.8 | ZV318S_K202_0200 EZ402U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 3.6              | 5.4               | 21              | 1.2 | ZV318S_K202_0200 EZ502U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 3.6              | 5.4               | 21              | 1.2 | ZV318S_K202_0200 EZ701U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 4.0              | 5.8               | 24              | 1.1 | ZV318S_K202_0200 EZ404U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 0.89  | 4.3              | 7.3               | 25              | 1.0 | ZV318S_K202_0200 EZ503U | 7.7                 | 14                   | 220                | 20.33 | 0.59                 | 0.58      | 0.96                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 0.9              | 1.0               | 7.5             | 4.0 | ZV318S_K202_0170 EZ302U | 2.9                 | 4.3                  | 82                 | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 1.1              | 1.3               | 9.8             | 3.1 | ZV318S_K202_0170 EZ303U | 3.4                 | 4.3                  | 98                 | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 1.3              | 1.6               | 9.5             | 3.1 | ZV318S_K202_0170 EZ401U | 4.9                 | 14                   | 139                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 1.9              | 2.5               | 14              | 2.1 | ZV318S_K202_0170 EZ501U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 2.0              | 2.8               | 15              | 2.1 | ZV318S_K202_0170 EZ402U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07  | 3.0              | 4.5               | 22              | 1.4 | ZV318S_K202_0170 EZ502U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |

| v <sub>F2N</sub>   | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2maxDB</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K2 (n<sub>n</sub> = 6000 rpm, (F<sub>F2acc,max</sub> = 7,7 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 1.07   | 3.0              | 4.5               | 22              | 1.4 | ZV318S_K202_0170 EZ701U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 3.3              | 4.8               | 24              | 1.2 | ZV318S_K202_0170 EZ404U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 3.5              | 6.1               | 26              | 1.2 | ZV318S_K202_0170 EZ503U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| 1.07   | 4.1              | 8.2               | 30              | 1.0 | ZV318S_K202_0170 EZ702U | 7.7                 | 14                   | 220                | 16.86 | 0.71                 | 0.69      | 1.16                 | 83   | 42                  | 12                 | 23               | 3              | 18 | 57.3           |
| <b>ZV2K3 (n<sub>n</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 10 kN)</b>  |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.06   | 4.6              | 4.7               | 2.4             | 1.1 | ZV225S_K303_1360 EZ301U | 10                  | 26                   | 276                | 136.0 | 0.08                 | 0.07      | 0.12                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.08   | 3.7              | 3.7               | 2.3             | 1.4 | ZV225S_K303_1090 EZ301U | 10                  | 26                   | 276                | 109.2 | 0.10                 | 0.09      | 0.15                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.09   | 3.1              | 3.1               | 2.2             | 1.7 | ZV225S_K303_0910 EZ301U | 9.2                 | 22                   | 244                | 91.23 | 0.12                 | 0.11      | 0.18                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.11   | 2.7              | 2.7               | 2.6             | 1.9 | ZV225S_K303_0790 EZ301U | 8.0                 | 19                   | 213                | 79.42 | 0.13                 | 0.12      | 0.21                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.11   | 4.6              | 4.8               | 4.4             | 1.1 | ZV225S_K303_0790 EZ302U | 10                  | 19                   | 276                | 79.42 | 0.13                 | 0.12      | 0.21                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.12   | 2.4              | 2.4               | 3.4             | 2.2 | ZV225S_K302_0690 EZ301U | 7.1                 | 11                   | 189                | 69.43 | 0.15                 | 0.14      | 0.24                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.12   | 4.0              | 4.3               | 5.8             | 1.3 | ZV225S_K302_0690 EZ302U | 9.0                 | 11                   | 238                | 69.43 | 0.15                 | 0.14      | 0.24                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.12   | 2.3              | 2.3               | 2.1             | 2.3 | ZV225S_K303_0680 EZ301U | 6.8                 | 16                   | 181                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.12   | 3.9              | 4.1               | 3.5             | 1.3 | ZV225S_K303_0680 EZ302U | 10                  | 16                   | 276                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.12   | 5.1              | 5.3               | 4.6             | 1.0 | ZV225S_K303_0680 EZ303U | 10                  | 16                   | 276                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.13   | 2.2              | 2.3               | 2.6             | 2.3 | ZV225S_K303_0660 EZ301U | 6.7                 | 16                   | 178                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.13   | 3.8              | 4.0               | 4.4             | 1.4 | ZV225S_K303_0660 EZ302U | 10                  | 16                   | 276                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.13   | 4.9              | 5.2               | 5.8             | 1.0 | ZV225S_K303_0660 EZ303U | 10                  | 16                   | 276                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.15   | 1.8              | 1.9               | 2.4             | 2.8 | ZV225S_K303_0550 EZ301U | 5.5                 | 13                   | 146                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.15   | 3.1              | 3.3               | 4.1             | 1.7 | ZV225S_K303_0550 EZ302U | 9.8                 | 13                   | 261                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.15   | 4.1              | 4.3               | 5.3             | 1.3 | ZV225S_K303_0550 EZ303U | 10                  | 13                   | 276                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 1.7              | 1.8               | 4.3             | 3.0 | ZV225S_K302_0500 EZ301U | 5.2                 | 8.2                  | 137                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 2.9              | 3.1               | 7.3             | 1.8 | ZV225S_K302_0500 EZ302U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 3.8              | 4.0               | 9.6             | 1.4 | ZV225S_K302_0500 EZ303U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 5.2              | 5.5               | 13              | 1.0 | ZV225S_K302_0500 EZ401U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 1.7              | 1.7               | 2.6             | 3.1 | ZV225S_K303_0490 EZ301U | 5.0                 | 12                   | 132                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 2.8              | 3.0               | 4.5             | 1.8 | ZV225S_K303_0490 EZ302U | 8.9                 | 12                   | 235                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 3.7              | 3.9               | 5.8             | 1.4 | ZV225S_K303_0490 EZ303U | 9.5                 | 12                   | 253                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.17   | 5.0              | 5.3               | 7.8             | 1.0 | ZV225S_K303_0490 EZ401U | 9.5                 | 12                   | 253                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.18   | 4.7              | 5.1               | 5.7             | 1.1 | ZV225S_K302_0460 EZ401U | 10                  | 26                   | 276                | 46.23 | 0.23                 | 0.21      | 0.36                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.21   | 4.1              | 4.4               | 9.8             | 1.2 | ZV225S_K302_0410 EZ401U | 8.7                 | 15                   | 231                | 40.51 | 0.26                 | 0.24      | 0.41                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.24   | 3.6              | 3.8               | 5.5             | 1.5 | ZV225S_K302_0350 EZ401U | 10                  | 26                   | 276                | 34.73 | 0.30                 | 0.28      | 0.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 3.4              | 3.7               | 7.2             | 1.5 | ZV225S_K302_0340 EZ401U | 10                  | 19                   | 276                | 33.62 | 0.31                 | 0.29      | 0.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.26   | 5.1              | 5.5               | 8.3             | 1.0 | ZV225S_K303_0330 EZ501U | 10                  | 22                   | 276                | 32.65 | 0.32                 | 0.30      | 0.51                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.30   | 2.9              | 3.1               | 5.6             | 1.8 | ZV225S_K302_0280 EZ401U | 8.7                 | 26                   | 230                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.30   | 4.4              | 4.8               | 8.5             | 1.2 | ZV225S_K302_0280 EZ501U | 10                  | 26                   | 276                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.30   | 4.8              | 5.3               | 9.3             | 1.1 | ZV225S_K302_0280 EZ402U | 10                  | 26                   | 276                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 2.6              | 2.8               | 5.6             | 2.0 | ZV225S_K302_0250 EZ401U | 7.9                 | 23                   | 208                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 4.0              | 4.3               | 8.6             | 1.3 | ZV225S_K302_0250 EZ501U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 4.3              | 4.8               | 9.4             | 1.2 | ZV225S_K302_0250 EZ402U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.36   | 2.4              | 2.6               | 5.6             | 2.2 | ZV225S_K302_0230 EZ401U | 7.2                 | 24                   | 192                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.36   | 3.7              | 4.0               | 8.7             | 1.4 | ZV225S_K302_0230 EZ501U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.36   | 4.0              | 4.4               | 9.5             | 1.3 | ZV225S_K302_0230 EZ402U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 2.1              | 2.2               | 5.7             | 2.5 | ZV225S_K302_0200 EZ401U | 6.3                 | 19                   | 167                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 3.2              | 3.5               | 8.8             | 1.6 | ZV225S_K302_0200 EZ501U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 3.5              | 3.9               | 9.6             | 1.5 | ZV225S_K302_0200 EZ402U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 5.1              | 6.4               | 14              | 1.0 | ZV225S_K302_0200 EZ404U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 1.8              | 1.9               | 5.8             | 2.9 | ZV225S_K302_0175 EZ401U | 5.4                 | 19                   | 143                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 2.7              | 3.0               | 8.9             | 1.9 | ZV225S_K302_0175 EZ501U | 10                  | 19                   | 268                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 3.0              | 3.3               | 9.7             | 1.7 | ZV225S_K302_0175 EZ402U | 10                  | 19                   | 268                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 4.4              | 5.4               | 14              | 1.2 | ZV225S_K302_0175 EZ404U | 10                  | 19                   | 276                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 4.7              | 5.1               | 15              | 1.1 | ZV225S_K302_0175 EZ502U | 10                  | 19                   | 276                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 4.7              | 5.2               | 15              | 1.1 | ZV225S_K302_0175 EZ701U | 10                  | 26                   | 276                | 17.29 | 0.56                 | 0.50      | 0.80                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 1.7              | 1.9               | 5.8             | 3.0 | ZV225S_K302_0170 EZ401U | 5.3                 | 18                   | 140                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 2.7              | 2.9               | 8.9             | 1.9 | ZV225S_K302_0170 EZ501U | 9.9                 | 18                   | 263                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 2.9              | 3.2               | 9.7             | 1.8 | ZV225S_K302_0170 EZ402U | 9.9                 | 18                   | 263                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 4.3              | 5.3               | 14              | 1.2 | ZV225S_K302_0170 EZ404U | 10                  | 18                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 4.6              | 5.0               | 15              | 1.1 | ZV225S_K302_0170 EZ502U | 10                  | 18                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.49   | 4.6              | 5.1               | 15              | 1.1 | ZV225S_K302_0170 EZ701U | 10                  | 26                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 1.4              | 1.5               | 5.9             | 3.6 | ZV225S_K302_0140 EZ401U | 4.3                 | 15                   | 115                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 2.2              | 2.4               | 9.0             | 2.4 | ZV225S_K302_0140 EZ501U | 8.2                 | 15                   | 216                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 2.4              | 2.6               | 9.9             | 2.2 | ZV225S_K302_0140 EZ402U | 8.2                 | 15                   | 216                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 3.5              | 4.4               | 15              | 1.5 | ZV225S_K302_0140 EZ404U | 10                  | 15                   | 276                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 3.8              | 4.1               | 16              | 1.4 | ZV225S_K302_0140 EZ502U | 10                  | 15                   | 276                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K3 (n<sub>1N</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 10 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.60   | 3.8              | 4.2               | 16              | 1.4 | ZV225S_K302_0140 EZ701U | 10                  | 26                   | 270                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 4.9              | 5.7               | 20              | 1.0 | ZV225S_K302_0140 EZ503U | 10                  | 15                   | 276                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 1.3              | 1.4               | 5.9             | 4.0 | ZV225S_K302_0125 EZ401U | 3.9                 | 14                   | 104                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 2.0              | 2.2               | 9.1             | 2.6 | ZV225S_K302_0125 EZ501U | 7.4                 | 14                   | 195                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 2.2              | 2.4               | 10              | 2.4 | ZV225S_K302_0125 EZ402U | 7.4                 | 14                   | 195                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 3.2              | 4.0               | 15              | 1.6 | ZV225S_K302_0125 EZ404U | 10                  | 14                   | 276                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 3.4              | 3.7               | 16              | 1.5 | ZV225S_K302_0125 EZ502U | 10                  | 14                   | 276                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 3.4              | 3.8               | 16              | 1.5 | ZV225S_K302_0125 EZ701U | 9.2                 | 26                   | 244                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 4.5              | 5.1               | 21              | 1.2 | ZV225S_K302_0125 EZ503U | 10                  | 14                   | 276                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 1.2              | 1.3               | 6.0             | 4.3 | ZV225S_K302_0115 EZ401U | 3.6                 | 13                   | 96                 | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 1.8              | 2.0               | 9.2             | 2.8 | ZV225S_K302_0115 EZ501U | 6.8                 | 13                   | 180                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 2.0              | 2.2               | 10              | 2.6 | ZV225S_K302_0115 EZ402U | 6.8                 | 13                   | 180                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 2.9              | 3.7               | 15              | 1.8 | ZV225S_K302_0115 EZ404U | 10                  | 13                   | 270                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 3.1              | 3.4               | 16              | 1.6 | ZV225S_K302_0115 EZ502U | 10                  | 13                   | 270                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 3.1              | 3.5               | 16              | 1.6 | ZV225S_K302_0115 EZ701U | 8.5                 | 26                   | 225                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 4.1              | 4.7               | 21              | 1.3 | ZV225S_K302_0115 EZ503U | 10                  | 13                   | 270                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 5.1              | 6.1               | 26              | 1.0 | ZV225S_K302_0115 EZ702U | 10                  | 26                   | 276                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 1.0              | 1.1               | 6.0             | 5.0 | ZV225S_K302_0100 EZ401U | 3.2                 | 11                   | 84                 | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 1.6              | 1.7               | 9.3             | 3.2 | ZV225S_K302_0100 EZ501U | 5.9                 | 11                   | 157                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 1.7              | 1.9               | 10              | 3.0 | ZV225S_K302_0100 EZ402U | 5.9                 | 11                   | 157                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 2.6              | 3.2               | 15              | 2.0 | ZV225S_K302_0100 EZ404U | 8.9                 | 11                   | 236                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 2.7              | 3.0               | 16              | 1.9 | ZV225S_K302_0100 EZ502U | 8.9                 | 11                   | 236                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 2.7              | 3.1               | 16              | 1.9 | ZV225S_K302_0100 EZ701U | 7.4                 | 26                   | 197                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 3.6              | 4.1               | 21              | 1.4 | ZV225S_K302_0100 EZ503U | 8.9                 | 11                   | 236                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 4.4              | 5.3               | 26              | 1.2 | ZV225S_K302_0100 EZ702U | 10                  | 26                   | 276                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82   | 5.0              | 5.9               | 29              | 1.0 | ZV225S_K302_0100 EZ505U | 10                  | 26                   | 276                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.90   | 2.5              | 2.8               | 16              | 2.0 | ZV225S_K302_0093 EZ701U | 6.8                 | 25                   | 180                | 9.267 | 0.96                 | 0.84      | 1.35                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.90   | 4.1              | 4.9               | 26              | 1.2 | ZV225S_K302_0093 EZ702U | 10                  | 25                   | 276                | 9.267 | 0.96                 | 0.84      | 1.35                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.90   | 4.6              | 5.4               | 29              | 1.1 | ZV225S_K302_0093 EZ505U | 10                  | 25                   | 276                | 9.267 | 0.96                 | 0.84      | 1.35                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 1.3              | 1.5               | 9.9             | 3.7 | ZV225S_K302_0084 EZ501U | 4.9                 | 9.3                  | 131                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 1.5              | 1.6               | 11              | 3.4 | ZV225S_K302_0084 EZ402U | 4.9                 | 9.3                  | 131                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 2.1              | 2.7               | 16              | 2.3 | ZV225S_K302_0084 EZ404U | 7.4                 | 9.3                  | 197                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 2.3              | 2.5               | 17              | 2.1 | ZV225S_K302_0084 EZ502U | 7.4                 | 9.3                  | 197                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 2.3              | 2.6               | 16              | 2.1 | ZV225S_K302_0084 EZ701U | 6.2                 | 23                   | 164                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 3.0              | 3.4               | 22              | 1.6 | ZV225S_K302_0084 EZ503U | 7.4                 | 9.3                  | 197                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 3.7              | 4.4               | 26              | 1.3 | ZV225S_K302_0084 EZ702U | 10                  | 23                   | 276                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 4.2              | 4.9               | 30              | 1.2 | ZV225S_K302_0084 EZ505U | 10                  | 23                   | 276                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.13   | 2.0              | 2.2               | 16              | 2.3 | ZV225S_K302_0074 EZ701U | 5.4                 | 20                   | 143                | 7.391 | 1.02                 | 0.86      | 1.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.13   | 3.2              | 3.9               | 27              | 1.4 | ZV225S_K302_0074 EZ702U | 10                  | 20                   | 276                | 7.391 | 1.02                 | 0.86      | 1.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.13   | 3.6              | 4.3               | 30              | 1.3 | ZV225S_K302_0074 EZ505U | 10                  | 20                   | 276                | 7.391 | 1.02                 | 0.86      | 1.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.13   | 4.5              | 5.6               | 37              | 1.0 | ZV225S_K302_0074 EZ703U | 10                  | 20                   | 276                | 7.391 | 1.02                 | 0.86      | 1.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.24   | 1.8              | 2.0               | 17              | 2.5 | ZV225S_K302_0067 EZ701U | 4.9                 | 18                   | 131                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.24   | 3.0              | 3.5               | 27              | 1.5 | ZV225S_K302_0067 EZ702U | 10                  | 18                   | 268                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.24   | 3.3              | 3.9               | 30              | 1.4 | ZV225S_K302_0067 EZ505U | 10                  | 18                   | 276                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.24   | 4.1              | 5.1               | 37              | 1.1 | ZV225S_K302_0067 EZ703U | 10                  | 18                   | 276                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.39   | 1.6              | 1.8               | 17              | 2.7 | ZV225S_K302_0060 EZ701U | 4.4                 | 16                   | 116                | 6.000 | 1.25                 | 1.07      | 1.85                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.39   | 2.6              | 3.2               | 27              | 1.7 | ZV225S_K302_0060 EZ702U | 9.0                 | 16                   | 239                | 6.000 | 1.25                 | 1.07      | 1.85                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.39   | 3.0              | 3.5               | 30              | 1.5 | ZV225S_K302_0060 EZ505U | 10                  | 16                   | 276                | 6.000 | 1.25                 | 1.07      | 1.85                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.39   | 3.6              | 4.6               | 37              | 1.2 | ZV225S_K302_0060 EZ703U | 10                  | 16                   | 276                | 6.000 | 1.25                 | 1.07      | 1.85                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.55   | 1.5              | 1.6               | 17              | 2.9 | ZV225S_K302_0054 EZ701U | 3.9                 | 15                   | 104                | 5.375 | 1.40                 | 1.19      | 2.07                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.55   | 2.4              | 2.8               | 27              | 1.8 | ZV225S_K302_0054 EZ702U | 8.1                 | 15                   | 214                | 5.375 | 1.40                 | 1.19      | 2.07                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.55   | 2.7              | 3.1               | 31              | 1.6 | ZV225S_K302_0054 EZ505U | 10                  | 15                   | 276                | 5.375 | 1.40                 | 1.19      | 2.07                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.55   | 3.2              | 4.1               | 38              | 1.3 | ZV225S_K302_0054 EZ703U | 10                  | 15                   | 276                | 5.375 | 1.40                 | 1.19      | 2.07                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.91   | 1.2              | 1.3               | 17              | 3.3 | ZV225S_K302_0044 EZ701U | 3.2                 | 12                   | 85                 | 4.364 | 1.72                 | 1.46      | 2.55                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.91   | 1.9              | 2.3               | 28              | 2.0 | ZV225S_K302_0044 EZ702U | 6.5                 | 12                   | 174                | 4.364 | 1.72                 | 1.46      | 2.55                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.91   | 2.2              | 2.6               | 31              | 1.8 | ZV225S_K302_0044 EZ505U | 9.6                 | 12                   | 254                | 4.364 | 1.72                 | 1.46      | 2.55                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.91   | 2.6              | 3.3               | 38              | 1.5 | ZV225S_K302_0044 EZ703U | 9.6                 | 12                   | 254                | 4.364 | 1.72                 | 1.46      | 2.55                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.91   | 3.4              | 4.8               | 49              | 1.2 | ZV225S_K302_0044 EZ705U | 10                  | 26                   | 276                | 4.364 | 1.72                 | 1.46      | 2.55                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 2.08   | 1.1              | 1.2               | 17              | 3.5 | ZV225S_K302_0040 EZ701U | 2.9                 | 11                   | 78                 | 4.000 | 1.88                 | 1.60      | 2.78                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 2.08   | 1.8              | 2.1               | 28              | 2.2 | ZV225S_K302_0040 EZ702U | 6.0                 | 11                   | 159                | 4.000 | 1.88                 | 1.60      | 2.78                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 2.08   | 2.0              | 2.3               | 31              | 1.9 | ZV225S_K302_0040 EZ505U | 8.8                 | 11                   | 233                | 4.000 | 1.88                 | 1.60      | 2.78                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 2.08   | 2.4              | 3.0               | 38              | 1.6 | ZV225S_K302_0040 EZ703U | 8.8                 | 11                   | 233                | 4.000 | 1.88                 | 1.60      | 2.78                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 2.08   | 3.1              | 4.4               | 50              | 1.2 | ZV225S_K302_0040 EZ705U | 10                  | 26                   | 276                | 4.000 | 1.88                 | 1.60      | 2.78                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |



| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K3 (n<sub>1N</sub> = 4500 rpm, (F<sub>fzacc,max</sub> = 10 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.90   | 4.8              | 7.8               | 23              | 1.0 | ZV225S_K302_0140 EZ505U | 10                  | 26                   | 276                | 13.94 | 0.70                 | 0.62      | 1.00                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.99   | 4.4              | 7.0               | 23              | 1.1 | ZV225S_K302_0125 EZ505U | 10                  | 26                   | 276                | 12.58 | 0.77                 | 0.69      | 1.10                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.08   | 4.0              | 6.5               | 23              | 1.2 | ZV225S_K302_0115 EZ505U | 10                  | 26                   | 276                | 11.61 | 0.77                 | 0.67      | 1.08                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.23   | 3.5              | 5.7               | 23              | 1.3 | ZV225S_K302_0100 EZ505U | 10                  | 26                   | 276                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.23   | 4.5              | 7.4               | 30              | 1.0 | ZV225S_K302_0100 EZ703U | 10                  | 26                   | 276                | 10.14 | 0.96                 | 0.85      | 1.37                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.35   | 3.2              | 5.2               | 24              | 1.4 | ZV225S_K302_0093 EZ505U | 10                  | 25                   | 276                | 9.267 | 0.96                 | 0.84      | 1.35                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.35   | 4.1              | 6.8               | 30              | 1.1 | ZV225S_K302_0093 EZ703U | 10                  | 25                   | 276                | 9.267 | 0.96                 | 0.84      | 1.35                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.48   | 2.9              | 4.7               | 24              | 1.5 | ZV225S_K302_0084 EZ505U | 10                  | 23                   | 276                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.48   | 3.7              | 6.2               | 30              | 1.1 | ZV225S_K302_0084 EZ703U | 10                  | 23                   | 276                | 8.444 | 1.05                 | 0.92      | 1.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.86   | 2.3              | 3.8               | 24              | 1.7 | ZV225S_K302_0067 EZ505U | 10                  | 18                   | 276                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 1.86   | 3.0              | 4.9               | 31              | 1.3 | ZV225S_K302_0067 EZ703U | 10                  | 18                   | 276                | 6.740 | 1.32                 | 1.15      | 1.86                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| <b>ZV2K3 (n<sub>1N</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 10 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.12   | 4.4              | 4.7               | 2.5             | 1.2 | ZV225S_K303_1360 EZ301U | 10                  | 26                   | 276                | 136.0 | 0.08                 | 0.07      | 0.12                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.15   | 3.5              | 3.7               | 2.4             | 1.5 | ZV225S_K303_1090 EZ301U | 10                  | 26                   | 276                | 109.2 | 0.10                 | 0.09      | 0.15                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.18   | 2.9              | 3.1               | 2.5             | 1.8 | ZV225S_K303_0910 EZ301U | 9.2                 | 22                   | 244                | 91.23 | 0.12                 | 0.11      | 0.18                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.18   | 4.9              | 5.5               | 4.2             | 1.0 | ZV225S_K303_0910 EZ302U | 10                  | 22                   | 276                | 91.23 | 0.12                 | 0.11      | 0.18                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.21   | 2.5              | 2.7               | 3.1             | 2.0 | ZV225S_K303_0790 EZ301U | 8.0                 | 19                   | 213                | 79.42 | 0.13                 | 0.12      | 0.21                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.21   | 4.3              | 4.8               | 5.2             | 1.2 | ZV225S_K303_0790 EZ302U | 10                  | 19                   | 276                | 79.42 | 0.13                 | 0.12      | 0.21                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.24   | 2.3              | 2.4               | 3.2             | 2.3 | ZV225S_K302_0690 EZ301U | 7.1                 | 11                   | 189                | 69.43 | 0.15                 | 0.14      | 0.24                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.24   | 3.8              | 4.3               | 5.5             | 1.4 | ZV225S_K302_0690 EZ302U | 9.0                 | 11                   | 238                | 69.43 | 0.15                 | 0.14      | 0.24                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.24   | 5.0              | 5.7               | 7.1             | 1.0 | ZV225S_K302_0690 EZ303U | 9.0                 | 11                   | 238                | 69.43 | 0.15                 | 0.14      | 0.24                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 2.2              | 2.3               | 2.5             | 2.4 | ZV225S_K303_0680 EZ301U | 6.8                 | 16                   | 181                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 3.7              | 4.1               | 4.2             | 1.4 | ZV225S_K303_0680 EZ302U | 10                  | 16                   | 276                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 4.8              | 5.5               | 5.4             | 1.1 | ZV225S_K303_0680 EZ303U | 10                  | 16                   | 276                | 67.73 | 0.16                 | 0.14      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 2.1              | 2.3               | 3.1             | 2.4 | ZV225S_K303_0660 EZ301U | 6.7                 | 16                   | 178                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 3.6              | 4.0               | 5.3             | 1.4 | ZV225S_K303_0660 EZ302U | 10                  | 16                   | 276                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.25   | 4.7              | 5.4               | 6.9             | 1.1 | ZV225S_K303_0660 EZ303U | 10                  | 16                   | 276                | 66.35 | 0.16                 | 0.15      | 0.25                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.30   | 4.7              | 5.7               | 6.3             | 1.1 | ZV225S_K302_0560 EZ401U | 10                  | 20                   | 276                | 55.71 | 0.19                 | 0.18      | 0.30                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.31   | 1.8              | 1.9               | 2.5             | 3.0 | ZV225S_K303_0550 EZ301U | 5.5                 | 13                   | 146                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.31   | 3.0              | 3.3               | 4.2             | 1.8 | ZV225S_K303_0550 EZ302U | 9.8                 | 13                   | 261                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.31   | 3.9              | 4.4               | 5.5             | 1.3 | ZV225S_K303_0550 EZ303U | 10                  | 13                   | 276                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.31   | 4.5              | 5.5               | 6.5             | 1.1 | ZV225S_K303_0550 EZ401U | 10                  | 13                   | 276                | 54.58 | 0.19                 | 0.18      | 0.31                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 1.6              | 1.8               | 4.1             | 3.1 | ZV225S_K302_0500 EZ301U | 5.2                 | 8.2                  | 137                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 2.8              | 3.1               | 6.9             | 1.9 | ZV225S_K302_0500 EZ302U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 3.6              | 4.2               | 9.1             | 1.4 | ZV225S_K302_0500 EZ303U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.33   | 4.2              | 5.2               | 11              | 1.2 | ZV225S_K302_0500 EZ401U | 6.5                 | 8.2                  | 173                | 50.49 | 0.21                 | 0.19      | 0.33                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.34   | 1.6              | 1.7               | 3.1             | 3.3 | ZV225S_K303_0490 EZ301U | 5.0                 | 12                   | 132                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.34   | 2.7              | 3.0               | 5.3             | 1.9 | ZV225S_K303_0490 EZ302U | 8.9                 | 12                   | 235                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.34   | 3.5              | 4.0               | 6.9             | 1.5 | ZV225S_K303_0490 EZ303U | 9.5                 | 12                   | 253                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.34   | 4.1              | 5.0               | 8.1             | 1.3 | ZV225S_K303_0490 EZ401U | 9.5                 | 12                   | 253                | 49.26 | 0.21                 | 0.20      | 0.34                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.36   | 3.9              | 4.7               | 5.5             | 1.3 | ZV225S_K302_0460 EZ401U | 10                  | 26                   | 276                | 46.23 | 0.23                 | 0.21      | 0.36                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 3.4              | 4.1               | 8.0             | 1.5 | ZV225S_K302_0410 EZ401U | 8.7                 | 15                   | 231                | 40.51 | 0.26                 | 0.24      | 0.41                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.41   | 5.0              | 6.5               | 12              | 1.0 | ZV225S_K302_0410 EZ501U | 8.7                 | 15                   | 231                | 40.51 | 0.26                 | 0.24      | 0.41                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.43   | 4.8              | 6.2               | 8.1             | 1.1 | ZV225S_K303_0390 EZ501U | 10                  | 26                   | 276                | 39.19 | 0.27                 | 0.25      | 0.43                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.47   | 4.4              | 5.7               | 8.2             | 1.2 | ZV225S_K303_0360 EZ501U | 10                  | 24                   | 276                | 35.83 | 0.30                 | 0.27      | 0.47                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 2.9              | 3.6               | 5.6             | 1.8 | ZV225S_K302_0350 EZ401U | 10                  | 26                   | 276                | 34.73 | 0.30                 | 0.28      | 0.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 4.3              | 5.6               | 8.3             | 1.2 | ZV225S_K302_0350 EZ501U | 10                  | 26                   | 276                | 34.73 | 0.30                 | 0.28      | 0.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.48   | 4.4              | 6.2               | 8.6             | 1.2 | ZV225S_K302_0350 EZ402U | 10                  | 26                   | 276                | 34.73 | 0.30                 | 0.28      | 0.48                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.50   | 2.8              | 3.4               | 5.9             | 1.8 | ZV225S_K302_0340 EZ401U | 10                  | 19                   | 276                | 33.62 | 0.31                 | 0.29      | 0.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.50   | 4.2              | 5.4               | 8.7             | 1.2 | ZV225S_K302_0340 EZ501U | 10                  | 19                   | 276                | 33.62 | 0.31                 | 0.29      | 0.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.50   | 4.3              | 6.0               | 9.0             | 1.2 | ZV225S_K302_0340 EZ402U | 10                  | 19                   | 276                | 33.62 | 0.31                 | 0.29      | 0.50                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.51   | 4.0              | 5.2               | 8.3             | 1.3 | ZV225S_K303_0330 EZ501U | 10                  | 22                   | 276                | 32.65 | 0.32                 | 0.30      | 0.51                 | 77   | 39                  | 19                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 2.3              | 2.9               | 5.8             | 2.2 | ZV225S_K302_0280 EZ401U | 8.7                 | 26                   | 230                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 3.5              | 4.5               | 8.5             | 1.5 | ZV225S_K302_0280 EZ501U | 10                  | 26                   | 276                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.60   | 3.6              | 5.0               | 8.8             | 1.4 | ZV225S_K302_0280 EZ402U | 10                  | 26                   | 276                | 27.88 | 0.38                 | 0.35      | 0.60                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 2.1              | 2.6               | 5.8             | 2.4 | ZV225S_K302_0250 EZ401U | 7.9                 | 23                   | 208                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 3.1              | 4.1               | 8.6             | 1.6 | ZV225S_K302_0250 EZ501U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 3.2              | 4.5               | 8.8             | 1.6 | ZV225S_K302_0250 EZ402U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 4.8              | 7.2               | 13              | 1.1 | ZV225S_K302_0250 EZ502U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.66   | 4.8              | 7.3               | 13              | 1.1 | ZV225S_K302_0250 EZ701U | 10                  | 23                   | 276                | 25.26 | 0.42                 | 0.39      | 0.66                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 2.0              | 2.4               | 5.8             | 2.6 | ZV225S_K302_0230 EZ401U | 7.2                 | 24                   | 192                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 2.9              | 3.7               | 8.6             | 1.8 | ZV225S_K302_0230 EZ501U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 3.0              | 4.2               | 8.9             | 1.7 | ZV225S_K302_0230 EZ402U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72   | 4.4              | 6.6               | 13              | 1.2 | ZV225S_K302_0230 EZ502U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>fzmaxDB</sub> |           | v <sub>fzmaxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV2K3 (n<sub>n</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 10 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.72  | 4.4              | 6.7               | 13              | 1.2 | ZV225S_K302_0230 EZ701U | 10                  | 26                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.72  | 4.9              | 7.2               | 15              | 1.0 | ZV225S_K302_0230 EZ404U | 10                  | 24                   | 276                | 23.29 | 0.45                 | 0.42      | 0.72                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 1.7              | 2.1               | 5.9             | 3.0 | ZV225S_K302_0200 EZ401U | 6.3                 | 19                   | 167                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 2.5              | 3.3               | 8.7             | 2.1 | ZV225S_K302_0200 EZ501U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 2.6              | 3.6               | 9.0             | 2.0 | ZV225S_K302_0200 EZ402U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 3.9              | 5.8               | 13              | 1.3 | ZV225S_K302_0200 EZ502U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 3.9              | 5.9               | 13              | 1.3 | ZV225S_K302_0200 EZ701U | 10                  | 26                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 4.3              | 6.2               | 15              | 1.2 | ZV225S_K302_0200 EZ404U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.82  | 4.6              | 7.9               | 16              | 1.1 | ZV225S_K302_0200 EZ503U | 10                  | 19                   | 276                | 20.28 | 0.52                 | 0.48      | 0.82                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 1.4              | 1.7               | 6.0             | 3.4 | ZV225S_K302_0170 EZ401U | 5.3                 | 18                   | 140                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 2.1              | 2.7               | 8.9             | 2.3 | ZV225S_K302_0170 EZ501U | 9.9                 | 18                   | 263                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 2.2              | 3.0               | 9.1             | 2.3 | ZV225S_K302_0170 EZ402U | 9.9                 | 18                   | 263                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 3.2              | 4.8               | 14              | 1.5 | ZV225S_K302_0170 EZ502U | 10                  | 18                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 3.2              | 4.9               | 14              | 1.5 | ZV225S_K302_0170 EZ701U | 10                  | 26                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 3.6              | 5.2               | 15              | 1.4 | ZV225S_K302_0170 EZ404U | 10                  | 18                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 3.8              | 6.6               | 16              | 1.3 | ZV225S_K302_0170 EZ503U | 10                  | 18                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| 0.98  | 4.5              | 8.9               | 19              | 1.1 | ZV225S_K302_0170 EZ702U | 10                  | 26                   | 276                | 16.94 | 0.62                 | 0.57      | 0.98                 | 77   | 31                  | 12                 | 30               | 2              | 25 | 53.1           |
| <b>ZV3K3 (n<sub>n</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.07  | 4.2              | 4.3               | 2.4             | 1.3 | ZV318S_K303_1360 EZ301U | 11                  | 24                   | 308                | 136.0 | 0.08                 | 0.08      | 0.13                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.08  | 3.4              | 3.5               | 2.3             | 1.6 | ZV318S_K303_1090 EZ301U | 10                  | 24                   | 292                | 109.2 | 0.10                 | 0.10      | 0.17                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.10  | 2.8              | 2.9               | 2.2             | 1.9 | ZV318S_K303_0910 EZ301U | 8.5                 | 20                   | 244                | 91.23 | 0.13                 | 0.12      | 0.20                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.10  | 4.8              | 5.1               | 3.7             | 1.1 | ZV318S_K303_0910 EZ302U | 11                  | 20                   | 308                | 91.23 | 0.13                 | 0.12      | 0.20                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.11  | 2.5              | 2.5               | 2.6             | 2.2 | ZV318S_K303_0790 EZ301U | 7.4                 | 18                   | 213                | 79.42 | 0.14                 | 0.13      | 0.23                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.11  | 4.2              | 4.5               | 4.4             | 1.3 | ZV318S_K303_0790 EZ302U | 11                  | 18                   | 308                | 79.42 | 0.14                 | 0.13      | 0.23                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 2.2              | 2.2               | 3.4             | 2.4 | ZV318S_K302_0690 EZ301U | 6.6                 | 10                   | 189                | 69.43 | 0.16                 | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 3.7              | 3.9               | 5.8             | 1.4 | ZV318S_K302_0690 EZ302U | 8.3                 | 10                   | 238                | 69.43 | 0.16                 | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 4.9              | 5.1               | 7.5             | 1.1 | ZV318S_K302_0690 EZ303U | 8.3                 | 10                   | 238                | 69.43 | 0.16                 | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 2.1              | 2.1               | 2.1             | 2.5 | ZV318S_K303_0680 EZ301U | 6.3                 | 15                   | 181                | 67.73 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 3.6              | 3.8               | 3.5             | 1.5 | ZV318S_K303_0680 EZ302U | 11                  | 15                   | 308                | 67.73 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.13  | 4.7              | 5.0               | 4.6             | 1.1 | ZV318S_K303_0680 EZ303U | 11                  | 15                   | 308                | 67.73 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.14  | 2.1              | 2.1               | 2.6             | 2.6 | ZV318S_K303_0660 EZ301U | 6.2                 | 15                   | 178                | 66.35 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.14  | 3.5              | 3.7               | 4.4             | 1.5 | ZV318S_K303_0660 EZ302U | 11                  | 15                   | 308                | 66.35 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.14  | 4.6              | 4.8               | 5.8             | 1.2 | ZV318S_K303_0660 EZ303U | 11                  | 15                   | 308                | 66.35 | 0.17                 | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.16  | 5.3              | 5.7               | 7.7             | 1.0 | ZV318S_K302_0560 EZ401U | 11                  | 18                   | 308                | 55.71 | 0.21                 | 0.19      | 0.32                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.17  | 1.7              | 1.7               | 2.4             | 3.1 | ZV318S_K303_0550 EZ301U | 5.1                 | 12                   | 146                | 54.58 | 0.21                 | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.17  | 2.9              | 3.1               | 4.1             | 1.8 | ZV318S_K303_0550 EZ302U | 9.1                 | 12                   | 261                | 54.58 | 0.21                 | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.17  | 3.8              | 4.0               | 5.3             | 1.4 | ZV318S_K303_0550 EZ303U | 9.8                 | 12                   | 280                | 54.58 | 0.21                 | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.17  | 5.1              | 5.5               | 7.1             | 1.0 | ZV318S_K303_0550 EZ401U | 9.8                 | 12                   | 280                | 54.58 | 0.21                 | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 1.6              | 1.6               | 4.3             | 3.4 | ZV318S_K302_0500 EZ301U | 4.8                 | 7.6                  | 137                | 50.49 | 0.23                 | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 2.7              | 2.9               | 7.3             | 2.0 | ZV318S_K302_0500 EZ302U | 6.0                 | 7.6                  | 173                | 50.49 | 0.23                 | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 3.5              | 3.7               | 9.6             | 1.5 | ZV318S_K302_0500 EZ303U | 6.0                 | 7.6                  | 173                | 50.49 | 0.23                 | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 4.8              | 5.1               | 13              | 1.1 | ZV318S_K302_0500 EZ401U | 6.0                 | 7.6                  | 173                | 50.49 | 0.23                 | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 1.5              | 1.6               | 2.6             | 3.5 | ZV318S_K303_0490 EZ301U | 4.6                 | 11                   | 132                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 2.6              | 2.8               | 4.5             | 2.0 | ZV318S_K303_0490 EZ302U | 8.2                 | 11                   | 235                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 3.4              | 3.6               | 5.8             | 1.6 | ZV318S_K303_0490 EZ303U | 8.8                 | 11                   | 253                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.18  | 4.6              | 4.9               | 7.8             | 1.2 | ZV318S_K303_0490 EZ401U | 8.8                 | 11                   | 253                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.20  | 4.4              | 4.7               | 5.7             | 1.2 | ZV318S_K302_0460 EZ401U | 11                  | 24                   | 308                | 46.23 | 0.25                 | 0.23      | 0.39                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.22  | 3.8              | 4.1               | 9.8             | 1.4 | ZV318S_K302_0410 EZ401U | 8.1                 | 13                   | 231                | 40.51 | 0.28                 | 0.26      | 0.44                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.25  | 5.1              | 5.6               | 8.2             | 1.0 | ZV318S_K303_0360 EZ501U | 11                  | 22                   | 308                | 35.83 | 0.32                 | 0.29      | 0.50                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.26  | 3.3              | 3.5               | 5.5             | 1.6 | ZV318S_K302_0350 EZ401U | 10                  | 24                   | 286                | 34.73 | 0.33                 | 0.30      | 0.52                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.26  | 5.1              | 5.5               | 8.4             | 1.1 | ZV318S_K302_0350 EZ501U | 11                  | 24                   | 308                | 34.73 | 0.33                 | 0.30      | 0.52                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.27  | 3.2              | 3.4               | 7.2             | 1.7 | ZV318S_K302_0340 EZ401U | 9.7                 | 17                   | 277                | 33.62 | 0.34                 | 0.31      | 0.54                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.27  | 4.9              | 5.3               | 11              | 1.1 | ZV318S_K302_0340 EZ501U | 10                  | 17                   | 300                | 33.62 | 0.34                 | 0.31      | 0.54                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.28  | 4.7              | 5.1               | 8.3             | 1.1 | ZV318S_K303_0330 EZ501U | 11                  | 20                   | 308                | 32.65 | 0.35                 | 0.32      | 0.55                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.32  | 2.6              | 2.8               | 5.6             | 2.0 | ZV318S_K302_0280 EZ401U | 8.0                 | 24                   | 230                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.32  | 4.1              | 4.4               | 8.5             | 1.3 | ZV318S_K302_0280 EZ501U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.32  | 4.4              | 4.9               | 9.3             | 1.2 | ZV318S_K302_0280 EZ402U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.36  | 2.4              | 2.6               | 5.6             | 2.2 | ZV318S_K302_0250 EZ401U | 7.3                 | 21                   | 208                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.36  | 3.7              | 4.0               | 8.6             | 1.4 | ZV318S_K302_0250 EZ501U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.36  | 4.0              | 4.4               | 9.4             | 1.3 | ZV318S_K302_0250 EZ402U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.39  | 2.2              | 2.4               | 5.6             | 2.4 | ZV318S_K302_0230 EZ401U | 6.7                 | 23                   | 192                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.39  | 3.4              | 3.7               | 8.7             | 1.6 | ZV318S_K302_0230 EZ501U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.39  | 3.7              | 4.1               | 9.5             | 1.4 | ZV318S_K302_0230 EZ402U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44  | 1.9              | 2.1               | 5.7             | 2.8 | ZV318S_K302_0200 EZ401U | 5.8                 | 18                   | 167                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |

| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K3 (n<sub>in</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.44   | 3.0              | 3.2               | 8.8             | 1.8 | ZV318S_K302_0200 EZ501U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44   | 3.2              | 3.6               | 9.6             | 1.7 | ZV318S_K302_0200 EZ402U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44   | 4.7              | 5.9               | 14              | 1.1 | ZV318S_K302_0200 EZ404U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44   | 5.1              | 5.5               | 15              | 1.0 | ZV318S_K302_0200 EZ502U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44   | 5.1              | 5.7               | 15              | 1.0 | ZV318S_K302_0200 EZ701U | 11                  | 24                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 1.6              | 1.8               | 5.8             | 3.2 | ZV318S_K302_0175 EZ401U | 5.0                 | 18                   | 143                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 2.5              | 2.8               | 8.9             | 2.1 | ZV318S_K302_0175 EZ501U | 9.4                 | 18                   | 268                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 2.8              | 3.0               | 9.7             | 1.9 | ZV318S_K302_0175 EZ402U | 9.4                 | 18                   | 268                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 4.0              | 5.0               | 14              | 1.3 | ZV318S_K302_0175 EZ404U | 11                  | 18                   | 308                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 4.3              | 4.7               | 15              | 1.2 | ZV318S_K302_0175 EZ502U | 11                  | 18                   | 308                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52   | 4.3              | 4.9               | 15              | 1.2 | ZV318S_K302_0175 EZ701U | 11                  | 24                   | 308                | 17.29 | 0.61                 | 0.54      | 0.87                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 1.6              | 1.7               | 5.8             | 3.3 | ZV318S_K302_0170 EZ401U | 4.9                 | 16                   | 140                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 2.5              | 2.7               | 8.9             | 2.2 | ZV318S_K302_0170 EZ501U | 9.2                 | 16                   | 263                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 2.7              | 3.0               | 9.7             | 2.0 | ZV318S_K302_0170 EZ402U | 9.2                 | 16                   | 263                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 4.0              | 4.9               | 14              | 1.3 | ZV318S_K302_0170 EZ404U | 11                  | 16                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 4.2              | 4.6               | 15              | 1.3 | ZV318S_K302_0170 EZ502U | 11                  | 16                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.53   | 4.2              | 4.8               | 15              | 1.3 | ZV318S_K302_0170 EZ701U | 11                  | 24                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 1.3              | 1.4               | 5.9             | 4.0 | ZV318S_K302_0140 EZ401U | 4.0                 | 14                   | 115                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 2.0              | 2.2               | 9.0             | 2.6 | ZV318S_K302_0140 EZ501U | 7.5                 | 14                   | 216                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 2.2              | 2.5               | 9.9             | 2.4 | ZV318S_K302_0140 EZ402U | 7.5                 | 14                   | 216                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 3.3              | 4.1               | 15              | 1.6 | ZV318S_K302_0140 EZ404U | 11                  | 14                   | 308                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 3.5              | 3.8               | 16              | 1.5 | ZV318S_K302_0140 EZ502U | 11                  | 14                   | 308                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 3.5              | 3.9               | 16              | 1.5 | ZV318S_K302_0140 EZ701U | 9.4                 | 24                   | 270                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65   | 4.6              | 5.2               | 20              | 1.2 | ZV318S_K302_0140 EZ503U | 11                  | 14                   | 308                | 13.94 | 0.75                 | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 1.2              | 1.3               | 5.9             | 4.5 | ZV318S_K302_0125 EZ401U | 3.6                 | 13                   | 104                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 1.8              | 2.0               | 9.1             | 2.9 | ZV318S_K302_0125 EZ501U | 6.8                 | 13                   | 195                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 2.0              | 2.2               | 10              | 2.7 | ZV318S_K302_0125 EZ402U | 6.8                 | 13                   | 195                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 2.9              | 3.7               | 15              | 1.8 | ZV318S_K302_0125 EZ404U | 10                  | 13                   | 293                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 3.2              | 3.4               | 16              | 1.7 | ZV318S_K302_0125 EZ502U | 10                  | 13                   | 293                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 3.2              | 3.5               | 16              | 1.7 | ZV318S_K302_0125 EZ701U | 8.5                 | 24                   | 244                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 4.1              | 4.7               | 21              | 1.3 | ZV318S_K302_0125 EZ503U | 10                  | 13                   | 293                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.72   | 5.1              | 6.1               | 25              | 1.0 | ZV318S_K302_0125 EZ702U | 11                  | 24                   | 308                | 12.58 | 0.84                 | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 1.1              | 1.2               | 6.0             | 4.8 | ZV318S_K302_0115 EZ401U | 3.3                 | 12                   | 96                 | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 1.7              | 1.8               | 9.2             | 3.2 | ZV318S_K302_0115 EZ501U | 6.3                 | 12                   | 180                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 1.8              | 2.0               | 10              | 2.9 | ZV318S_K302_0115 EZ402U | 6.3                 | 12                   | 180                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 2.7              | 3.4               | 15              | 2.0 | ZV318S_K302_0115 EZ404U | 9.4                 | 12                   | 270                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 2.9              | 3.1               | 16              | 1.8 | ZV318S_K302_0115 EZ502U | 9.4                 | 12                   | 270                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 2.9              | 3.3               | 16              | 1.8 | ZV318S_K302_0115 EZ701U | 7.9                 | 24                   | 225                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 3.8              | 4.4               | 21              | 1.4 | ZV318S_K302_0115 EZ503U | 9.4                 | 12                   | 270                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 4.7              | 5.7               | 26              | 1.1 | ZV318S_K302_0115 EZ702U | 11                  | 24                   | 308                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.78   | 5.3              | 6.3               | 29              | 1.0 | ZV318S_K302_0115 EZ505U | 11                  | 24                   | 308                | 11.61 | 0.83                 | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 1.5              | 1.6               | 9.3             | 3.6 | ZV318S_K302_0100 EZ501U | 5.5                 | 10                   | 157                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 1.6              | 1.8               | 10              | 3.3 | ZV318S_K302_0100 EZ402U | 5.5                 | 10                   | 157                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 2.4              | 3.0               | 15              | 2.2 | ZV318S_K302_0100 EZ404U | 8.2                 | 10                   | 236                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 2.5              | 2.7               | 16              | 2.1 | ZV318S_K302_0100 EZ502U | 8.2                 | 10                   | 236                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 2.5              | 2.8               | 16              | 2.1 | ZV318S_K302_0100 EZ701U | 6.9                 | 24                   | 197                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 3.3              | 3.8               | 21              | 1.6 | ZV318S_K302_0100 EZ503U | 8.2                 | 10                   | 236                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 4.1              | 4.9               | 26              | 1.3 | ZV318S_K302_0100 EZ702U | 11                  | 24                   | 308                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89   | 4.6              | 5.5               | 29              | 1.1 | ZV318S_K302_0100 EZ505U | 11                  | 24                   | 308                | 10.14 | 1.04                 | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.97   | 2.3              | 2.6               | 16              | 2.2 | ZV318S_K302_0093 EZ701U | 6.3                 | 24                   | 180                | 9.267 | 1.04                 | 0.91      | 1.46                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.97   | 3.8              | 4.5               | 26              | 1.4 | ZV318S_K302_0093 EZ702U | 11                  | 24                   | 308                | 9.267 | 1.04                 | 0.91      | 1.46                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.97   | 4.2              | 5.0               | 29              | 1.2 | ZV318S_K302_0093 EZ505U | 11                  | 24                   | 308                | 9.267 | 1.04                 | 0.91      | 1.46                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 1.2              | 1.3               | 9.9             | 4.0 | ZV318S_K302_0084 EZ501U | 4.6                 | 8.6                  | 131                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 1.3              | 1.5               | 11              | 3.7 | ZV318S_K302_0084 EZ402U | 4.6                 | 8.6                  | 131                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 2.0              | 2.5               | 16              | 2.5 | ZV318S_K302_0084 EZ404U | 6.9                 | 8.6                  | 197                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 2.1              | 2.3               | 17              | 2.3 | ZV318S_K302_0084 EZ502U | 6.9                 | 8.6                  | 197                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 2.1              | 2.4               | 16              | 2.3 | ZV318S_K302_0084 EZ701U | 5.7                 | 21                   | 164                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 2.8              | 3.2               | 22              | 1.8 | ZV318S_K302_0084 EZ503U | 6.9                 | 8.6                  | 197                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 3.4              | 4.1               | 26              | 1.4 | ZV318S_K302_0084 EZ702U | 11                  | 21                   | 308                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 3.9              | 4.6               | 30              | 1.3 | ZV318S_K302_0084 EZ505U | 11                  | 21                   | 308                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 4.7              | 5.9               | 36              | 1.1 | ZV318S_K302_0084 EZ703U | 11                  | 21                   | 308                | 8.444 | 1.14                 | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.22   | 1.9              | 2.1               | 16              | 2.6 | ZV318S_K302_0074 EZ701U | 5.0                 | 19                   | 143                | 7.391 | 1.10                 | 0.93      | 1.62                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.22   | 3.0              | 3.6               | 27              | 1.6 | ZV318S_K302_0074 EZ702U | 10                  | 19                   | 294                | 7.391 | 1.10                 | 0.93      | 1.62                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.22   | 3.4              | 4.0               | 30              | 1.4 | ZV318S_K302_0074 EZ505U | 11                  | 19                   | 308                | 7.391 | 1.10                 | 0.93      | 1.62                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>F2N</sub>   | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2acc</sub> | F <sub>F2NOT,E</sub> | M <sub>Zacc</sub> | i     | v <sub>F2max</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|--------------------|----------------------|-------------------|-------|--------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                    |                      |                   |       | EL1,2              | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]               | [kN]                 | [Nm]              |       | [m/s]              | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K3 (n<sub>1N</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                    |                      |                   |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 1.22   | 4.1              | 5.2               | 37              | 1.1 | ZV318S_K302_0074 EZ703U | 11                 | 19                   | 308               | 7.391 | 1.10               | 0.93      | 1.62                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.34   | 1.7              | 1.9               | 17              | 2.7 | ZV318S_K302_0067 EZ701U | 4.6                | 17                   | 131               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.34   | 2.7              | 3.3               | 27              | 1.7 | ZV318S_K302_0067 EZ702U | 9.4                | 17                   | 268               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.34   | 3.1              | 3.7               | 30              | 1.5 | ZV318S_K302_0067 EZ505U | 11                 | 17                   | 308               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.34   | 3.8              | 4.7               | 37              | 1.2 | ZV318S_K302_0067 EZ703U | 11                 | 17                   | 308               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.50   | 1.5              | 1.7               | 17              | 2.9 | ZV318S_K302_0060 EZ701U | 4.1                | 15                   | 116               | 6.000 | 1.35               | 1.15      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.50   | 2.4              | 2.9               | 27              | 1.8 | ZV318S_K302_0060 EZ702U | 8.3                | 15                   | 239               | 6.000 | 1.35               | 1.15      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.50   | 2.7              | 3.3               | 30              | 1.6 | ZV318S_K302_0060 EZ505U | 11                 | 15                   | 308               | 6.000 | 1.35               | 1.15      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.50   | 3.4              | 4.2               | 37              | 1.3 | ZV318S_K302_0060 EZ703U | 11                 | 15                   | 308               | 6.000 | 1.35               | 1.15      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.50   | 4.3              | 6.1               | 48              | 1.0 | ZV318S_K302_0060 EZ705U | 11                 | 24                   | 308               | 6.000 | 1.35               | 1.15      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.67   | 1.3              | 1.5               | 17              | 3.2 | ZV318S_K302_0054 EZ701U | 3.6                | 14                   | 104               | 5.375 | 1.51               | 1.28      | 2.23                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.67   | 2.2              | 2.6               | 27              | 2.0 | ZV318S_K302_0054 EZ702U | 7.5                | 14                   | 214               | 5.375 | 1.51               | 1.28      | 2.23                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.67   | 2.5              | 2.9               | 31              | 1.7 | ZV318S_K302_0054 EZ505U | 11                 | 14                   | 308               | 5.375 | 1.51               | 1.28      | 2.23                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.67   | 3.0              | 3.8               | 38              | 1.4 | ZV318S_K302_0054 EZ703U | 11                 | 14                   | 308               | 5.375 | 1.51               | 1.28      | 2.23                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.06   | 1.1              | 1.2               | 17              | 3.6 | ZV318S_K302_0044 EZ701U | 3.0                | 11                   | 85                | 4.364 | 1.86               | 1.58      | 2.75                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.06   | 1.8              | 2.1               | 28              | 2.2 | ZV318S_K302_0044 EZ702U | 6.1                | 11                   | 174               | 4.364 | 1.86               | 1.58      | 2.75                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.06   | 2.0              | 2.4               | 31              | 2.0 | ZV318S_K302_0044 EZ505U | 8.9                | 11                   | 254               | 4.364 | 1.86               | 1.58      | 2.75                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.06   | 2.4              | 3.1               | 38              | 1.6 | ZV318S_K302_0044 EZ703U | 8.9                | 11                   | 254               | 4.364 | 1.86               | 1.58      | 2.75                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.06   | 3.1              | 4.5               | 49              | 1.3 | ZV318S_K302_0044 EZ705U | 11                 | 24                   | 308               | 4.364 | 1.86               | 1.58      | 2.75                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.25   | 1.0              | 1.1               | 17              | 3.9 | ZV318S_K302_0040 EZ701U | 2.7                | 10                   | 78                | 4.000 | 2.03               | 1.73      | 3.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.25   | 1.6              | 2.0               | 28              | 2.4 | ZV318S_K302_0040 EZ702U | 5.6                | 10                   | 159               | 4.000 | 2.03               | 1.73      | 3.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.25   | 1.8              | 2.2               | 31              | 2.1 | ZV318S_K302_0040 EZ505U | 8.1                | 10                   | 233               | 4.000 | 2.03               | 1.73      | 3.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.25   | 2.2              | 2.8               | 38              | 1.7 | ZV318S_K302_0040 EZ703U | 8.1                | 10                   | 233               | 4.000 | 2.03               | 1.73      | 3.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.25   | 2.9              | 4.1               | 50              | 1.3 | ZV318S_K302_0040 EZ705U | 11                 | 24                   | 306               | 4.000 | 2.03               | 1.73      | 3.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| <b>ZV3K3 (n<sub>1N</sub> = 4500 rpm, (F<sub>F2acc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                    |                      |                   |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 0.97   | 4.5              | 7.2               | 23              | 1.1 | ZV318S_K302_0140 EZ505U | 11                 | 24                   | 308               | 13.94 | 0.75               | 0.67      | 1.08                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.07   | 4.0              | 6.5               | 23              | 1.2 | ZV318S_K302_0125 EZ505U | 11                 | 24                   | 308               | 12.58 | 0.84               | 0.74      | 1.19                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.16   | 3.7              | 6.0               | 23              | 1.3 | ZV318S_K302_0115 EZ505U | 11                 | 24                   | 308               | 11.61 | 0.83               | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.16   | 4.8              | 7.9               | 30              | 1.0 | ZV318S_K302_0115 EZ703U | 11                 | 24                   | 308               | 11.61 | 0.83               | 0.72      | 1.16                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.33   | 3.3              | 5.3               | 23              | 1.4 | ZV318S_K302_0100 EZ505U | 11                 | 24                   | 308               | 10.14 | 1.04               | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.33   | 4.2              | 6.9               | 30              | 1.1 | ZV318S_K302_0100 EZ703U | 11                 | 24                   | 308               | 10.14 | 1.04               | 0.92      | 1.48                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.46   | 3.0              | 4.8               | 24              | 1.5 | ZV318S_K302_0093 EZ505U | 11                 | 24                   | 308               | 9.267 | 1.04               | 0.91      | 1.46                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.46   | 3.8              | 6.3               | 30              | 1.2 | ZV318S_K302_0093 EZ703U | 11                 | 24                   | 308               | 9.267 | 1.04               | 0.91      | 1.46                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.60   | 2.7              | 4.4               | 24              | 1.6 | ZV318S_K302_0084 EZ505U | 11                 | 21                   | 308               | 8.444 | 1.14               | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.60   | 3.5              | 5.7               | 30              | 1.3 | ZV318S_K302_0084 EZ703U | 11                 | 21                   | 308               | 8.444 | 1.14               | 1.00      | 1.60                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.00   | 2.2              | 3.5               | 24              | 1.9 | ZV318S_K302_0067 EZ505U | 11                 | 17                   | 308               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 2.00   | 2.8              | 4.6               | 31              | 1.5 | ZV318S_K302_0067 EZ703U | 11                 | 17                   | 308               | 6.740 | 1.42               | 1.25      | 2.00                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| <b>ZV3K3 (n<sub>1N</sub> = 6000 rpm, (F<sub>F2acc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                    |                      |                   |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 0.13   | 4.0              | 4.3               | 2.5             | 1.3 | ZV318S_K303_1360 EZ301U | 11                 | 24                   | 308               | 136.0 | 0.08               | 0.08      | 0.13                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.17   | 3.2              | 3.5               | 2.4             | 1.6 | ZV318S_K303_1090 EZ301U | 10                 | 24                   | 292               | 109.2 | 0.10               | 0.10      | 0.17                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.20   | 2.7              | 2.9               | 2.5             | 2.0 | ZV318S_K303_0910 EZ301U | 8.5                | 20                   | 244               | 91.23 | 0.13               | 0.12      | 0.20                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.20   | 4.6              | 5.1               | 4.2             | 1.2 | ZV318S_K303_0910 EZ302U | 11                 | 20                   | 308               | 91.23 | 0.13               | 0.12      | 0.20                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.23   | 2.4              | 2.5               | 3.1             | 2.3 | ZV318S_K303_0790 EZ301U | 7.4                | 18                   | 213               | 79.42 | 0.14               | 0.13      | 0.23                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.23   | 4.0              | 4.5               | 5.2             | 1.3 | ZV318S_K303_0790 EZ302U | 11                 | 18                   | 308               | 79.42 | 0.14               | 0.13      | 0.23                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.23   | 5.2              | 6.0               | 6.8             | 1.0 | ZV318S_K303_0790 EZ303U | 11                 | 18                   | 308               | 79.42 | 0.14               | 0.13      | 0.23                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.26   | 2.1              | 2.2               | 3.2             | 2.5 | ZV318S_K302_0690 EZ301U | 6.6                | 10                   | 189               | 69.43 | 0.16               | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.26   | 3.5              | 3.9               | 5.5             | 1.5 | ZV318S_K302_0690 EZ302U | 8.3                | 10                   | 238               | 69.43 | 0.16               | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.26   | 4.6              | 5.3               | 7.1             | 1.2 | ZV318S_K302_0690 EZ303U | 8.3                | 10                   | 238               | 69.43 | 0.16               | 0.15      | 0.26                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 2.0              | 2.1               | 2.5             | 2.6 | ZV318S_K303_0680 EZ301U | 6.3                | 15                   | 181               | 67.73 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 3.4              | 3.8               | 4.2             | 1.6 | ZV318S_K303_0680 EZ302U | 11                 | 15                   | 308               | 67.73 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 4.4              | 5.1               | 5.4             | 1.2 | ZV318S_K303_0680 EZ303U | 11                 | 15                   | 308               | 67.73 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 5.2              | 6.3               | 6.4             | 1.0 | ZV318S_K303_0680 EZ401U | 11                 | 15                   | 308               | 67.73 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 2.0              | 2.1               | 3.1             | 2.7 | ZV318S_K303_0660 EZ301U | 6.2                | 15                   | 178               | 66.35 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 3.3              | 3.7               | 5.3             | 1.6 | ZV318S_K303_0660 EZ302U | 11                 | 15                   | 308               | 66.35 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 4.3              | 5.0               | 6.9             | 1.2 | ZV318S_K303_0660 EZ303U | 11                 | 15                   | 308               | 66.35 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.27   | 5.1              | 6.2               | 8.1             | 1.0 | ZV318S_K303_0660 EZ401U | 11                 | 15                   | 308               | 66.35 | 0.17               | 0.16      | 0.27                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.32   | 4.3              | 5.3               | 6.3             | 1.2 | ZV318S_K302_0560 EZ401U | 11                 | 18                   | 308               | 55.71 | 0.21               | 0.19      | 0.32                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.33   | 1.6              | 1.7               | 2.5             | 3.3 | ZV318S_K303_0550 EZ301U | 5.1                | 12                   | 146               | 54.58 | 0.21               | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.33   | 2.7              | 3.1               | 4.2             | 1.9 | ZV318S_K303_0550 EZ302U | 9.1                | 12                   | 261               | 54.58 | 0.21               | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.33   | 3.6              | 4.1               | 5.5             | 1.5 | ZV318S_K303_0550 EZ303U | 9.8                | 12                   | 280               | 54.58 | 0.21               | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.33   | 4.2              | 5.1               | 6.5             | 1.3 | ZV318S_K303_0550 EZ401U | 9.8                | 12                   | 280               | 54.58 | 0.21               | 0.19      | 0.33                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.36   | 1.5              | 1.6               | 4.1             | 3.5 | ZV318S_K302_0500 EZ301U | 4.8                | 7.6                  | 137               | 50.49 | 0.23               | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.36   | 2.6              | 2.9               | 6.9             | 2.1 | ZV318S_K302_0500 EZ302U | 6.0                | 7.6                  | 173               | 50.49 | 0.23               | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.36   | 3.4              | 3.8               | 9.1             | 1.6 | ZV318S_K302_0500 EZ303U | 6.0                | 7.6                  | 173               | 50.49 | 0.23               | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |



| v <sub>f2N</sub>  | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K3 (n<sub>n</sub> = 6000 rpm, (F<sub>fzacc,max</sub> = 11 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.36  | 3.9              | 4.8               | 11              | 1.4 | ZV318S_K302_0500 EZ401U | 6.0                 | 7.6                  | 173                | 50.49 | 0.23                 | 0.21      | 0.36                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.37  | 1.5              | 1.6               | 3.1             | 3.6 | ZV318S_K303_0490 EZ301U | 4.6                 | 11                   | 132                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.37  | 2.5              | 2.8               | 5.3             | 2.2 | ZV318S_K303_0490 EZ302U | 8.2                 | 11                   | 235                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.37  | 3.2              | 3.7               | 6.9             | 1.7 | ZV318S_K303_0490 EZ303U | 8.8                 | 11                   | 253                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.37  | 3.8              | 4.6               | 8.1             | 1.4 | ZV318S_K303_0490 EZ401U | 8.8                 | 11                   | 253                | 49.26 | 0.23                 | 0.21      | 0.37                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.39  | 3.6              | 4.4               | 5.5             | 1.5 | ZV318S_K302_0460 EZ401U | 11                  | 24                   | 308                | 46.23 | 0.25                 | 0.23      | 0.39                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.39  | 5.3              | 6.9               | 8.2             | 1.0 | ZV318S_K302_0460 EZ501U | 11                  | 24                   | 308                | 46.23 | 0.25                 | 0.23      | 0.39                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.40  | 5.1              | 6.6               | 8.1             | 1.0 | ZV318S_K303_0450 EZ501U | 11                  | 24                   | 308                | 44.89 | 0.25                 | 0.23      | 0.40                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.44  | 3.2              | 3.8               | 8.0             | 1.7 | ZV318S_K302_0410 EZ401U | 8.1                 | 13                   | 231                | 40.51 | 0.28                 | 0.26      | 0.44                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44  | 4.7              | 6.0               | 12              | 1.1 | ZV318S_K302_0410 EZ501U | 8.1                 | 13                   | 231                | 40.51 | 0.28                 | 0.26      | 0.44                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.44  | 4.8              | 6.7               | 12              | 1.1 | ZV318S_K302_0410 EZ402U | 8.1                 | 13                   | 231                | 40.51 | 0.28                 | 0.26      | 0.44                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.46  | 4.4              | 5.8               | 8.1             | 1.2 | ZV318S_K303_0390 EZ501U | 11                  | 24                   | 308                | 39.19 | 0.29                 | 0.27      | 0.46                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.50  | 4.1              | 5.3               | 8.2             | 1.3 | ZV318S_K303_0360 EZ501U | 11                  | 22                   | 308                | 35.83 | 0.32                 | 0.29      | 0.50                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.52  | 2.7              | 3.3               | 5.6             | 2.0 | ZV318S_K302_0350 EZ401U | 10                  | 24                   | 286                | 34.73 | 0.33                 | 0.30      | 0.52                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52  | 4.0              | 5.2               | 8.3             | 1.3 | ZV318S_K302_0350 EZ501U | 11                  | 24                   | 308                | 34.73 | 0.33                 | 0.30      | 0.52                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.52  | 4.1              | 5.8               | 8.6             | 1.3 | ZV318S_K302_0350 EZ402U | 11                  | 24                   | 308                | 34.73 | 0.33                 | 0.30      | 0.52                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.54  | 2.6              | 3.2               | 5.9             | 2.0 | ZV318S_K302_0340 EZ401U | 9.7                 | 17                   | 277                | 33.62 | 0.34                 | 0.31      | 0.54                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.54  | 3.9              | 5.0               | 8.7             | 1.4 | ZV318S_K302_0340 EZ501U | 10                  | 17                   | 300                | 33.62 | 0.34                 | 0.31      | 0.54                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.54  | 4.0              | 5.6               | 9.0             | 1.3 | ZV318S_K302_0340 EZ402U | 10                  | 17                   | 300                | 33.62 | 0.34                 | 0.31      | 0.54                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.55  | 3.7              | 4.8               | 8.3             | 1.4 | ZV318S_K303_0330 EZ501U | 11                  | 20                   | 308                | 32.65 | 0.35                 | 0.32      | 0.55                 | 83   | 42                  | 21                 | 30               | 3              | 18 | 57.3           |
| 0.65  | 2.2              | 2.6               | 5.8             | 2.5 | ZV318S_K302_0280 EZ401U | 8.0                 | 24                   | 230                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65  | 3.2              | 4.2               | 8.5             | 1.7 | ZV318S_K302_0280 EZ501U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65  | 3.3              | 4.6               | 8.8             | 1.6 | ZV318S_K302_0280 EZ402U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65  | 4.9              | 7.4               | 13              | 1.1 | ZV318S_K302_0280 EZ502U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.65  | 4.9              | 7.5               | 13              | 1.1 | ZV318S_K302_0280 EZ701U | 11                  | 24                   | 308                | 27.88 | 0.41                 | 0.38      | 0.65                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 2.0              | 2.4               | 5.8             | 2.7 | ZV318S_K302_0250 EZ401U | 7.3                 | 21                   | 208                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 2.9              | 3.8               | 8.6             | 1.8 | ZV318S_K302_0250 EZ501U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 3.0              | 4.2               | 8.8             | 1.8 | ZV318S_K302_0250 EZ402U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 4.4              | 6.7               | 13              | 1.2 | ZV318S_K302_0250 EZ502U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 4.4              | 6.8               | 13              | 1.2 | ZV318S_K302_0250 EZ701U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 5.0              | 7.2               | 15              | 1.1 | ZV318S_K302_0250 EZ404U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.71  | 5.3              | 9.1               | 16              | 1.0 | ZV318S_K302_0250 EZ503U | 11                  | 21                   | 308                | 25.26 | 0.45                 | 0.42      | 0.71                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 1.8              | 2.2               | 5.8             | 2.9 | ZV318S_K302_0230 EZ401U | 6.7                 | 23                   | 192                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 2.7              | 3.5               | 8.6             | 2.0 | ZV318S_K302_0230 EZ501U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 2.8              | 3.9               | 8.9             | 1.9 | ZV318S_K302_0230 EZ402U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 4.1              | 6.2               | 13              | 1.3 | ZV318S_K302_0230 EZ502U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 4.1              | 6.2               | 13              | 1.3 | ZV318S_K302_0230 EZ701U | 11                  | 24                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 4.6              | 6.6               | 15              | 1.2 | ZV318S_K302_0230 EZ404U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.77  | 4.9              | 8.4               | 16              | 1.1 | ZV318S_K302_0230 EZ503U | 11                  | 23                   | 308                | 23.29 | 0.49                 | 0.45      | 0.77                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 1.6              | 1.9               | 5.9             | 3.3 | ZV318S_K302_0200 EZ401U | 5.8                 | 18                   | 167                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 2.3              | 3.0               | 8.7             | 2.3 | ZV318S_K302_0200 EZ501U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 2.4              | 3.4               | 9.0             | 2.2 | ZV318S_K302_0200 EZ402U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 3.6              | 5.4               | 13              | 1.5 | ZV318S_K302_0200 EZ502U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 3.6              | 5.4               | 13              | 1.5 | ZV318S_K302_0200 EZ701U | 11                  | 24                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 4.0              | 5.8               | 15              | 1.3 | ZV318S_K302_0200 EZ404U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 4.3              | 7.3               | 16              | 1.2 | ZV318S_K302_0200 EZ503U | 11                  | 18                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 0.89  | 4.9              | 9.8               | 18              | 1.1 | ZV318S_K302_0200 EZ702U | 11                  | 24                   | 308                | 20.28 | 0.56                 | 0.52      | 0.89                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 1.3              | 1.6               | 6.0             | 3.8 | ZV318S_K302_0170 EZ401U | 4.9                 | 16                   | 140                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 2.0              | 2.5               | 8.9             | 2.5 | ZV318S_K302_0170 EZ501U | 9.2                 | 16                   | 263                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 2.0              | 2.8               | 9.1             | 2.5 | ZV318S_K302_0170 EZ402U | 9.2                 | 16                   | 263                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 3.0              | 4.5               | 14              | 1.7 | ZV318S_K302_0170 EZ502U | 11                  | 16                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 3.0              | 4.5               | 14              | 1.7 | ZV318S_K302_0170 EZ701U | 11                  | 24                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 3.3              | 4.8               | 15              | 1.5 | ZV318S_K302_0170 EZ404U | 11                  | 16                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 3.6              | 6.1               | 16              | 1.4 | ZV318S_K302_0170 EZ503U | 11                  | 16                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| 1.06  | 4.1              | 8.2               | 19              | 1.2 | ZV318S_K302_0170 EZ702U | 11                  | 24                   | 308                | 16.94 | 0.67                 | 0.62      | 1.06                 | 83   | 33                  | 12                 | 30               | 3              | 18 | 57.3           |
| <b>ZV3K4 (n<sub>n</sub> = 2000 rpm, (F<sub>fzacc,max</sub> = 13 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 1.68  | 5.3              | 8.0               | 64              | 1.0 | ZV322S_K402_0044 EZ805U | 13                  | 24                   | 472                | 4.364 | 2.18                 | 1.85      | 3.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.83  | 4.8              | 7.3               | 65              | 1.1 | ZV322S_K402_0040 EZ805U | 13                  | 22                   | 459                | 4.000 | 2.38                 | 2.02      | 3.48                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| <b>ZV3K4 (n<sub>n</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.05  | 5.5              | 5.7               | 2.4             | 1.2 | ZV322S_K403_2180 EZ301U | 15                  | 24                   | 508                | 218.2 | 0.06                 | 0.06      | 0.09                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.06  | 4.6              | 4.7               | 2.0             | 1.4 | ZV322S_K403_1810 EZ301U | 14                  | 28                   | 485                | 181.4 | 0.07                 | 0.07      | 0.11                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.08  | 3.5              | 3.5               | 2.0             | 1.9 | ZV322S_K403_1360 EZ301U | 10                  | 23                   | 364                | 136.1 | 0.10                 | 0.09      | 0.15                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.08  | 5.9              | 6.2               | 3.4             | 1.1 | ZV322S_K403_1360 EZ302U | 15                  | 23                   | 540                | 136.1 | 0.10                 | 0.09      | 0.15                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.10  | 2.8              | 2.8               | 2.0             | 2.4 | ZV322S_K403_1090 EZ301U | 8.3                 | 20                   | 291                | 108.8 | 0.12                 | 0.11      | 0.19                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>fzmaxDB</sub> |           | v <sub>fzmaxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K4 (n<sub>in</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.10   | 4.7              | 5.0               | 3.3             | 1.4 | ZV322S_K403_1090 EZ302U | 15                  | 20                   | 520                | 108.8 | 0.12                 | 0.11      | 0.19                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.10   | 6.1              | 6.5               | 4.4             | 1.1 | ZV322S_K403_1090 EZ303U | 15                  | 20                   | 540                | 108.8 | 0.12                 | 0.11      | 0.19                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.12   | 2.3              | 2.4               | 2.0             | 2.9 | ZV322S_K403_0910 EZ301U | 7.0                 | 17                   | 244                | 91.23 | 0.15                 | 0.13      | 0.22                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.12   | 4.0              | 4.2               | 3.4             | 1.7 | ZV322S_K403_0910 EZ302U | 12                  | 17                   | 436                | 91.23 | 0.15                 | 0.13      | 0.22                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.12   | 5.2              | 5.5               | 4.4             | 1.3 | ZV322S_K403_0910 EZ303U | 13                  | 17                   | 468                | 91.23 | 0.15                 | 0.13      | 0.22                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.14   | 2.0              | 2.1               | 2.5             | 3.3 | ZV322S_K403_0790 EZ301U | 6.0                 | 14                   | 212                | 79.11 | 0.17                 | 0.15      | 0.26                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.14   | 3.4              | 3.6               | 4.2             | 1.9 | ZV322S_K403_0790 EZ302U | 11                  | 14                   | 378                | 79.11 | 0.17                 | 0.15      | 0.26                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.14   | 4.5              | 4.7               | 5.5             | 1.5 | ZV322S_K403_0790 EZ303U | 12                  | 14                   | 406                | 79.11 | 0.17                 | 0.15      | 0.26                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.14   | 6.0              | 6.5               | 7.5             | 1.1 | ZV322S_K403_0790 EZ401U | 12                  | 14                   | 406                | 79.11 | 0.17                 | 0.15      | 0.26                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.17   | 1.7              | 1.7               | 2.5             | 3.9 | ZV322S_K403_0660 EZ301U | 5.1                 | 12                   | 178                | 66.35 | 0.20                 | 0.18      | 0.30                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.17   | 2.9              | 3.0               | 4.3             | 2.3 | ZV322S_K403_0660 EZ302U | 9.1                 | 12                   | 317                | 66.35 | 0.20                 | 0.18      | 0.30                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.17   | 3.7              | 4.0               | 5.6             | 1.8 | ZV322S_K403_0660 EZ303U | 9.7                 | 12                   | 340                | 66.35 | 0.20                 | 0.18      | 0.30                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.17   | 5.1              | 5.4               | 7.5             | 1.3 | ZV322S_K403_0660 EZ401U | 9.7                 | 12                   | 340                | 66.35 | 0.20                 | 0.18      | 0.30                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.21   | 6.3              | 6.9               | 6.1             | 1.0 | ZV322S_K403_0540 EZ501U | 15                  | 27                   | 540                | 53.69 | 0.25                 | 0.23      | 0.38                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.22   | 6.0              | 6.6               | 12              | 1.1 | ZV322S_K402_0500 EZ501U | 9.2                 | 15                   | 323                | 50.43 | 0.26                 | 0.24      | 0.40                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.23   | 5.7              | 6.3               | 5.9             | 1.2 | ZV322S_K403_0490 EZ501U | 15                  | 25                   | 540                | 48.94 | 0.27                 | 0.25      | 0.41                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.24   | 5.5              | 6.0               | 6.1             | 1.2 | ZV322S_K402_0460 EZ501U | 15                  | 28                   | 540                | 46.31 | 0.29                 | 0.26      | 0.44                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.25   | 5.2              | 5.7               | 5.9             | 1.3 | ZV322S_K403_0450 EZ501U | 15                  | 22                   | 540                | 44.54 | 0.30                 | 0.27      | 0.45                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.27   | 4.8              | 5.3               | 10              | 1.4 | ZV322S_K402_0410 EZ501U | 11                  | 18                   | 370                | 40.51 | 0.33                 | 0.30      | 0.50                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.28   | 4.6              | 5.0               | 6.1             | 1.4 | ZV322S_K403_0390 EZ501U | 15                  | 20                   | 540                | 39.05 | 0.34                 | 0.31      | 0.52                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.31   | 4.2              | 4.6               | 6.0             | 1.6 | ZV322S_K403_0360 EZ501U | 14                  | 18                   | 505                | 35.72 | 0.37                 | 0.34      | 0.57                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.32   | 4.1              | 4.5               | 6.1             | 1.6 | ZV322S_K402_0350 EZ501U | 15                  | 23                   | 539                | 34.76 | 0.38                 | 0.35      | 0.58                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.33   | 4.0              | 4.4               | 7.8             | 1.6 | ZV322S_K402_0340 EZ501U | 13                  | 20                   | 467                | 33.68 | 0.39                 | 0.36      | 0.60                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.34   | 3.8              | 4.2               | 6.4             | 1.7 | ZV322S_K403_0320 EZ501U | 13                  | 16                   | 458                | 32.39 | 0.41                 | 0.37      | 0.62                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.34   | 6.5              | 7.1               | 11              | 1.0 | ZV322S_K403_0320 EZ502U | 13                  | 16                   | 458                | 32.39 | 0.41                 | 0.37      | 0.62                 | 102  | 51                  | 25                 | 34               | 3              | 22 | 70.0           |
| 0.40   | 3.3              | 3.6               | 6.2             | 2.0 | ZV322S_K402_0280 EZ501U | 12                  | 21                   | 431                | 27.77 | 0.48                 | 0.44      | 0.73                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.40   | 5.7              | 6.2               | 11              | 1.2 | ZV322S_K402_0280 EZ502U | 15                  | 21                   | 540                | 27.77 | 0.48                 | 0.44      | 0.73                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.40   | 5.7              | 6.4               | 11              | 1.2 | ZV322S_K402_0280 EZ701U | 15                  | 31                   | 539                | 27.77 | 0.48                 | 0.44      | 0.73                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.44   | 3.0              | 3.3               | 6.3             | 2.2 | ZV322S_K402_0250 EZ501U | 11                  | 17                   | 392                | 25.28 | 0.52                 | 0.48      | 0.80                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.44   | 5.2              | 5.6               | 11              | 1.3 | ZV322S_K402_0250 EZ502U | 13                  | 17                   | 470                | 25.28 | 0.52                 | 0.48      | 0.80                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.44   | 5.2              | 5.8               | 11              | 1.3 | ZV322S_K402_0250 EZ701U | 14                  | 29                   | 490                | 25.28 | 0.52                 | 0.48      | 0.80                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.47   | 2.8              | 3.0               | 6.3             | 2.4 | ZV322S_K402_0230 EZ501U | 10                  | 19                   | 361                | 23.29 | 0.57                 | 0.52      | 0.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.47   | 4.8              | 5.2               | 11              | 1.4 | ZV322S_K402_0230 EZ502U | 15                  | 19                   | 540                | 23.29 | 0.57                 | 0.52      | 0.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.47   | 4.8              | 5.4               | 11              | 1.4 | ZV322S_K402_0230 EZ701U | 13                  | 31                   | 452                | 23.29 | 0.57                 | 0.52      | 0.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.47   | 6.3              | 7.2               | 14              | 1.1 | ZV322S_K402_0230 EZ503U | 15                  | 19                   | 540                | 23.29 | 0.57                 | 0.52      | 0.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.55   | 2.4              | 2.6               | 6.4             | 2.7 | ZV322S_K402_0200 EZ501U | 9.0                 | 15                   | 313                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.55   | 4.1              | 4.5               | 11              | 1.6 | ZV322S_K402_0200 EZ502U | 12                  | 15                   | 434                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.55   | 4.1              | 4.6               | 11              | 1.6 | ZV322S_K402_0200 EZ701U | 11                  | 31                   | 392                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.55   | 5.4              | 6.2               | 14              | 1.2 | ZV322S_K402_0200 EZ503U | 12                  | 15                   | 434                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.63   | 3.6              | 4.0               | 11              | 1.9 | ZV322S_K402_0175 EZ701U | 9.6                 | 31                   | 338                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.63   | 5.8              | 6.9               | 18              | 1.1 | ZV322S_K402_0175 EZ702U | 15                  | 31                   | 540                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.63   | 6.5              | 7.7               | 20              | 1.0 | ZV322S_K402_0175 EZ505U | 15                  | 31                   | 540                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 2.0              | 2.2               | 6.5             | 3.3 | ZV322S_K402_0170 EZ501U | 7.5                 | 14                   | 263                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 3.5              | 3.8               | 11              | 1.9 | ZV322S_K402_0170 EZ502U | 11                  | 14                   | 394                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 3.5              | 3.9               | 11              | 1.9 | ZV322S_K402_0170 EZ701U | 9.4                 | 29                   | 329                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 4.6              | 5.2               | 15              | 1.5 | ZV322S_K402_0170 EZ503U | 11                  | 14                   | 394                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 5.6              | 6.8               | 18              | 1.2 | ZV322S_K402_0170 EZ702U | 15                  | 29                   | 540                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.65   | 6.3              | 7.5               | 20              | 1.0 | ZV322S_K402_0170 EZ505U | 15                  | 29                   | 540                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.79   | 2.8              | 3.2               | 11              | 2.3 | ZV322S_K402_0140 EZ701U | 7.7                 | 29                   | 269                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.79   | 4.6              | 5.5               | 18              | 1.4 | ZV322S_K402_0140 EZ702U | 15                  | 29                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.79   | 5.2              | 6.2               | 21              | 1.3 | ZV322S_K402_0140 EZ505U | 15                  | 29                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.79   | 6.3              | 8.0               | 25              | 1.0 | ZV322S_K402_0140 EZ703U | 15                  | 29                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.87   | 2.6              | 2.9               | 11              | 2.5 | ZV322S_K402_0125 EZ701U | 7.0                 | 25                   | 246                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.87   | 4.2              | 5.0               | 18              | 1.6 | ZV322S_K402_0125 EZ702U | 14                  | 25                   | 503                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.87   | 4.7              | 5.6               | 21              | 1.4 | ZV322S_K402_0125 EZ505U | 15                  | 25                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.87   | 5.8              | 7.3               | 25              | 1.1 | ZV322S_K402_0125 EZ703U | 15                  | 25                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.96   | 2.4              | 2.6               | 11              | 2.8 | ZV322S_K402_0115 EZ701U | 6.4                 | 24                   | 223                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.96   | 3.8              | 4.6               | 19              | 1.7 | ZV322S_K402_0115 EZ702U | 13                  | 24                   | 458                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.96   | 4.3              | 5.1               | 21              | 1.5 | ZV322S_K402_0115 EZ505U | 15                  | 24                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.96   | 5.3              | 6.6               | 26              | 1.3 | ZV322S_K402_0115 EZ703U | 15                  | 24                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.09   | 2.1              | 2.3               | 12              | 3.1 | ZV322S_K402_0100 EZ701U | 5.6                 | 21                   | 196                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.09   | 3.4              | 4.0               | 19              | 1.9 | ZV322S_K402_0100 EZ702U | 11                  | 21                   | 402                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.09   | 3.8              | 4.5               | 21              | 1.7 | ZV322S_K402_0100 EZ505U | 15                  | 21                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.09   | 4.6              | 5.8               | 26              | 1.4 | ZV322S_K402_0100 EZ703U | 15                  | 21                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |

| v <sub>F2N</sub>  | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2maxDB</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|---|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|   |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]   | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K4 (n<sub>n</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 1.09  | 6.0              | 8.4               | 33              | 1.1 | ZV322S_K402_0100 EZ705U | 15                  | 31                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.09  | 6.2              | 10                | 35              | 1.0 | ZV322S_K402_0100 EZ802U | 15                  | 31                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 1.9              | 2.1               | 12              | 3.3 | ZV322S_K402_0092 EZ701U | 5.1                 | 19                   | 179                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 3.1              | 3.7               | 19              | 2.0 | ZV322S_K402_0092 EZ702U | 10                  | 19                   | 367                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 3.5              | 4.1               | 21              | 1.8 | ZV322S_K402_0092 EZ505U | 15                  | 19                   | 538                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 4.2              | 5.3               | 26              | 1.5 | ZV322S_K402_0092 EZ703U | 15                  | 19                   | 538                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 5.5              | 7.7               | 34              | 1.1 | ZV322S_K402_0092 EZ705U | 15                  | 31                   | 540                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 5.7              | 9.5               | 35              | 1.1 | ZV322S_K402_0092 EZ802U | 15                  | 31                   | 540                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 1.7              | 1.9               | 12              | 3.5 | ZV322S_K402_0084 EZ701U | 4.6                 | 17                   | 163                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 2.8              | 3.3               | 19              | 2.2 | ZV322S_K402_0084 EZ702U | 9.5                 | 17                   | 333                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 3.1              | 3.7               | 22              | 1.9 | ZV322S_K402_0084 EZ505U | 14                  | 17                   | 488                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 3.8              | 4.8               | 26              | 1.6 | ZV322S_K402_0084 EZ703U | 14                  | 17                   | 488                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 4.9              | 7.0               | 34              | 1.2 | ZV322S_K402_0084 EZ705U | 15                  | 31                   | 540                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.31  | 5.2              | 8.6               | 36              | 1.2 | ZV322S_K402_0084 EZ802U | 15                  | 31                   | 540                | 8.377 | 1.31                 | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.48  | 4.4              | 6.2               | 34              | 1.3 | ZV322S_K402_0075 EZ705U | 15                  | 31                   | 540                | 7.456 | 1.28                 | 1.08      | 1.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.48  | 4.6              | 7.7               | 36              | 1.3 | ZV322S_K402_0075 EZ802U | 15                  | 31                   | 540                | 7.456 | 1.28                 | 1.08      | 1.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.48  | 5.5              | 10                | 43              | 1.0 | ZV322S_K402_0075 EZ803U | 15                  | 31                   | 540                | 7.456 | 1.28                 | 1.08      | 1.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 1.4              | 1.5               | 12              | 4.0 | ZV322S_K402_0067 EZ701U | 3.7                 | 14                   | 130                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 2.2              | 2.7               | 19              | 2.5 | ZV322S_K402_0067 EZ702U | 7.6                 | 14                   | 267                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 2.5              | 3.0               | 22              | 2.2 | ZV322S_K402_0067 EZ505U | 11                  | 14                   | 391                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 3.1              | 3.9               | 27              | 1.8 | ZV322S_K402_0067 EZ703U | 11                  | 14                   | 391                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 4.0              | 5.6               | 35              | 1.4 | ZV322S_K402_0067 EZ705U | 15                  | 31                   | 540                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 4.2              | 6.9               | 36              | 1.3 | ZV322S_K402_0067 EZ802U | 15                  | 31                   | 540                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.64  | 5.0              | 9.0               | 43              | 1.1 | ZV322S_K402_0067 EZ803U | 15                  | 31                   | 540                | 6.719 | 1.64                 | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.83  | 3.5              | 5.0               | 35              | 1.5 | ZV322S_K402_0060 EZ705U | 15                  | 31                   | 525                | 6.000 | 1.59                 | 1.34      | 2.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.83  | 3.7              | 6.2               | 37              | 1.4 | ZV322S_K402_0060 EZ802U | 15                  | 31                   | 525                | 6.000 | 1.59                 | 1.34      | 2.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.83  | 4.4              | 8.0               | 44              | 1.2 | ZV322S_K402_0060 EZ803U | 15                  | 31                   | 525                | 6.000 | 1.59                 | 1.34      | 2.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.03  | 3.2              | 4.5               | 35              | 1.6 | ZV322S_K402_0054 EZ705U | 14                  | 30                   | 508                | 5.422 | 1.76                 | 1.49      | 2.57                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.03  | 3.3              | 5.6               | 37              | 1.5 | ZV322S_K402_0054 EZ802U | 14                  | 30                   | 508                | 5.422 | 1.76                 | 1.49      | 2.57                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.03  | 4.0              | 7.2               | 44              | 1.3 | ZV322S_K402_0054 EZ803U | 14                  | 30                   | 508                | 5.422 | 1.76                 | 1.49      | 2.57                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.52  | 2.6              | 3.7               | 36              | 1.9 | ZV322S_K402_0044 EZ705U | 13                  | 24                   | 440                | 4.364 | 2.18                 | 1.85      | 3.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.52  | 2.7              | 4.5               | 38              | 1.8 | ZV322S_K402_0044 EZ802U | 12                  | 24                   | 423                | 4.364 | 2.18                 | 1.85      | 3.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.52  | 3.2              | 5.8               | 45              | 1.5 | ZV322S_K402_0044 EZ803U | 13                  | 24                   | 472                | 4.364 | 2.18                 | 1.85      | 3.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.75  | 2.4              | 3.3               | 36              | 2.0 | ZV322S_K402_0040 EZ705U | 12                  | 22                   | 404                | 4.000 | 2.38                 | 2.02      | 3.48                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.75  | 2.5              | 4.1               | 38              | 1.9 | ZV322S_K402_0040 EZ802U | 11                  | 22                   | 388                | 4.000 | 2.38                 | 2.02      | 3.48                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.75  | 2.9              | 5.3               | 45              | 1.6 | ZV322S_K402_0040 EZ803U | 13                  | 22                   | 459                | 4.000 | 2.38                 | 2.02      | 3.48                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| <b>ZV3K4 (n<sub>n</sub> = 4500 rpm, (F<sub>F2acc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.71  | 6.1              | 9.9               | 16              | 1.1 | ZV322S_K402_0230 EZ505U | 15                  | 31                   | 540                | 23.29 | 0.57                 | 0.52      | 0.87                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.82  | 5.3              | 8.6               | 16              | 1.2 | ZV322S_K402_0200 EZ505U | 15                  | 31                   | 540                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.82  | 5.9              | 19                | 18              | 1.1 | ZV322S_K402_0200 EZ802U | 15                  | 31                   | 540                | 20.20 | 0.65                 | 0.60      | 1.00                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.95  | 4.6              | 7.4               | 16              | 1.4 | ZV322S_K402_0175 EZ505U | 15                  | 31                   | 540                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.95  | 5.1              | 17                | 18              | 1.3 | ZV322S_K402_0175 EZ802U | 15                  | 31                   | 540                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.95  | 5.8              | 9.6               | 21              | 1.1 | ZV322S_K402_0175 EZ703U | 15                  | 31                   | 540                | 17.41 | 0.72                 | 0.63      | 1.05                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.97  | 4.5              | 7.2               | 16              | 1.5 | ZV322S_K402_0170 EZ505U | 15                  | 29                   | 540                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.97  | 4.9              | 16                | 18              | 1.3 | ZV322S_K402_0170 EZ802U | 15                  | 31                   | 540                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 0.97  | 5.7              | 9.4               | 21              | 1.2 | ZV322S_K402_0170 EZ703U | 15                  | 29                   | 540                | 16.94 | 0.78                 | 0.71      | 1.19                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 3.7              | 5.9               | 17              | 1.7 | ZV322S_K402_0140 EZ505U | 15                  | 29                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 4.0              | 13                | 18              | 1.5 | ZV322S_K402_0140 EZ802U | 15                  | 31                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.19  | 4.7              | 7.7               | 21              | 1.3 | ZV322S_K402_0140 EZ703U | 15                  | 29                   | 540                | 13.89 | 0.90                 | 0.79      | 1.32                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.30  | 3.3              | 5.4               | 17              | 1.8 | ZV322S_K402_0125 EZ505U | 15                  | 25                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.30  | 3.7              | 12                | 19              | 1.6 | ZV322S_K402_0125 EZ802U | 15                  | 31                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.30  | 4.2              | 7.0               | 21              | 1.4 | ZV322S_K402_0125 EZ703U | 15                  | 25                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.30  | 5.8              | 11                | 29              | 1.0 | ZV322S_K402_0125 EZ705U | 15                  | 31                   | 540                | 12.66 | 0.99                 | 0.87      | 1.45                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.43  | 3.0              | 4.9               | 17              | 1.9 | ZV322S_K402_0115 EZ505U | 15                  | 24                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.43  | 3.4              | 11                | 19              | 1.7 | ZV322S_K402_0115 EZ802U | 15                  | 31                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.43  | 3.9              | 6.4               | 22              | 1.5 | ZV322S_K402_0115 EZ703U | 15                  | 24                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.43  | 5.2              | 9.6               | 29              | 1.1 | ZV322S_K402_0115 EZ705U | 15                  | 31                   | 540                | 11.52 | 0.96                 | 0.83      | 1.43                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.63  | 2.7              | 4.3               | 17              | 2.1 | ZV322S_K402_0100 EZ505U | 15                  | 21                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.63  | 2.9              | 9.7               | 19              | 1.9 | ZV322S_K402_0100 EZ802U | 15                  | 31                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.63  | 3.4              | 5.6               | 22              | 1.6 | ZV322S_K402_0100 EZ703U | 15                  | 21                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.63  | 4.6              | 8.4               | 29              | 1.2 | ZV322S_K402_0100 EZ705U | 15                  | 31                   | 540                | 10.10 | 1.24                 | 1.09      | 1.82                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.79  | 2.4              | 3.9               | 17              | 2.2 | ZV322S_K402_0092 EZ505U | 15                  | 19                   | 538                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.79  | 2.7              | 8.8               | 19              | 2.0 | ZV322S_K402_0092 EZ802U | 15                  | 31                   | 540                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.79  | 3.1              | 5.1               | 22              | 1.7 | ZV322S_K402_0092 EZ703U | 15                  | 19                   | 538                | 9.238 | 1.19                 | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>F2N</sub>   | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2max</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|--------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2              | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]              | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV3K4 (n<sub>1N</sub> = 4500 rpm, (F<sub>F2acc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 1.79   | 4.2              | 7.7               | 30              | 1.3 | ZV322S_K402_0092 EZ705U | 15                  | 31                   | 540                | 9.238 | 1.19               | 1.03      | 1.79                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.97   | 2.2              | 3.6               | 17              | 2.4 | ZV322S_K402_0084 EZ505U | 14                  | 17                   | 488                | 8.377 | 1.31               | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.97   | 2.4              | 8.0               | 19              | 2.1 | ZV322S_K402_0084 EZ802U | 15                  | 31                   | 540                | 8.377 | 1.31               | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.97   | 2.8              | 4.6               | 22              | 1.9 | ZV322S_K402_0084 EZ703U | 14                  | 17                   | 488                | 8.377 | 1.31               | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 1.97   | 3.8              | 7.0               | 30              | 1.4 | ZV322S_K402_0084 EZ705U | 15                  | 31                   | 540                | 8.377 | 1.31               | 1.14      | 1.97                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.46   | 1.8              | 2.8               | 18              | 2.7 | ZV322S_K402_0067 EZ505U | 11                  | 14                   | 391                | 6.719 | 1.64               | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.46   | 2.0              | 6.4               | 20              | 2.5 | ZV322S_K402_0067 EZ802U | 15                  | 31                   | 540                | 6.719 | 1.64               | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.46   | 2.3              | 3.7               | 23              | 2.2 | ZV322S_K402_0067 EZ703U | 11                  | 14                   | 391                | 6.719 | 1.64               | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| 2.46   | 3.1              | 5.6               | 30              | 1.6 | ZV322S_K402_0067 EZ705U | 15                  | 31                   | 540                | 6.719 | 1.64               | 1.42      | 2.46                 | 102  | 41                  | 15                 | 34               | 3              | 22 | 70.0           |
| <b>ZV4K4 (n<sub>1N</sub> = 2000 rpm, (F<sub>F2acc,max</sub> = 12 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 1.83   | 4.8              | 7.3               | 64              | 1.1 | ZV418S_K402_0044 EZ805U | 12                  | 22                   | 472                | 4.364 | 2.38               | 2.02      | 3.48                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.00   | 4.4              | 6.7               | 65              | 1.2 | ZV418S_K402_0040 EZ805U | 12                  | 20                   | 459                | 4.000 | 2.60               | 2.20      | 3.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| <b>ZV4K4 (n<sub>1N</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                    |           |                      |      |                     |                    |                  |                |    |                |
| 0.04   | 6.3              | 6.5               | 2.9             | 1.1 | ZV418S_K403_2720 EZ301U | 12                  | 19                   | 445                | 271.6 | 0.05               | 0.05      | 0.08                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.06   | 5.1              | 5.2               | 2.4             | 1.4 | ZV418S_K403_2180 EZ301U | 13                  | 22                   | 508                | 218.2 | 0.07               | 0.06      | 0.10                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.07   | 4.2              | 4.3               | 2.0             | 1.6 | ZV418S_K403_1810 EZ301U | 13                  | 26                   | 485                | 181.4 | 0.08               | 0.07      | 0.12                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.09   | 3.2              | 3.2               | 2.0             | 2.2 | ZV418S_K403_1360 EZ301U | 9.5                 | 21                   | 364                | 136.1 | 0.11               | 0.10      | 0.16                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.09   | 5.4              | 5.7               | 3.4             | 1.3 | ZV418S_K403_1360 EZ302U | 15                  | 21                   | 573                | 136.1 | 0.11               | 0.10      | 0.16                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.11   | 2.5              | 2.6               | 2.0             | 2.7 | ZV418S_K403_1090 EZ301U | 7.6                 | 18                   | 291                | 108.8 | 0.13               | 0.12      | 0.20                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.11   | 4.3              | 4.6               | 3.3             | 1.6 | ZV418S_K403_1090 EZ302U | 14                  | 18                   | 520                | 108.8 | 0.13               | 0.12      | 0.20                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.11   | 5.6              | 6.0               | 4.4             | 1.2 | ZV418S_K403_1090 EZ303U | 15                  | 18                   | 558                | 108.8 | 0.13               | 0.12      | 0.20                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.13   | 2.1              | 2.2               | 2.0             | 3.3 | ZV418S_K403_0910 EZ301U | 6.4                 | 15                   | 244                | 91.23 | 0.16               | 0.15      | 0.24                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.13   | 3.6              | 3.8               | 3.4             | 1.9 | ZV418S_K403_0910 EZ302U | 11                  | 15                   | 436                | 91.23 | 0.16               | 0.15      | 0.24                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.13   | 4.7              | 5.0               | 4.4             | 1.5 | ZV418S_K403_0910 EZ303U | 12                  | 15                   | 468                | 91.23 | 0.16               | 0.15      | 0.24                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.13   | 6.4              | 6.8               | 5.9             | 1.1 | ZV418S_K403_0910 EZ401U | 12                  | 15                   | 468                | 91.23 | 0.16               | 0.15      | 0.24                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.15   | 1.8              | 1.9               | 2.5             | 3.8 | ZV418S_K403_0790 EZ301U | 5.5                 | 13                   | 212                | 79.11 | 0.18               | 0.17      | 0.28                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.15   | 3.1              | 3.3               | 4.2             | 2.2 | ZV418S_K403_0790 EZ302U | 9.9                 | 13                   | 378                | 79.11 | 0.18               | 0.17      | 0.28                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.15   | 4.1              | 4.3               | 5.5             | 1.7 | ZV418S_K403_0790 EZ303U | 11                  | 13                   | 406                | 79.11 | 0.18               | 0.17      | 0.28                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.15   | 5.5              | 5.9               | 7.5             | 1.3 | ZV418S_K403_0790 EZ401U | 11                  | 13                   | 406                | 79.11 | 0.18               | 0.17      | 0.28                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.18   | 1.5              | 1.6               | 2.5             | 4.5 | ZV418S_K403_0660 EZ301U | 4.6                 | 11                   | 178                | 66.35 | 0.22               | 0.20      | 0.33                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.18   | 2.6              | 2.8               | 4.3             | 2.6 | ZV418S_K403_0660 EZ302U | 8.3                 | 11                   | 317                | 66.35 | 0.22               | 0.20      | 0.33                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.18   | 3.4              | 3.6               | 5.6             | 2.0 | ZV418S_K403_0660 EZ303U | 8.9                 | 11                   | 340                | 66.35 | 0.22               | 0.20      | 0.33                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.18   | 4.6              | 5.0               | 7.5             | 1.5 | ZV418S_K403_0660 EZ401U | 8.9                 | 11                   | 340                | 66.35 | 0.22               | 0.20      | 0.33                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.22   | 6.1              | 6.6               | 8.1             | 1.1 | ZV418S_K402_0560 EZ501U | 13                  | 22                   | 508                | 55.71 | 0.26               | 0.24      | 0.40                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.22   | 5.8              | 6.3               | 6.1             | 1.2 | ZV418S_K403_0540 EZ501U | 15                  | 25                   | 573                | 53.69 | 0.27               | 0.25      | 0.41                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.24   | 5.5              | 6.0               | 12              | 1.3 | ZV418S_K402_0500 EZ501U | 8.5                 | 14                   | 323                | 50.43 | 0.29               | 0.26      | 0.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.25   | 5.3              | 5.8               | 5.9             | 1.3 | ZV418S_K403_0490 EZ501U | 15                  | 23                   | 573                | 48.94 | 0.29               | 0.27      | 0.45                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.26   | 5.1              | 5.5               | 6.1             | 1.4 | ZV418S_K402_0460 EZ501U | 15                  | 26                   | 573                | 46.31 | 0.31               | 0.29      | 0.48                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.27   | 4.8              | 5.2               | 5.9             | 1.4 | ZV418S_K403_0450 EZ501U | 15                  | 21                   | 573                | 44.54 | 0.32               | 0.30      | 0.49                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.30   | 4.4              | 4.8               | 10              | 1.6 | ZV418S_K402_0410 EZ501U | 9.7                 | 16                   | 370                | 40.51 | 0.36               | 0.33      | 0.54                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.31   | 4.2              | 4.6               | 6.1             | 1.7 | ZV418S_K403_0390 EZ501U | 14                  | 18                   | 552                | 39.05 | 0.37               | 0.34      | 0.56                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.34   | 3.8              | 4.2               | 6.0             | 1.8 | ZV418S_K403_0360 EZ501U | 13                  | 17                   | 505                | 35.72 | 0.40               | 0.37      | 0.62                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.34   | 6.6              | 7.2               | 10              | 1.1 | ZV418S_K403_0360 EZ502U | 13                  | 17                   | 505                | 35.72 | 0.40               | 0.37      | 0.62                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.35   | 3.8              | 4.1               | 6.1             | 1.8 | ZV418S_K402_0350 EZ501U | 14                  | 21                   | 539                | 34.76 | 0.41               | 0.38      | 0.63                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.35   | 6.5              | 7.1               | 10              | 1.1 | ZV418S_K402_0350 EZ502U | 15                  | 21                   | 573                | 34.76 | 0.41               | 0.38      | 0.63                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.35   | 6.5              | 7.3               | 10              | 1.1 | ZV418S_K402_0350 EZ701U | 15                  | 29                   | 573                | 34.76 | 0.41               | 0.38      | 0.63                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.36   | 3.7              | 4.0               | 7.8             | 1.9 | ZV418S_K402_0340 EZ501U | 12                  | 19                   | 467                | 33.68 | 0.43               | 0.39      | 0.65                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.36   | 6.3              | 6.8               | 13              | 1.1 | ZV418S_K402_0340 EZ502U | 12                  | 19                   | 467                | 33.68 | 0.43               | 0.39      | 0.65                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.36   | 6.3              | 7.1               | 13              | 1.1 | ZV418S_K402_0340 EZ701U | 12                  | 19                   | 467                | 33.68 | 0.43               | 0.39      | 0.65                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.37   | 3.5              | 3.8               | 6.4             | 2.0 | ZV418S_K403_0320 EZ501U | 12                  | 15                   | 458                | 32.39 | 0.45               | 0.41      | 0.68                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.37   | 6.0              | 6.5               | 11              | 1.2 | ZV418S_K403_0320 EZ502U | 12                  | 15                   | 458                | 32.39 | 0.45               | 0.41      | 0.68                 | 111  | 56                  | 28                 | 34               | 4              | 18 | 76.4           |
| 0.43   | 3.0              | 3.3               | 6.2             | 2.3 | ZV418S_K402_0280 EZ501U | 11                  | 20                   | 431                | 27.77 | 0.52               | 0.48      | 0.79                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.43   | 5.2              | 5.6               | 11              | 1.3 | ZV418S_K402_0280 EZ502U | 15                  | 20                   | 573                | 27.77 | 0.52               | 0.48      | 0.79                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.43   | 5.2              | 5.9               | 11              | 1.3 | ZV418S_K402_0280 EZ701U | 14                  | 29                   | 539                | 27.77 | 0.52               | 0.48      | 0.79                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.43   | 6.8              | 7.8               | 14              | 1.0 | ZV418S_K402_0280 EZ503U | 15                  | 20                   | 573                | 27.77 | 0.52               | 0.48      | 0.79                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.48   | 2.8              | 3.0               | 6.3             | 2.5 | ZV418S_K402_0250 EZ501U | 10                  | 15                   | 392                | 25.28 | 0.57               | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.48   | 4.8              | 5.1               | 11              | 1.5 | ZV418S_K402_0250 EZ502U | 12                  | 15                   | 470                | 25.28 | 0.57               | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.48   | 4.8              | 5.3               | 11              | 1.5 | ZV418S_K402_0250 EZ701U | 13                  | 26                   | 490                | 25.28 | 0.57               | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.48   | 6.2              | 7.1               | 14              | 1.1 | ZV418S_K402_0250 EZ503U | 12                  | 15                   | 470                | 25.28 | 0.57               | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.52   | 2.5              | 2.8               | 6.3             | 2.7 | ZV418S_K402_0230 EZ501U | 9.5                 | 18                   | 361                | 23.29 | 0.62               | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.52   | 4.4              | 4.7               | 11              | 1.6 | ZV418S_K402_0230 EZ502U | 14                  | 18                   | 542                | 23.29 | 0.62               | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.52   | 4.4              | 4.9               | 11              | 1.6 | ZV418S_K402_0230 EZ701U | 12                  | 29                   | 452                | 23.29 | 0.62               | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.52   | 5.7              | 6.6               | 14              | 1.2 | ZV418S_K402_0230 EZ503U | 14                  | 18                   | 542                | 23.29 | 0.62               | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.59   | 2.2              | 2.4               | 6.4             | 3.1 | ZV418S_K402_0200 EZ501U | 8.2                 | 14                   | 313                | 20.20 | 0.71               | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |



| v <sub>F2N</sub>   | F <sub>F2N</sub> | F <sub>F2,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>F2accE</sub> | F <sub>F2NOT,E</sub> | M <sub>ZaccE</sub> | i     | v <sub>F2maxDB</sub> |           | v <sub>F2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>0</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV4K4 (n<sub>in</sub> = 3000 rpm, (F<sub>F2acc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.59   | 3.8              | 4.1               | 11              | 1.8 | ZV418S_K402_0200 EZ502U | 11                  | 14                   | 434                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.59   | 3.8              | 4.3               | 11              | 1.8 | ZV418S_K402_0200 EZ701U | 10                  | 29                   | 392                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.59   | 5.0              | 5.7               | 14              | 1.4 | ZV418S_K402_0200 EZ503U | 11                  | 14                   | 434                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.59   | 6.2              | 7.4               | 18              | 1.1 | ZV418S_K402_0200 EZ702U | 15                  | 29                   | 573                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.59   | 6.9              | 8.2               | 20              | 1.0 | ZV418S_K402_0200 EZ505U | 15                  | 29                   | 573                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.69   | 3.3              | 3.7               | 11              | 2.1 | ZV418S_K402_0175 EZ701U | 8.8                 | 29                   | 338                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.69   | 5.3              | 6.4               | 18              | 1.3 | ZV418S_K402_0175 EZ702U | 15                  | 29                   | 573                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.69   | 6.0              | 7.1               | 20              | 1.2 | ZV418S_K402_0175 EZ505U | 15                  | 29                   | 573                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 1.8              | 2.0               | 6.5             | 3.8 | ZV418S_K402_0170 EZ501U | 6.9                 | 13                   | 263                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 3.2              | 3.4               | 11              | 2.2 | ZV418S_K402_0170 EZ502U | 10                  | 13                   | 394                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 3.2              | 3.6               | 11              | 2.2 | ZV418S_K402_0170 EZ701U | 8.6                 | 27                   | 329                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 4.2              | 4.8               | 15              | 1.7 | ZV418S_K402_0170 EZ503U | 10                  | 13                   | 394                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 5.2              | 6.2               | 18              | 1.3 | ZV418S_K402_0170 EZ702U | 15                  | 27                   | 573                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 5.8              | 6.9               | 20              | 1.2 | ZV418S_K402_0170 EZ505U | 15                  | 27                   | 573                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.86   | 2.6              | 2.9               | 11              | 2.7 | ZV418S_K402_0140 EZ701U | 7.1                 | 26                   | 269                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.86   | 4.2              | 5.1               | 18              | 1.6 | ZV418S_K402_0140 EZ702U | 14                  | 26                   | 552                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.86   | 4.8              | 5.6               | 21              | 1.5 | ZV418S_K402_0140 EZ505U | 15                  | 26                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.86   | 5.8              | 7.3               | 25              | 1.2 | ZV418S_K402_0140 EZ703U | 15                  | 26                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.95   | 2.4              | 2.7               | 11              | 2.9 | ZV418S_K402_0125 EZ701U | 6.4                 | 23                   | 246                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.95   | 3.9              | 4.6               | 18              | 1.8 | ZV418S_K402_0125 EZ702U | 13                  | 23                   | 503                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.95   | 4.3              | 5.1               | 21              | 1.6 | ZV418S_K402_0125 EZ505U | 15                  | 23                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.95   | 5.3              | 6.7               | 25              | 1.3 | ZV418S_K402_0125 EZ703U | 15                  | 23                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.95   | 6.8              | 9.7               | 33              | 1.0 | ZV418S_K402_0125 EZ705U | 15                  | 29                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 2.2              | 2.4               | 11              | 3.1 | ZV418S_K402_0115 EZ701U | 5.8                 | 22                   | 223                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 3.5              | 4.2               | 19              | 1.9 | ZV418S_K402_0115 EZ702U | 12                  | 22                   | 458                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 3.9              | 4.7               | 21              | 1.7 | ZV418S_K402_0115 EZ505U | 15                  | 22                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 4.8              | 6.1               | 26              | 1.4 | ZV418S_K402_0115 EZ703U | 15                  | 22                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 6.2              | 8.8               | 33              | 1.1 | ZV418S_K402_0115 EZ705U | 15                  | 29                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.04   | 6.5              | 11                | 35              | 1.0 | ZV418S_K402_0115 EZ802U | 15                  | 29                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 1.9              | 2.1               | 12              | 3.4 | ZV418S_K402_0100 EZ701U | 5.1                 | 19                   | 196                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 3.1              | 3.7               | 19              | 2.1 | ZV418S_K402_0100 EZ702U | 11                  | 19                   | 402                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 3.5              | 4.1               | 21              | 1.9 | ZV418S_K402_0100 EZ505U | 15                  | 19                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 4.2              | 5.3               | 26              | 1.5 | ZV418S_K402_0100 EZ703U | 15                  | 19                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 5.5              | 7.7               | 33              | 1.2 | ZV418S_K402_0100 EZ705U | 15                  | 29                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.19   | 5.7              | 9.5               | 35              | 1.1 | ZV418S_K402_0100 EZ802U | 15                  | 29                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 1.7              | 1.9               | 12              | 3.6 | ZV418S_K402_0092 EZ701U | 4.7                 | 18                   | 179                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 2.8              | 3.4               | 19              | 2.2 | ZV418S_K402_0092 EZ702U | 9.6                 | 18                   | 367                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 3.2              | 3.8               | 21              | 2.0 | ZV418S_K402_0092 EZ505U | 14                  | 18                   | 538                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 3.9              | 4.9               | 26              | 1.6 | ZV418S_K402_0092 EZ703U | 14                  | 18                   | 538                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 5.0              | 7.1               | 34              | 1.2 | ZV418S_K402_0092 EZ705U | 15                  | 29                   | 573                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 5.2              | 8.7               | 35              | 1.2 | ZV418S_K402_0092 EZ802U | 15                  | 29                   | 573                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 1.6              | 1.8               | 12              | 3.8 | ZV418S_K402_0084 EZ701U | 4.3                 | 16                   | 163                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 2.6              | 3.1               | 19              | 2.4 | ZV418S_K402_0084 EZ702U | 8.7                 | 16                   | 333                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 2.9              | 3.4               | 22              | 2.1 | ZV418S_K402_0084 EZ505U | 13                  | 16                   | 488                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 3.5              | 4.4               | 26              | 1.7 | ZV418S_K402_0084 EZ703U | 13                  | 16                   | 488                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 4.5              | 6.4               | 34              | 1.3 | ZV418S_K402_0084 EZ705U | 15                  | 29                   | 573                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 4.7              | 7.9               | 36              | 1.3 | ZV418S_K402_0084 EZ802U | 15                  | 29                   | 573                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.43   | 5.7              | 10                | 42              | 1.1 | ZV418S_K402_0084 EZ803U | 15                  | 29                   | 573                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.61   | 4.0              | 5.7               | 34              | 1.4 | ZV418S_K402_0075 EZ705U | 15                  | 29                   | 564                | 7.456 | 1.40                 | 1.18      | 2.04                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.61   | 4.2              | 7.0               | 36              | 1.4 | ZV418S_K402_0075 EZ802U | 15                  | 29                   | 564                | 7.456 | 1.40                 | 1.18      | 2.04                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.61   | 5.0              | 9.1               | 43              | 1.2 | ZV418S_K402_0075 EZ803U | 15                  | 29                   | 564                | 7.456 | 1.40                 | 1.18      | 2.04                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 1.3              | 1.4               | 12              | 4.4 | ZV418S_K402_0067 EZ701U | 3.4                 | 13                   | 130                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 2.0              | 2.5               | 19              | 2.7 | ZV418S_K402_0067 EZ702U | 7.0                 | 13                   | 267                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 2.3              | 2.7               | 22              | 2.4 | ZV418S_K402_0067 EZ505U | 10                  | 13                   | 391                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 2.8              | 3.5               | 27              | 2.0 | ZV418S_K402_0067 EZ703U | 10                  | 13                   | 391                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 3.6              | 5.2               | 35              | 1.5 | ZV418S_K402_0067 EZ705U | 14                  | 29                   | 545                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 3.8              | 6.3               | 36              | 1.5 | ZV418S_K402_0067 EZ802U | 14                  | 29                   | 545                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.79   | 4.5              | 8.2               | 43              | 1.2 | ZV418S_K402_0067 EZ803U | 14                  | 29                   | 545                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.00   | 3.2              | 4.6               | 35              | 1.7 | ZV418S_K402_0060 EZ705U | 14                  | 29                   | 525                | 6.000 | 1.73                 | 1.47      | 2.53                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.00   | 3.4              | 5.7               | 37              | 1.6 | ZV418S_K402_0060 EZ802U | 14                  | 29                   | 525                | 6.000 | 1.73                 | 1.47      | 2.53                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.00   | 4.1              | 7.3               | 44              | 1.3 | ZV418S_K402_0060 EZ803U | 14                  | 29                   | 525                | 6.000 | 1.73                 | 1.47      | 2.53                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.21   | 2.9              | 4.2               | 35              | 1.8 | ZV418S_K402_0054 EZ705U | 13                  | 28                   | 508                | 5.422 | 1.92                 | 1.62      | 2.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.21   | 3.1              | 5.1               | 37              | 1.7 | ZV418S_K402_0054 EZ802U | 13                  | 28                   | 508                | 5.422 | 1.92                 | 1.62      | 2.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.21   | 3.7              | 6.6               | 44              | 1.4 | ZV418S_K402_0054 EZ803U | 13                  | 28                   | 508                | 5.422 | 1.92                 | 1.62      | 2.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |

12.2 Selection table 12 ZVK rack and pinion drives

| v <sub>f2N</sub>   | F <sub>f2N</sub> | F <sub>fz,0</sub> | a <sub>th</sub> | S   | Type                    | F <sub>fzaccE</sub> | F <sub>fzNOT,E</sub> | M <sub>zaccE</sub> | i     | v <sub>f2maxDB</sub> |           | v <sub>f2maxZB</sub> | Δs   | Δs <sub>redII</sub> | Δs <sub>redI</sub> | C <sub>lin</sub> | m <sub>n</sub> | z  | d <sub>o</sub> |
|--|------------------|-------------------|-----------------|-----|-------------------------|---------------------|----------------------|--------------------|-------|----------------------|-----------|----------------------|------|---------------------|--------------------|------------------|----------------|----|----------------|
|  |                  |                   |                 |     |                         |                     |                      |                    |       | EL1,2                | EL3,4,5,6 |                      |      |                     |                    |                  |                |    |                |
| [m/s]  | [kN]             | [kN]              |                 |     |                         | [kN]                | [kN]                 | [Nm]               |       | [m/s]                | [m/s]     | [m/s]                | [μm] | [μm]                | [μm]               | [N/μm]           | [mm]           |    | [mm]           |
| <b>ZV4K4 (n<sub>1N</sub> = 3000 rpm, (F<sub>fzacc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 2.75   | 2.4              | 3.3               | 36              | 2.1 | ZV418S_K402_0044 EZ705U | 12                  | 22                   | 440                | 4.364 | 2.38                 | 2.02      | 3.48                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.75   | 2.5              | 4.1               | 38              | 2.0 | ZV418S_K402_0044 EZ802U | 11                  | 22                   | 423                | 4.364 | 2.38                 | 2.02      | 3.48                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.75   | 2.9              | 5.3               | 45              | 1.6 | ZV418S_K402_0044 EZ803U | 12                  | 22                   | 472                | 4.364 | 2.38                 | 2.02      | 3.48                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 3.00   | 2.2              | 3.1               | 36              | 2.2 | ZV418S_K402_0040 EZ705U | 11                  | 20                   | 404                | 4.000 | 2.60                 | 2.20      | 3.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 3.00   | 2.3              | 3.8               | 38              | 2.1 | ZV418S_K402_0040 EZ802U | 10                  | 20                   | 388                | 4.000 | 2.60                 | 2.20      | 3.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 3.00   | 2.7              | 4.9               | 45              | 1.7 | ZV418S_K402_0040 EZ803U | 12                  | 20                   | 459                | 4.000 | 2.60                 | 2.20      | 3.80                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| <b>ZV4K4 (n<sub>1N</sub> = 4500 rpm, (F<sub>fzacc,max</sub> = 15 kN)</b> |                  |                   |                 |     |                         |                     |                      |                    |       |                      |           |                      |      |                     |                    |                  |                |    |                |
| 0.65   | 6.7              | 11                | 16              | 1.0 | ZV418S_K402_0280 EZ505U | 15                  | 29                   | 573                | 27.77 | 0.52                 | 0.48      | 0.79                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 6.1              | 9.8               | 16              | 1.1 | ZV418S_K402_0250 EZ505U | 15                  | 26                   | 573                | 25.28 | 0.57                 | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.71   | 6.7              | 22                | 17              | 1.0 | ZV418S_K402_0250 EZ802U | 15                  | 26                   | 573                | 25.28 | 0.57                 | 0.52      | 0.87                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.77   | 5.6              | 9.0               | 16              | 1.2 | ZV418S_K402_0230 EZ505U | 15                  | 29                   | 573                | 23.29 | 0.62                 | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.77   | 6.2              | 20                | 18              | 1.1 | ZV418S_K402_0230 EZ802U | 15                  | 29                   | 573                | 23.29 | 0.62                 | 0.57      | 0.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.89   | 4.9              | 7.8               | 16              | 1.4 | ZV418S_K402_0200 EZ505U | 15                  | 29                   | 573                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.89   | 5.4              | 18                | 18              | 1.3 | ZV418S_K402_0200 EZ802U | 15                  | 29                   | 573                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 0.89   | 6.2              | 10                | 21              | 1.1 | ZV418S_K402_0200 EZ703U | 15                  | 29                   | 573                | 20.20 | 0.71                 | 0.65      | 1.09                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.03   | 4.2              | 6.8               | 16              | 1.6 | ZV418S_K402_0175 EZ505U | 15                  | 29                   | 573                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.03   | 4.6              | 15                | 18              | 1.4 | ZV418S_K402_0175 EZ802U | 15                  | 29                   | 573                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.03   | 5.3              | 8.8               | 21              | 1.3 | ZV418S_K402_0175 EZ703U | 15                  | 29                   | 573                | 17.41 | 0.78                 | 0.69      | 1.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.06   | 4.1              | 6.6               | 16              | 1.6 | ZV418S_K402_0170 EZ505U | 15                  | 27                   | 573                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.06   | 4.5              | 15                | 18              | 1.5 | ZV418S_K402_0170 EZ802U | 15                  | 29                   | 573                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.06   | 5.2              | 8.6               | 21              | 1.3 | ZV418S_K402_0170 EZ703U | 15                  | 27                   | 573                | 16.94 | 0.85                 | 0.78      | 1.30                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 3.3              | 5.4               | 17              | 1.9 | ZV418S_K402_0140 EZ505U | 15                  | 26                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 3.7              | 12                | 18              | 1.7 | ZV418S_K402_0140 EZ802U | 15                  | 29                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 4.3              | 7.1               | 21              | 1.5 | ZV418S_K402_0140 EZ703U | 15                  | 26                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.30   | 5.8              | 11                | 29              | 1.1 | ZV418S_K402_0140 EZ705U | 15                  | 29                   | 573                | 13.89 | 0.98                 | 0.86      | 1.44                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.42   | 3.1              | 4.9               | 17              | 2.0 | ZV418S_K402_0125 EZ505U | 15                  | 23                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.42   | 3.4              | 11                | 19              | 1.8 | ZV418S_K402_0125 EZ802U | 15                  | 29                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.42   | 3.9              | 6.4               | 21              | 1.6 | ZV418S_K402_0125 EZ703U | 15                  | 23                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.42   | 5.3              | 9.6               | 29              | 1.1 | ZV418S_K402_0125 EZ705U | 15                  | 29                   | 573                | 12.66 | 1.07                 | 0.95      | 1.58                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.56   | 2.8              | 4.5               | 17              | 2.1 | ZV418S_K402_0115 EZ505U | 15                  | 22                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.56   | 3.1              | 10                | 19              | 1.9 | ZV418S_K402_0115 EZ802U | 15                  | 29                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.56   | 3.5              | 5.8               | 22              | 1.7 | ZV418S_K402_0115 EZ703U | 15                  | 22                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.56   | 4.8              | 8.8               | 29              | 1.2 | ZV418S_K402_0115 EZ705U | 15                  | 29                   | 573                | 11.52 | 1.04                 | 0.90      | 1.56                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.78   | 2.4              | 3.9               | 17              | 2.3 | ZV418S_K402_0100 EZ505U | 15                  | 19                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.78   | 2.7              | 8.8               | 19              | 2.1 | ZV418S_K402_0100 EZ802U | 15                  | 29                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.78   | 3.1              | 5.1               | 22              | 1.8 | ZV418S_K402_0100 EZ703U | 15                  | 19                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.78   | 4.2              | 7.7               | 29              | 1.3 | ZV418S_K402_0100 EZ705U | 15                  | 29                   | 573                | 10.10 | 1.35                 | 1.19      | 1.98                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.95   | 2.2              | 3.6               | 17              | 2.4 | ZV418S_K402_0092 EZ505U | 14                  | 18                   | 538                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.95   | 2.5              | 8.1               | 19              | 2.2 | ZV418S_K402_0092 EZ802U | 15                  | 29                   | 573                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.95   | 2.8              | 4.7               | 22              | 1.9 | ZV418S_K402_0092 EZ703U | 14                  | 18                   | 538                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 1.95   | 3.8              | 7.0               | 30              | 1.4 | ZV418S_K402_0092 EZ705U | 15                  | 29                   | 573                | 9.238 | 1.30                 | 1.13      | 1.95                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.15   | 2.0              | 3.3               | 17              | 2.6 | ZV418S_K402_0084 EZ505U | 13                  | 16                   | 488                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.15   | 2.2              | 7.3               | 19              | 2.4 | ZV418S_K402_0084 EZ802U | 15                  | 29                   | 573                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.15   | 2.6              | 4.3               | 22              | 2.0 | ZV418S_K402_0084 EZ703U | 13                  | 16                   | 488                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.15   | 3.5              | 6.4               | 30              | 1.5 | ZV418S_K402_0084 EZ705U | 15                  | 29                   | 573                | 8.377 | 1.43                 | 1.24      | 2.15                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.68   | 1.6              | 2.6               | 18              | 3.0 | ZV418S_K402_0067 EZ505U | 10                  | 13                   | 391                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.68   | 1.8              | 5.9               | 20              | 2.7 | ZV418S_K402_0067 EZ802U | 14                  | 29                   | 545                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.68   | 2.1              | 3.4               | 23              | 2.4 | ZV418S_K402_0067 EZ703U | 10                  | 13                   | 391                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |
| 2.68   | 2.8              | 5.1               | 30              | 1.8 | ZV418S_K402_0067 EZ705U | 14                  | 29                   | 545                | 6.719 | 1.79                 | 1.55      | 2.68                 | 111  | 44                  | 17                 | 34               | 4              | 18 | 76.4           |

## 12.3 Dimensional drawings

This chapter shows you the dimensions of rack and pinion drives with EZ synchronous servo motors.

Dimension  $a_z$  in the tables of dimensions applies to Atlanta gear racks. In general:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

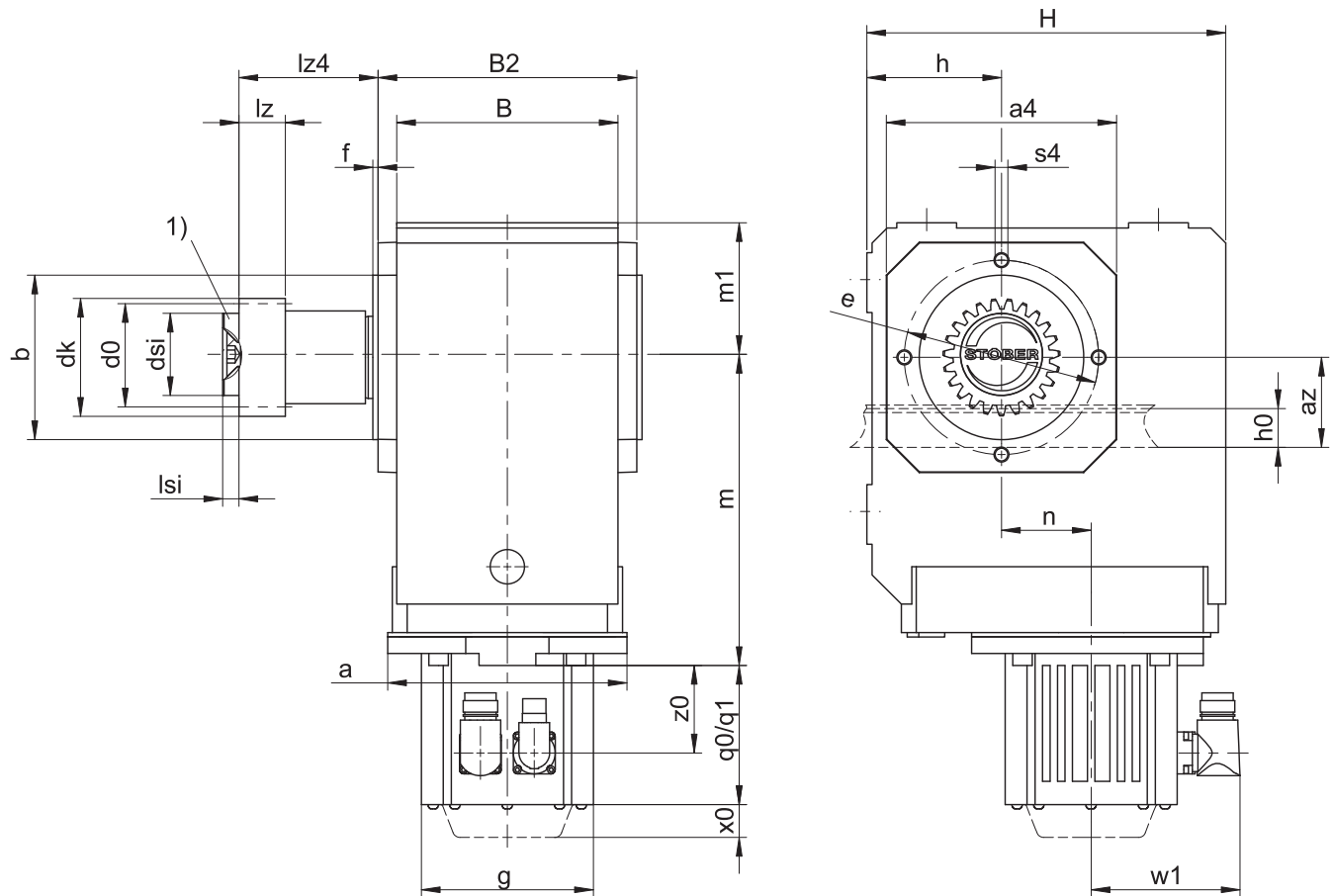
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

Combination options and the dimensions of forced ventilated geared motors can also be found at <https://configurator.stoeber.de/en-US/>.

### 12.3.1 Pinion position E



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type       | mn | az    | □a4 | Øb               | B   | B2  | Ød0   | Ødk   | Ødsi | Øe  | f   | h  | h0 | H   | lz | lz4  | lsi | m1 | s4  | x   |
|------------|----|-------|-----|------------------|-----|-----|-------|-------|------|-----|-----|----|----|-----|----|------|-----|----|-----|-----|
| ZV220SEK1_ | 2  | 44.02 | 105 | 75 <sub>6</sub>  | 90  | 106 | 42.44 | 47.90 | 30   | 90  | 3.0 | 60 | 22 | 160 | 26 | 50.5 | 6   | 60 | M8  | 0.4 |
| ZV225SEK2_ | 2  | 49.33 | 116 | 82 <sub>6</sub>  | 115 | 134 | 53.05 | 58.52 | 45   | 100 | 3.0 | 65 | 22 | 190 | 26 | 67.5 | 8   | 65 | M8  | 0.4 |
| ZV318SEK2_ | 3  | 55.55 | 116 | 82 <sub>6</sub>  | 115 | 134 | 57.30 | 65.01 | 45   | 100 | 3.0 | 65 | 26 | 190 | 31 | 67.5 | 8   | 65 | M8  | 0.3 |
| ZV225SEK3_ | 2  | 49.33 | 132 | 95 <sub>6</sub>  | 130 | 146 | 53.05 | 58.52 | 45   | 115 | 3.0 | 75 | 22 | 213 | 26 | 68.5 | 8   | 75 | M8  | 0.4 |
| ZV318SEK3_ | 3  | 55.55 | 132 | 95 <sub>6</sub>  | 130 | 146 | 57.30 | 65.01 | 45   | 115 | 3.0 | 75 | 26 | 213 | 31 | 68.5 | 8   | 75 | M8  | 0.3 |
| ZV322SEK4_ | 3  | 62.21 | 152 | 110 <sub>6</sub> | 148 | 173 | 70.03 | 78.35 | 55   | 130 | 3.5 | 90 | 26 | 240 | 31 | 93.0 | 10  | 90 | M10 | 0.4 |
| ZV418SEK4_ | 4  | 74.40 | 152 | 110 <sub>6</sub> | 148 | 173 | 76.40 | 86.77 | 55   | 130 | 3.5 | 90 | 35 | 240 | 41 | 93.0 | 10  | 90 | M10 | 0.3 |

#### Dimensions of motors

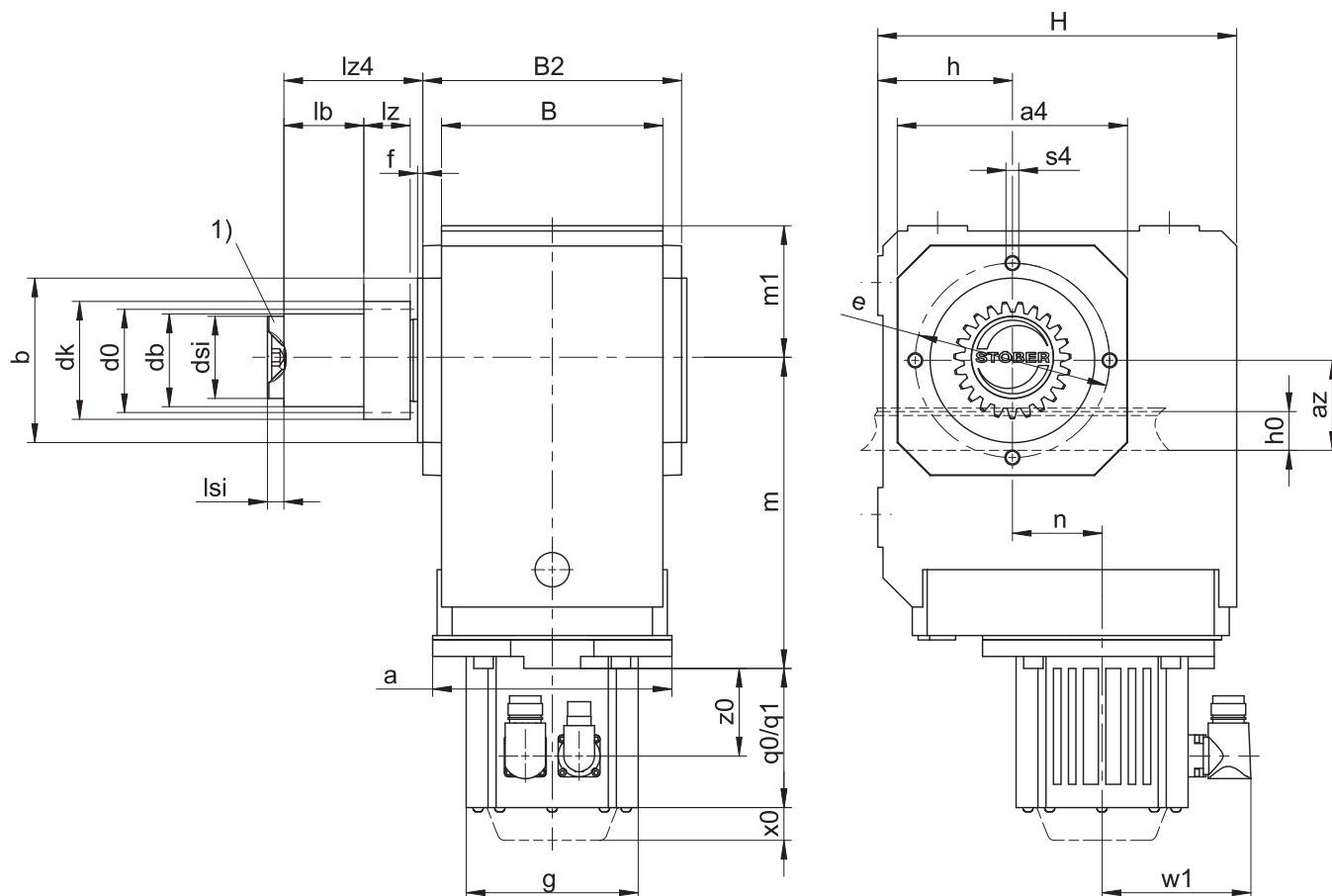
| Type   | □g  | q0    | q1    | w1    | x0 | z0    |
|--------|-----|-------|-------|-------|----|-------|
| EZ202U | 55  | 148.0 | 157.0 | 47.0  | 25 | 93.0  |
| EZ203U | 55  | 166.0 | 175.0 | 47.0  | 25 | 111.0 |
| EZ301U | 72  | 114.0 | 154.0 | 55.5  | 21 | 78.5  |
| EZ302U | 72  | 136.0 | 176.0 | 55.5  | 21 | 100.5 |
| EZ303U | 72  | 158.0 | 198.0 | 55.5  | 21 | 122.5 |
| EZ401U | 98  | 118.5 | 167.0 | 91.0  | 22 | 76.5  |
| EZ402U | 98  | 143.5 | 192.0 | 91.0  | 22 | 101.5 |
| EZ404U | 98  | 193.5 | 242.0 | 91.0  | 22 | 151.5 |
| EZ501U | 115 | 112.0 | 166.5 | 100.0 | 22 | 77.5  |
| EZ502U | 115 | 137.0 | 191.5 | 100.0 | 22 | 102.5 |
| EZ503U | 115 | 162.0 | 216.5 | 100.0 | 22 | 127.5 |
| EZ505U | 115 | 212.0 | 266.5 | 100.0 | 22 | 177.5 |
| EZ701U | 145 | 125.0 | 184.0 | 115.0 | 22 | 87.0  |
| EZ702U | 145 | 150.0 | 209.0 | 115.0 | 22 | 112.0 |
| EZ703U | 145 | 175.0 | 234.0 | 115.0 | 22 | 137.0 |

| Type   | □g  | q0    | q1    | w1    | x0 | z0    |
|--------|-----|-------|-------|-------|----|-------|
| EZ705U | 145 | 230.0 | 289.0 | 134.0 | 22 | 188.0 |
| EZ802U | 190 | 232.5 | 309.5 | 156.5 | 22 | 178.5 |
| EZ803U | 190 | 273.5 | 350.5 | 156.5 | 22 | 219.5 |
| EZ805U | 190 | 355.5 | 432.5 | 156.5 | 22 | 301.5 |

## Dimensions of geared motors

| Type     | EZ2 |     |      | EZ3  |     |      | EZ4  |     |      | EZ5  |     |      | EZ7  |     |      | EZ8  |     |      |
|----------|-----|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|
|          | a   | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    |
| ZV_K102_ | □55 | 124 | 36.0 | □72  | 124 | 36.0 | □98  | 124 | 36.0 | □115 | 128 | 36.0 | □145 | 130 | 36.0 | -    | -   | -    |
| ZV_K202_ | -   | -   | -    | □72  | 143 | 46.0 | □98  | 143 | 46.0 | □115 | 147 | 46.0 | □145 | 149 | 46.0 | -    | -   | -    |
| ZV_K203_ | -   | -   | -    | ∅140 | 180 | 46.0 | ∅140 | 180 | 46.0 | -    | -   | -    | -    | -   | -    | -    | -   | -    |
| ZV_K302_ | -   | -   | -    | ∅140 | 163 | 52.5 | ∅140 | 163 | 52.5 | □115 | 167 | 52.5 | □145 | 169 | 52.5 | -    | -   | -    |
| ZV_K303_ | -   | -   | -    | ∅140 | 200 | 52.5 | ∅140 | 200 | 52.5 | ∅160 | 210 | 16.0 | -    | -   | -    | -    | -   | -    |
| ZV_K402_ | -   | -   | -    | -    | -   | -    | -    | -   | -    | ∅160 | 187 | 60.0 | □145 | 189 | 60.0 | □190 | 192 | 60.0 |
| ZV_K403_ | -   | -   | -    | ∅140 | 220 | 60.0 | ∅140 | 220 | 60.0 | ∅160 | 230 | 23.0 | -    | -   | -    | -    | -   | -    |

### 12.3.2 Pinion position S



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

x0 Applies to encoders using an optical measuring method.

w1 Different for the One Cable Solution (OCS), see the chapter [13.4](#)

1) Axial locking (optional)

#### Dimensions of gear units

| Type       | mn | az    | a4  | $\varnothing b$   | B   | B2  | $\varnothing d_0$ | $\varnothing d_b$ | $\varnothing d_k$ | $\varnothing d_{si}$ | $\varnothing e$ | f   | h  | h0 | H   | l <sub>b</sub> | l <sub>z</sub> | l <sub>z4</sub> | l <sub>si</sub> | m1 | $\varnothing s4$ | x   |
|------------|----|-------|-----|-------------------|-----|-----|-------------------|-------------------|-------------------|----------------------|-----------------|-----|----|----|-----|----------------|----------------|-----------------|-----------------|----|------------------|-----|
| ZV220SSK1_ | 2  | 44.02 | 105 | 75 <sub>f6</sub>  | 90  | 106 | 42.44             | 38                | 47.90             | 30                   | 90              | 3.0 | 60 | 22 | 160 | 12.5           | 26             | 50.5            | 6               | 60 | M8               | 0.4 |
| ZV225SSK2_ | 2  | 49.33 | 116 | 82 <sub>f6</sub>  | 115 | 134 | 53.05             | 50                | 58.52             | 45                   | 100             | 3.0 | 65 | 22 | 190 | 34.5           | 26             | 67.5            | 8               | 65 | M8               | 0.4 |
| ZV318SSK2_ | 3  | 55.55 | 116 | 82 <sub>f6</sub>  | 115 | 134 | 57.30             | 50                | 65.01             | 45                   | 100             | 3.0 | 65 | 26 | 190 | 29.5           | 31             | 67.5            | 8               | 65 | M8               | 0.3 |
| ZV225SSK3_ | 2  | 49.33 | 132 | 95 <sub>f6</sub>  | 130 | 146 | 53.05             | 50                | 58.52             | 45                   | 115             | 3.0 | 75 | 22 | 213 | 34.5           | 26             | 68.5            | 8               | 75 | M8               | 0.4 |
| ZV318SSK3_ | 3  | 55.55 | 132 | 95 <sub>f6</sub>  | 130 | 146 | 57.30             | 50                | 65.01             | 45                   | 115             | 3.0 | 75 | 26 | 213 | 29.5           | 31             | 68.5            | 8               | 75 | M8               | 0.3 |
| ZV322SSK4_ | 3  | 62.21 | 152 | 110 <sub>f6</sub> | 148 | 173 | 70.03             | 62                | 78.35             | 55                   | 130             | 3.5 | 90 | 26 | 240 | 53.5           | 31             | 93.0            | 10              | 90 | M10              | 0.4 |
| ZV418SSK4_ | 4  | 74.40 | 152 | 110 <sub>f6</sub> | 148 | 173 | 76.40             | 62                | 86.77             | 55                   | 130             | 3.5 | 90 | 35 | 240 | 43.5           | 41             | 93.0            | 10              | 90 | M10              | 0.3 |

## Dimensions of motors

| Type   | □g  | q0    | q1    | w1    | x0 | z0    |
|--------|-----|-------|-------|-------|----|-------|
| EZ202U | 55  | 148.0 | 157.0 | 47.0  | 25 | 93.0  |
| EZ203U | 55  | 166.0 | 175.0 | 47.0  | 25 | 111.0 |
| EZ301U | 72  | 114.0 | 154.0 | 55.5  | 21 | 78.5  |
| EZ302U | 72  | 136.0 | 176.0 | 55.5  | 21 | 100.5 |
| EZ303U | 72  | 158.0 | 198.0 | 55.5  | 21 | 122.5 |
| EZ401U | 98  | 118.5 | 167.0 | 91.0  | 22 | 76.5  |
| EZ402U | 98  | 143.5 | 192.0 | 91.0  | 22 | 101.5 |
| EZ404U | 98  | 193.5 | 242.0 | 91.0  | 22 | 151.5 |
| EZ501U | 115 | 112.0 | 166.5 | 100.0 | 22 | 77.5  |
| EZ502U | 115 | 137.0 | 191.5 | 100.0 | 22 | 102.5 |
| EZ503U | 115 | 162.0 | 216.5 | 100.0 | 22 | 127.5 |
| EZ505U | 115 | 212.0 | 266.5 | 100.0 | 22 | 177.5 |
| EZ701U | 145 | 125.0 | 184.0 | 115.0 | 22 | 87.0  |
| EZ702U | 145 | 150.0 | 209.0 | 115.0 | 22 | 112.0 |
| EZ703U | 145 | 175.0 | 234.0 | 115.0 | 22 | 137.0 |
| EZ705U | 145 | 230.0 | 289.0 | 134.0 | 22 | 188.0 |
| EZ802U | 190 | 232.5 | 309.5 | 156.5 | 22 | 178.5 |
| EZ803U | 190 | 273.5 | 350.5 | 156.5 | 22 | 219.5 |
| EZ805U | 190 | 355.5 | 432.5 | 156.5 | 22 | 301.5 |

## Dimensions of geared motors

| Type     | EZ2 |     |      | EZ3  |     |      | EZ4  |     |      | EZ5  |     |      | EZ7  |     |      | EZ8  |     |      |
|----------|-----|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|
|          | a   | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    | a    | m   | n    |
| ZV_K102_ | □55 | 124 | 36.0 | □72  | 124 | 36.0 | □98  | 124 | 36.0 | □115 | 128 | 36.0 | □145 | 130 | 36.0 | -    | -   | -    |
| ZV_K202_ | -   | -   | -    | □72  | 143 | 46.0 | □98  | 143 | 46.0 | □115 | 147 | 46.0 | □145 | 149 | 46.0 | -    | -   | -    |
| ZV_K203_ | -   | -   | -    | ∅140 | 180 | 46.0 | ∅140 | 180 | 46.0 | -    | -   | -    | -    | -   | -    | -    | -   | -    |
| ZV_K302_ | -   | -   | -    | ∅140 | 163 | 52.5 | ∅140 | 163 | 52.5 | □115 | 167 | 52.5 | □145 | 169 | 52.5 | -    | -   | -    |
| ZV_K303_ | -   | -   | -    | ∅140 | 200 | 52.5 | ∅140 | 200 | 52.5 | ∅160 | 210 | 16.0 | -    | -   | -    | -    | -   | -    |
| ZV_K402_ | -   | -   | -    | -    | -   | -    | -    | -   | -    | ∅160 | 187 | 60.0 | □145 | 189 | 60.0 | □190 | 192 | 60.0 |
| ZV_K403_ | -   | -   | -    | ∅140 | 220 | 60.0 | ∅140 | 220 | 60.0 | ∅160 | 230 | 23.0 | -    | -   | -    | -    | -   | -    |

## 12.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

### Example code

|   |   |   |    |   |   |   |   |   |   |   |   |      |        |
|---|---|---|----|---|---|---|---|---|---|---|---|------|--------|
| Z | V | 3 | 22 | S | S | K | 4 | 0 | 2 | V | G | 0084 | EZ802U |
|---|---|---|----|---|---|---|---|---|---|---|---|------|--------|

### Explanation

| Code   | Designation                                 | Design                          |
|--------|---|---------------------------------|
| Z      | Type  | Rack and pinion drive           |
| V      | Design                                      | Plug-on pinion                  |
| 3      | Module                                      | $m_n = 3$ (example)             |
| 22     | Number of teeth                             | $z = 22$ (example)              |
| S      | Toothing                                    | Helical (left-hand 19° 31' 42") |
| E      | Pinion position                             | Shaft end                       |
| S      |   | Shaft shoulder                  |
| K      | Type  | Helical bevel gear unit         |
| 4      | Size  | 4 (example)                     |
| 0      | Generation                                  | Generation 0                    |
| 1      |   | Generation 1                    |
| 2      | Stages                                      | Two-stage                       |
| 3      |   | Three-stage                     |
| V      | Shaft                                       | Solid shaft                     |
| G      | Housing                                     | Pitch circle diameter           |
| 0084   | Transmission ratio ( $i \times 10$ rounded) | $i = 8.377$ (example)           |
| EZ802U | Motor                                       | EZ synchronous servo motor      |

### To complete the type designation, also specify the following in your order:

- A detailed type designation of the motor, see the chapter [\[ 13\]](#)
- Mounting position, see the chapter [\[ 12.5.4\]](#)
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- Backlash: Standard/class II/class I. Backlash class II and class I for an additional charge.
- For axial locking (optional), see the chapter [\[ 12.3\]](#)
- For the position of the plug connectors, see the chapter [\[ 12.5.6\]](#)

An explanation of the gear unit sides can be found in the chapter [\[ 12.5.4\]](#)

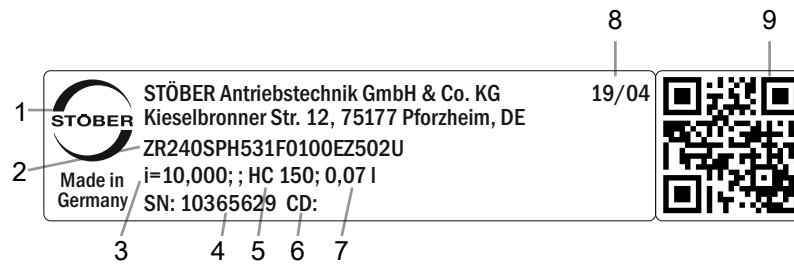
In this catalog, you will find all information on rack and pinion drives with EZ synchronous servo motors.

All input options available on request can be found in the chapter [\[ 12.5.1\]](#).



## 12.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



| Code | Designation                              |
|------|--|
| 1    | Name of manufacturer                     |
| 2    | Type designation                         |
| 3    | Gear ratio of the gear unit              |
| 4    | Serial number of the gear unit           |
| 5    | Lubricant specification                  |
| 6    | Customer-specific data                   |
| 7    | Lubricant fill volume                    |
| 8    | Date of manufacture (year/calendar week) |
| 9    | QR code (link to product information)    |

### 12.4.1.1 Supporting documents

You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:

<https://id.stober.com>

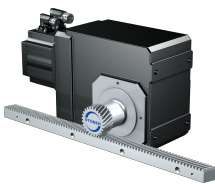
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 12.5 Product description

### 12.5.1 Input options

This chapter shows you all available input options:

EZ synchronous servo motor



Catalog ID 443286\_en

ME motor adapter



Catalog ID 443137\_en

MB motor adapter



On request

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

You can also acquire rack and pinion drives with low-backlash K gear units on request. To do so, send us an e-mail at [sales@stober.de](mailto:sales@stober.de).

## 12.5.2 Gear rack

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 6.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

| Module $m_n$ [mm] | Minimum gear rack quality | Gear rack material       |
|-------------------|---------------------------|--------------------------|
| 2 – 4             | 8                         | C45 inductively hardened |

Also note the project configuration of the gear rack on the Atlanta pages.

### 12.5.2.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

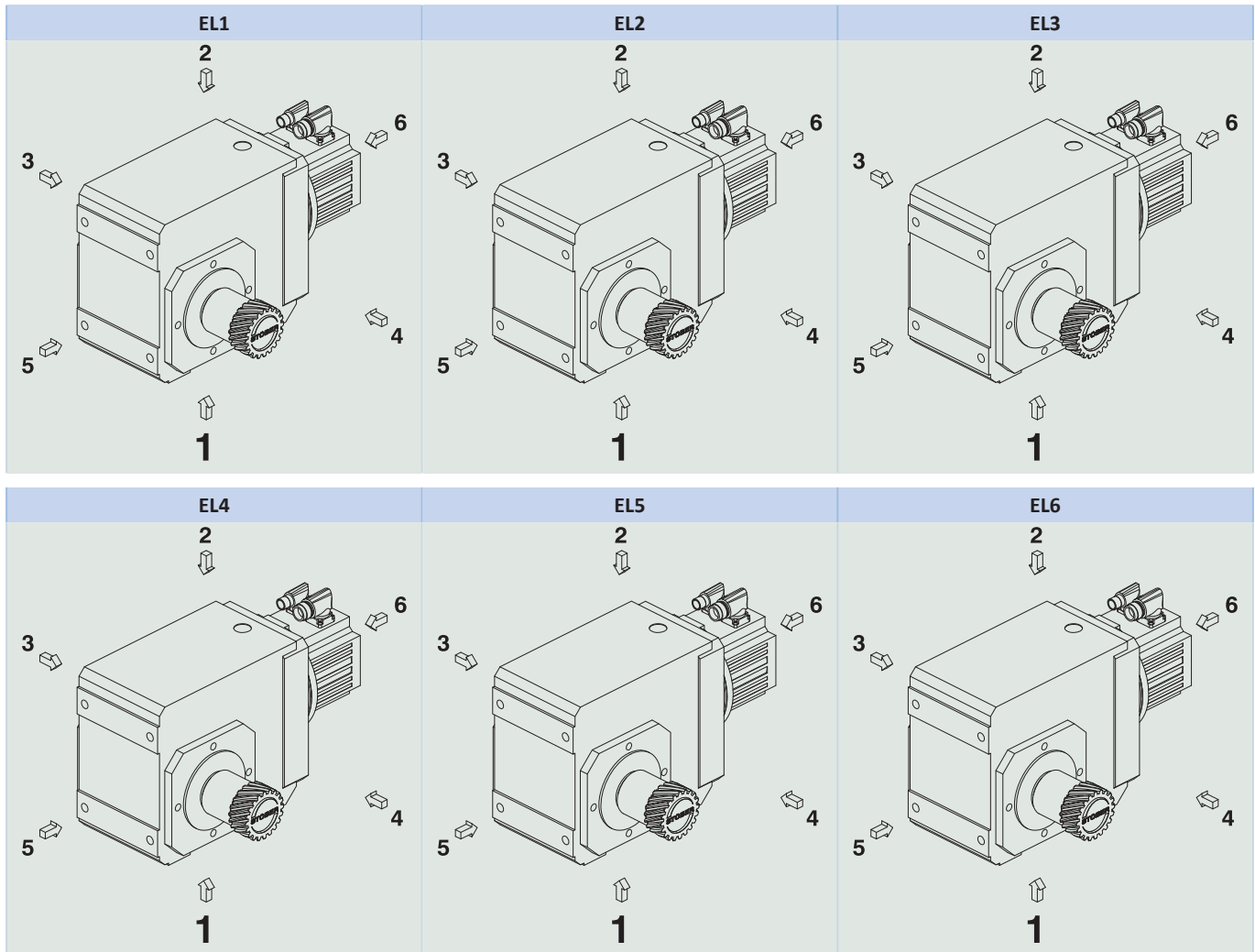
## 12.5.3 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 12.5.4 Mounting positions

The following table shows the standard mounting positions.

The numbers identify the gear unit sides. The mounting position is defined by the gear side facing downwards.



Since the lubricant filling volume of the gear unit depends on the mounting position, the mounting position must be specified when ordering.

## 12.5.5 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate. The filling volume and the structure of the gear units depend on the mounting position.

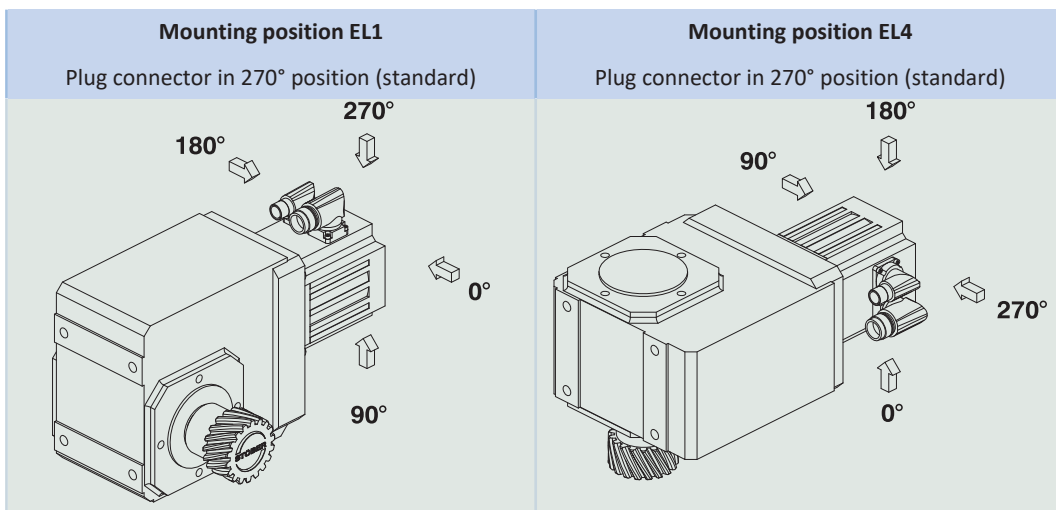
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

### 12.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

### 12.5.6 Position of the plug connectors



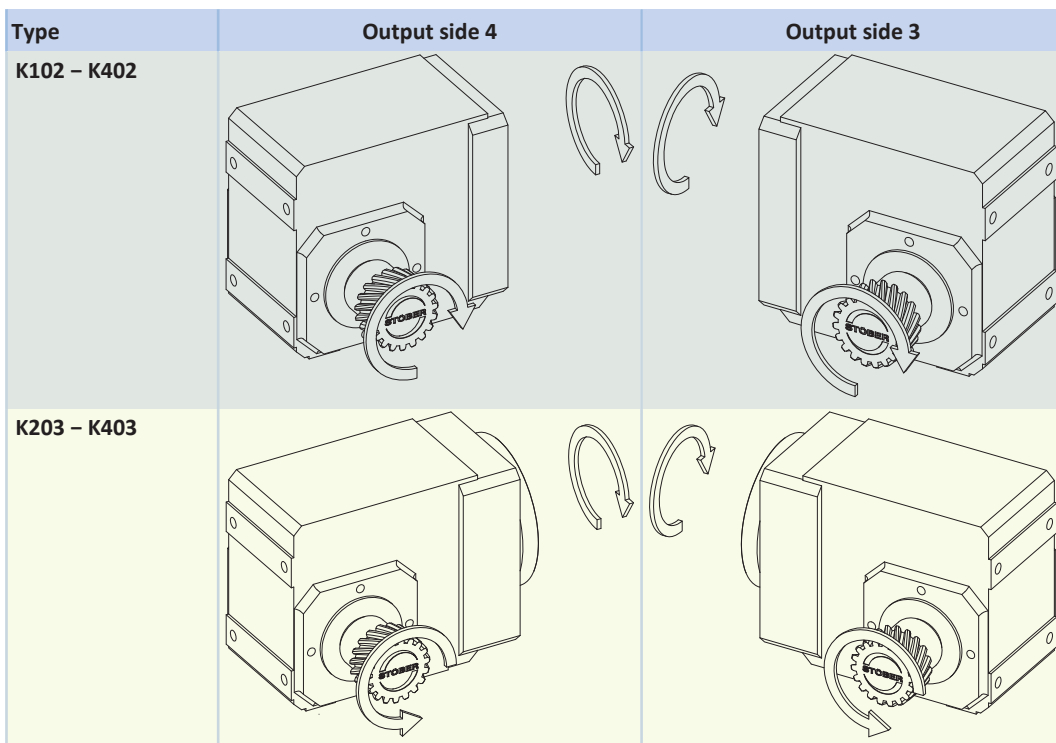
The plug connectors are in the 270° position as standard. Indicate variations for your rack and pinion drive in the order.

Note that the plug connectors also rotate when the gear rack is rotated to a different position.

### 12.5.7 Other product features

| Feature  | Value                 |
|--|-----------------------|
| Max. permitted gear unit temperature (on the surface of the gear unit) | ≤ 80 °C               |
| Paint  | Black RAL 9005        |
| (ATEX) Directive 2014/34/EU (Option)                                   | Not suitable.         |
| Protection class: <sup>1</sup>   |                       |
| Planetary gear units   | IP65                  |
| Motor  | IP56, optionally IP66 |
| Pinion/gear rack   | IPXX                  |

### 12.5.8 Direction of rotation



The pictures show mounting position EL1.

<sup>1</sup>Observe the protection class of all the components.

## 12.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

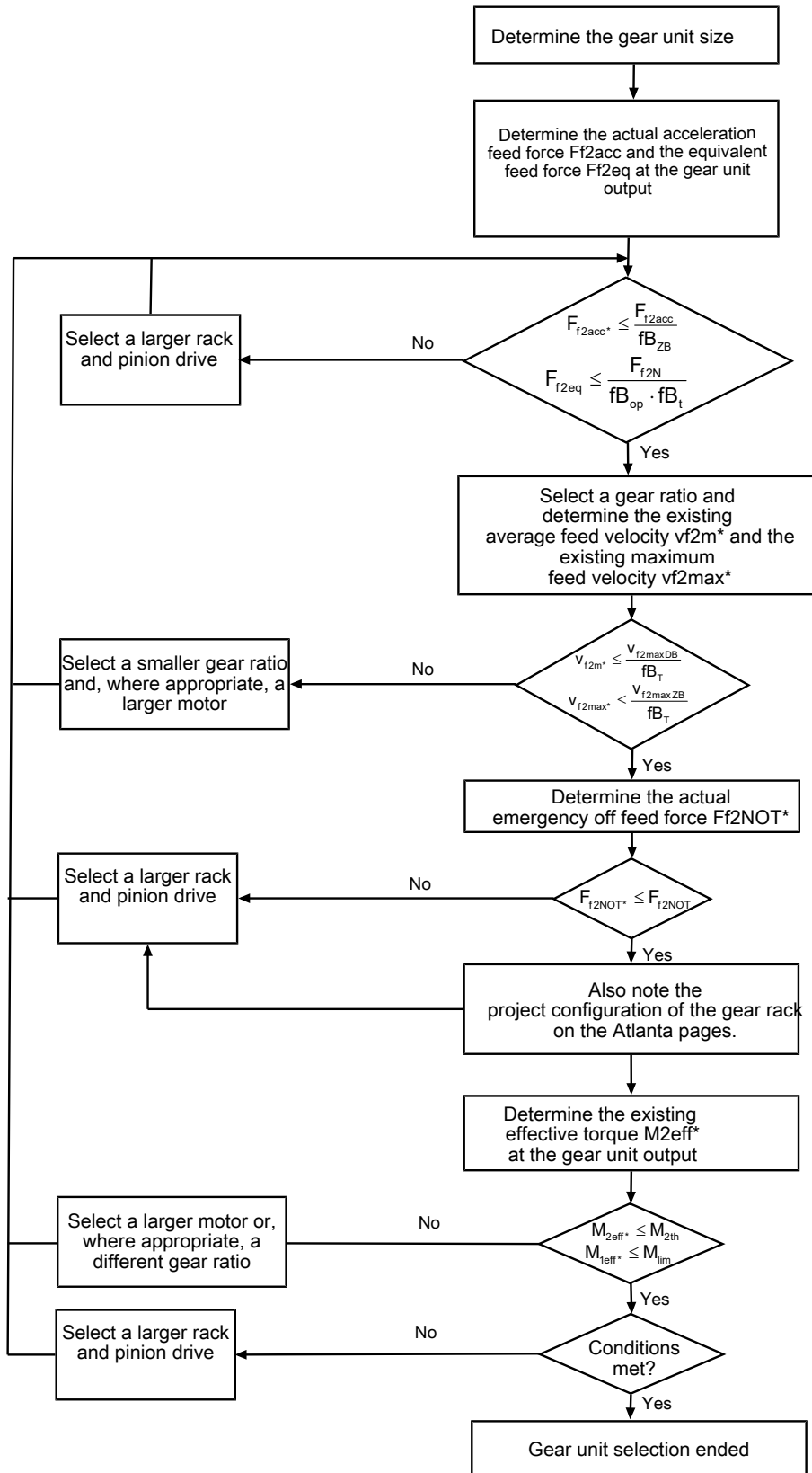
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 15.1](#).

### 12.6.1 Drive selection

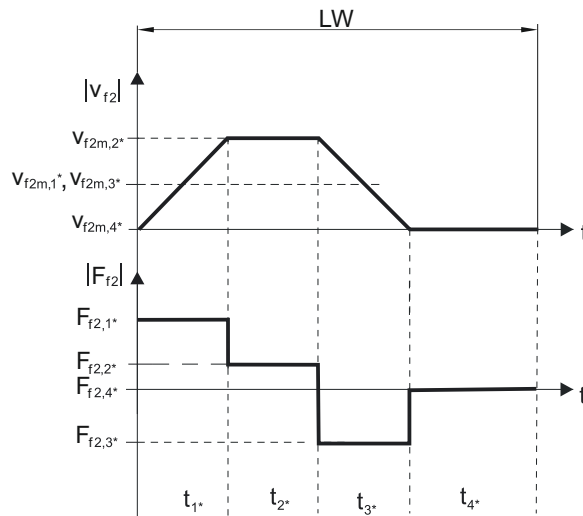


Refer to the selection tables for the values of  $i$ ,  $v_{f2maxDB}$ ,  $v_{f2maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  can be found in the corresponding tables in this chapter.

**Example of cyclic operation**

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

**Calculation of the actual average input speed**

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

The values for the ratio  $i$  can be found in the selection tables.

**Calculation of the actual emergency off feed force**

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

**Calculation of the actual equivalent feed force**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Calculation of the thermal limit torque**

Calculate the thermal limit torque  $M_{2th}$  for a duty cycle  $ED_{10} > 50\%$  and the actual average input speed  $n_{1m*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m*}$  accordingly or select another geared motor size.)

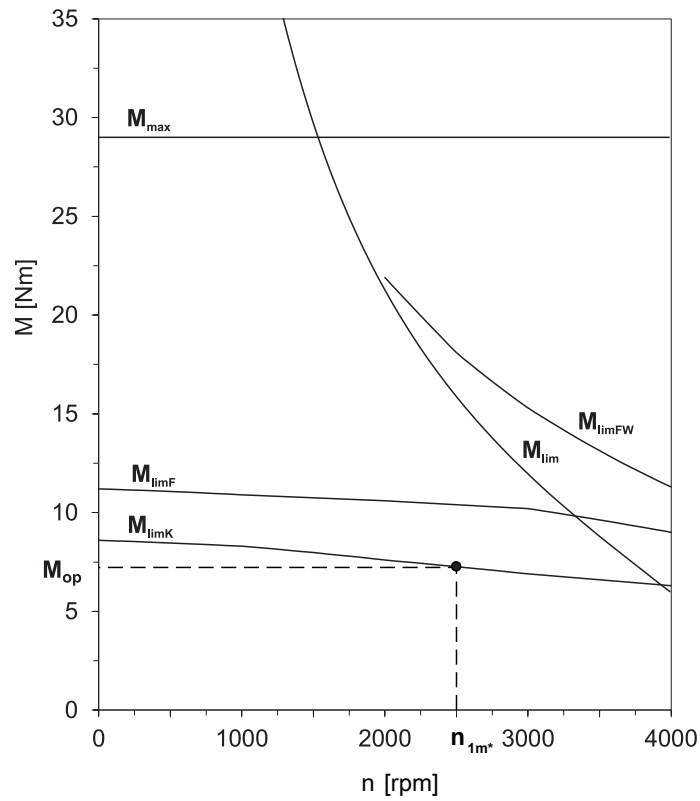
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,95 - \frac{a_{th}}{1000} \cdot athEL \cdot fB_T \cdot \left( \frac{n_{1m*}}{1000} \right)^2$$

Refer to the selection tables for the values of  $i$  and  $a_{th}$ .

The values for  $a_{thEL}$  and  $fB_T$  can be found in the corresponding tables in this chapter.

The value for the torque of the motor at operating point  $M_{op}$  with the determined average input speed  $n_{1m*}$  can be found in the motor characteristic curve in the chapter [▶ 13.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.



Calculation of the actual effective torque

$$M_{2eff*} = \sqrt{\frac{t_{1*} \cdot M_{2,1*}^2 + \dots + t_{n*} \cdot M_{2,n*}^2}{t_{1*} + \dots + t_{n*}}}$$

$$M_{2,n*} = \frac{F_{f2,n*} \cdot d_0}{2}$$

$$M_{1eff*} = \frac{M_{2eff*}}{i \cdot \eta}$$

Operating factors

Parameter  $a_{thEL}$

|                                 |                              |
|---------------------------------|------------------------------|
| <b>Mounting position</b>        | <b><math>a_{thEL}</math></b> |
| EL1, 2                          | 1.0                          |
| EL3, 4, 5, 6                    | 1.1                          |
| <b>Operating mode</b>           | <b><math>fB_{op}</math></b>  |
| Uniform continuous operation    | 1.00                         |
| Cyclic operation                | 1.00                         |
| Reversing load cyclic operation | 1.00                         |
| <b>Run time</b>                 | <b><math>fB_t</math></b>     |
| Daily runtime ≤ 8 h             | 1.00                         |
| Daily runtime ≤ 16 h            | 1.15                         |
| Daily runtime ≤ 24 h            | 1.20                         |
| <b>Cyclic operation</b>         | <b><math>fB_{zB}</math></b>  |
| ≤ 1000 load changes/hour (LW/h) | 1.00                         |
| > 1000 load changes/hour (LW/h) | 1.15                         |



| Temperature                   |                         | $f_{B_T}$ |
|-------------------------------|-------------------------|-----------|
| Motor cooling                 | Surrounding temperature |           |
| Motor with forced ventilation | $\leq 20\text{ °C}$     | 0.9       |
|                               | $\leq 30\text{ °C}$     | 1.0       |
|                               | $\leq 40\text{ °C}$     | 1.15      |
| Motor with convection cooling | $\leq 20\text{ °C}$     | 1.0       |
|                               | $\leq 30\text{ °C}$     | 1.1       |
|                               | $\leq 40\text{ °C}$     | 1.25      |

**Notes**

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$ ) in the selection tables.

## 12.7 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

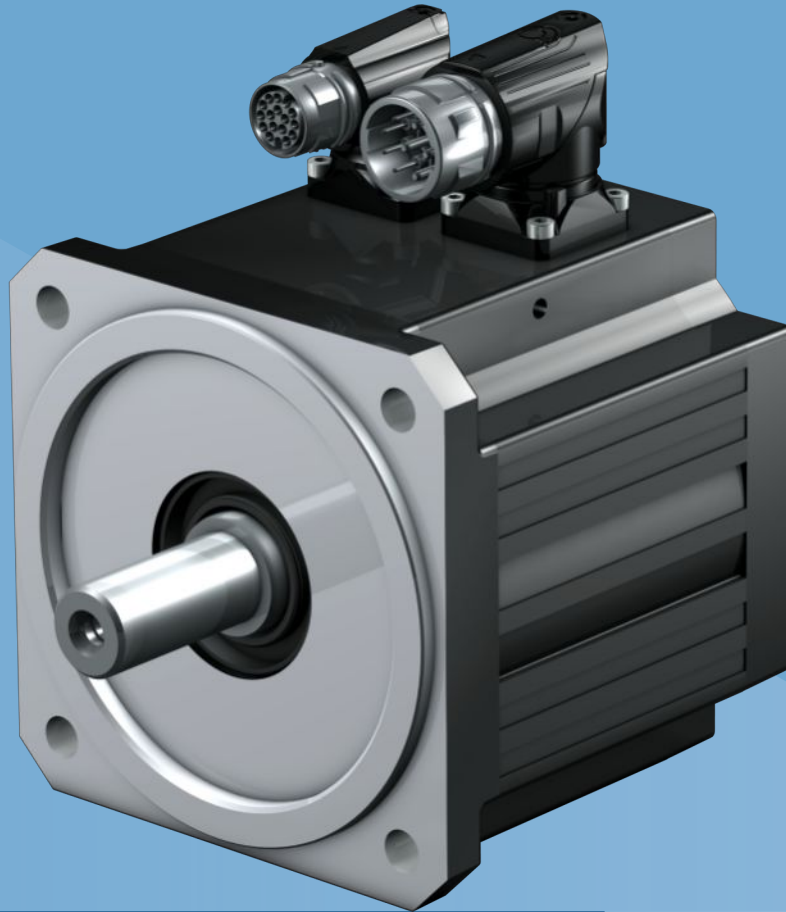
| Documentation                                    | ID        |
|--|-----------|
| Operating manual gear units, geared motors K     | 443364_en |
| Operating manual for EZ synchronous servo motors | 443032_en |
| Operating manual for gear racks (Atlanta)        | 442455    |



# 13 EZ synchronous servo motors

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## 13 Synchronous servo motors

EZ

### 13.1 Overview

Synchronous servo motors with single tooth winding

#### Features

- High dynamics ✓
- Short length ✓
- Super compact due to tooth-coil winding method with the highest possible copper fill factor ✓
- Backlash-free holding brake (optional) ✓
- Electronic nameplate for fast and reliable commissioning ✓
- Convection cooling or forced ventilation (optional) ✓
- Optical, inductive EnDat absolute encoders or resolvers ✓
- Elimination of referencing with multi-turn absolute encoders (optional) ✓
- One Cable Solution (OCS) with EnDat 3 encoder (optional) ✓
- Rotatable plug connectors with quick lock ✓

#### Torques

|       |               |
|-------|---------------|
| $M_N$ | 0.4 – 77.2 Nm |
| $M_0$ | 0.44 – 94 Nm  |

## 13.2 Selection tables

The technical data specified in the selection tables applies to:

- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from  $-15\text{ °C}$  to  $+40\text{ °C}$
- Operation on a STOBBER drive controller
- DC link voltage  $U_{zk} = \text{DC } 540\text{ V}$
- Coating: RAL 9005 Jet black, matte

In addition, the technical data applies to an uninsulated design with the following thermal mounting conditions:

| Type      | Dimensions of steel mounting flange<br>(thickness x width x height) | Convection surface area<br>Steel mounting flange |
|-----------|---|--|
| EZ2 – EZ5 | 23 x 210 x 275 mm   | 0.14 m <sup>2</sup>                              |
| EZ7 – EZ8 | 28 x 300 x 400 mm   | 0.3 m <sup>2</sup>                               |

Note the differing ambient conditions in Chapter Derating

### Formula symbols

An explanation of the formula symbols can be found in Chapter Symbols in formulas.

Observe the additional information on the following formula symbols:

- $I_0$  = RMS value of the line-to-line current when stall torque  $M_0$  is generated (tolerance  $\pm 5\%$ ).
- $I_{\max}$  = RMS value of the short-term maximum permitted line-to-line current when maximum torque  $M_{\max}$  is generated (tolerance  $\pm 5\%$ ). Exceeding  $I_{\max}$  may lead to irreversible damage (demagnetization) of the rotor.
- $I_N$  = RMS value of the line-to-line current when nominal torque  $M_N$  is generated at the nominal point (tolerance  $\pm 5\%$ ).
- $M_0$  = Torque that a motor is continuously able to deliver at a speed of 10 rpm (tolerance  $\pm 5\%$ ). At a speed of 0 rpm, a minor continuous torque has to be taken into account. Contact your STOBBER customer advisor for such an application.

### 13.2.1 EZ motors with convection cooling

| Type   | $K_{EM}$<br>[V/1000<br>rpm] | $n_N$<br>[rpm] | $M_N$<br>[Nm] | $I_N$<br>[A] | $K_{M,N}$<br>[Nm/A] | $P_N$<br>[kW] | $M_0$<br>[Nm] | $I_0$<br>[A] | $K_{M0}$<br>[Nm/A] | $M_R$<br>[Nm] | $M_{max}$<br>[Nm] | $I_{max}$<br>[A] | $R_{U-V}$<br>[Ω] | $L_{U-V}$<br>[mH] | $T_{el}$<br>[ms] | $J_{dyn}$<br>[kgcm <sup>2</sup> ] | $m_{dyn}$<br>[kg] |
|--------|-----------------------------|----------------|---------------|--------------|---------------------|---------------|---------------|--------------|--------------------|---------------|-------------------|------------------|------------------|-------------------|------------------|-----------------------------------|-------------------|
| EZ202U | 40                          | 6000           | 0.40          | 0.99         | 0.41                | 0.25          | 0.44          | 1.03         | 0.45               | 0.03          | 1.48              | 3.48             | 26.00            | 15.80             | 0.61             | 0.13                              | 1.43              |
| EZ203U | 40                          | 6000           | 0.61          | 1.54         | 0.40                | 0.38          | 0.69          | 1.64         | 0.44               | 0.03          | 2.70              | 5.80             | 13.20            | 10.30             | 0.76             | 0.17                              | 1.67              |
| EZ301U | 40                          | 6000           | 0.89          | 1.93         | 0.46                | 0.56          | 0.95          | 2.02         | 0.49               | 0.04          | 2.80              | 12.7             | 11.70            | 39.80             | 3.40             | 0.19                              | 1.50              |
| EZ301U | 40                          | 3000           | 0.93          | 1.99         | 0.47                | 0.29          | 0.95          | 2.02         | 0.49               | 0.04          | 2.80              | 12.7             | 11.70            | 39.80             | 3.40             | 0.19                              | 1.50              |
| EZ302U | 42                          | 6000           | 1.50          | 3.18         | 0.47                | 0.94          | 1.68          | 3.48         | 0.49               | 0.04          | 5.00              | 17.8             | 4.50             | 18.70             | 4.16             | 0.29                              | 2.10              |
| EZ302U | 86                          | 3000           | 1.59          | 1.60         | 0.99                | 0.50          | 1.68          | 1.67         | 1.03               | 0.04          | 5.00              | 8.55             | 17.80            | 75.00             | 4.21             | 0.29                              | 2.10              |
| EZ303U | 55                          | 6000           | 1.96          | 3.17         | 0.62                | 1.2           | 2.25          | 3.55         | 0.65               | 0.04          | 7.00              | 16.9             | 4.90             | 21.10             | 4.31             | 0.40                              | 2.60              |
| EZ303U | 109                         | 3000           | 2.07          | 1.63         | 1.27                | 0.65          | 2.19          | 1.71         | 1.30               | 0.04          | 7.00              | 8.25             | 20.30            | 68.70             | 5.24             | 0.40                              | 2.60              |
| EZ401U | 47                          | 6000           | 2.30          | 4.56         | 0.50                | 1.4           | 2.80          | 5.36         | 0.53               | 0.04          | 8.50              | 33.0             | 1.94             | 11.52             | 5.94             | 0.93                              | 4.00              |
| EZ401U | 96                          | 3000           | 2.80          | 2.74         | 1.02                | 0.88          | 3.00          | 2.88         | 1.06               | 0.04          | 8.50              | 16.5             | 6.70             | 37.70             | 5.63             | 0.93                              | 4.00              |
| EZ402U | 60                          | 6000           | 3.50          | 5.65         | 0.62                | 2.2           | 4.90          | 7.43         | 0.66               | 0.04          | 16.0              | 43.5             | 1.20             | 8.88              | 7.40             | 1.63                              | 5.10              |
| EZ402U | 94                          | 3000           | 4.70          | 4.40         | 1.07                | 1.5           | 5.20          | 4.80         | 1.09               | 0.04          | 16.0              | 26.5             | 3.00             | 21.80             | 7.26             | 1.63                              | 5.10              |
| EZ404U | 78                          | 6000           | 5.80          | 7.18         | 0.81                | 3.6           | 8.40          | 9.78         | 0.86               | 0.04          | 29.0              | 51.0             | 0.89             | 7.07              | 7.94             | 2.98                              | 7.20              |
| EZ404U | 116                         | 3000           | 6.90          | 5.80         | 1.19                | 2.2           | 8.60          | 6.60         | 1.31               | 0.04          | 29.0              | 35.0             | 1.85             | 15.00             | 8.11             | 2.98                              | 7.20              |
| EZ501U | 68                          | 6000           | 3.40          | 4.77         | 0.71                | 2.1           | 4.40          | 5.80         | 0.77               | 0.06          | 16.0              | 31.0             | 2.10             | 12.10             | 5.76             | 2.90                              | 5.00              |
| EZ501U | 97                          | 3000           | 4.30          | 3.74         | 1.15                | 1.4           | 4.70          | 4.00         | 1.19               | 0.06          | 16.0              | 22.0             | 3.80             | 23.50             | 6.18             | 2.90                              | 5.00              |
| EZ502U | 72                          | 6000           | 5.20          | 7.35         | 0.71                | 3.3           | 7.80          | 9.80         | 0.80               | 0.06          | 31.0              | 59.0             | 0.76             | 5.60              | 7.37             | 5.20                              | 6.50              |
| EZ502U | 121                         | 3000           | 7.40          | 5.46         | 1.36                | 2.3           | 8.00          | 5.76         | 1.40               | 0.06          | 31.0              | 33.0             | 2.32             | 16.80             | 7.24             | 5.20                              | 6.50              |
| EZ503U | 84                          | 6000           | 6.20          | 7.64         | 0.81                | 3.9           | 10.6          | 11.6         | 0.92               | 0.06          | 43.0              | 63.5             | 0.62             | 5.00              | 8.06             | 7.58                              | 8.00              |
| EZ503U | 119                         | 3000           | 9.70          | 6.90         | 1.41                | 3.1           | 11.1          | 7.67         | 1.46               | 0.06          | 43.0              | 41.0             | 1.25             | 10.00             | 8.00             | 7.58                              | 8.00              |
| EZ505U | 103                         | 4500           | 9.50          | 8.94         | 1.06                | 4.5           | 15.3          | 13.4         | 1.15               | 0.06          | 67.0              | 73.0             | 0.50             | 4.47              | 8.94             | 12.2                              | 10.9              |
| EZ505U | 141                         | 3000           | 13.5          | 8.80         | 1.53                | 4.2           | 16.0          | 10.0         | 1.61               | 0.06          | 67.0              | 52.0             | 0.93             | 8.33              | 8.96             | 12.2                              | 10.9              |
| EZ701U | 76                          | 6000           | 5.20          | 6.68         | 0.78                | 3.3           | 7.90          | 9.38         | 0.87               | 0.24          | 20.0              | 31.0             | 0.87             | 8.13              | 9.34             | 8.50                              | 8.30              |
| EZ701U | 95                          | 3000           | 7.40          | 7.20         | 1.03                | 2.3           | 8.30          | 8.00         | 1.07               | 0.24          | 20.0              | 25.0             | 1.30             | 12.83             | 9.87             | 8.50                              | 8.30              |
| EZ702U | 82                          | 6000           | 7.20          | 8.96         | 0.80                | 4.5           | 14.3          | 16.5         | 0.88               | 0.24          | 41.0              | 60.5             | 0.34             | 3.90              | 11.47            | 13.7                              | 10.8              |
| EZ702U | 133                         | 3000           | 12.0          | 8.20         | 1.46                | 3.8           | 14.4          | 9.60         | 1.53               | 0.24          | 41.0              | 36.0             | 1.00             | 11.73             | 11.73            | 13.7                              | 10.8              |
| EZ703U | 99                          | 4500           | 12.1          | 11.5         | 1.05                | 5.7           | 20.0          | 17.8         | 1.14               | 0.24          | 65.0              | 78.0             | 0.36             | 4.42              | 12.28            | 21.6                              | 12.8              |
| EZ703U | 122                         | 3000           | 16.5          | 11.4         | 1.45                | 5.2           | 20.8          | 14.0         | 1.50               | 0.24          | 65.0              | 62.0             | 0.52             | 6.80              | 13.08            | 21.6                              | 12.8              |
| EZ705U | 106                         | 4500           | 16.4          | 14.8         | 1.11                | 7.7           | 30.0          | 25.2         | 1.20               | 0.24          | 104               | 114              | 0.22             | 2.76              | 12.55            | 34.0                              | 18.3              |
| EZ705U | 140                         | 3000           | 21.3          | 14.2         | 1.50                | 6.7           | 30.2          | 19.5         | 1.56               | 0.24          | 104               | 87.0             | 0.33             | 4.80              | 14.55            | 34.0                              | 18.3              |
| EZ802U | 90                          | 4500           | 10.5          | 11.2         | 0.94                | 5.0           | 34.5          | 33.3         | 1.05               | 0.30          | 100               | 135              | 0.13             | 1.90              | 14.60            | 58.0                              | 26.6              |
| EZ802U | 136                         | 3000           | 22.3          | 13.9         | 1.60                | 7.0           | 37.1          | 22.3         | 1.68               | 0.30          | 100               | 84.0             | 0.30             | 5.00              | 16.66            | 58.0                              | 26.6              |
| EZ803U | 131                         | 3000           | 26.6          | 17.7         | 1.50                | 8.4           | 48.2          | 31.1         | 1.56               | 0.30          | 145               | 124              | 0.18             | 2.79              | 15.50            | 83.5                              | 32.7              |
| EZ805U | 142                         | 2000           | 43.7          | 25.9         | 1.69                | 9.2           | 66.1          | 37.9         | 1.75               | 0.30          | 205               | 155              | 0.13             | 2.22              | 17.08            | 133                               | 45.8              |

## 13.2.2 EZ motors with forced ventilation

| Type   | $K_{EM}$<br>[V/1000<br>rpm] | $n_N$<br>[rpm] | $M_N$<br>[Nm] | $I_N$<br>[A] | $K_{M,N}$<br>[Nm/A] | $P_N$<br>[kW] | $M_0$<br>[Nm] | $I_0$<br>[A] | $K_{M0}$<br>[Nm/A] | $M_R$<br>[Nm] | $M_{max}$<br>[Nm] | $I_{max}$<br>[A] | $R_{U-V}$<br>[Ω] | $L_{U-V}$<br>[mH] | $T_{el}$<br>[ms] | $J_{dyn}$<br>[kgcm <sup>2</sup> ] | $m_{dyn}$<br>[kg] |
|--------|-----------------------------|----------------|---------------|--------------|---------------------|---------------|---------------|--------------|--------------------|---------------|-------------------|------------------|------------------|-------------------|------------------|-----------------------------------|-------------------|
| EZ401B | 47                          | 6000           | 2.90          | 5.62         | 0.52                | 1.8           | 3.50          | 6.83         | 0.52               | 0.04          | 8.50              | 33.0             | 1.94             | 11.52             | 5.94             | 0.93                              | 5.40              |
| EZ401B | 96                          | 3000           | 3.40          | 3.40         | 1.00                | 1.1           | 3.70          | 3.60         | 1.04               | 0.04          | 8.50              | 16.5             | 6.70             | 37.70             | 5.63             | 0.93                              | 5.40              |
| EZ402B | 60                          | 6000           | 5.10          | 7.88         | 0.65                | 3.2           | 6.40          | 9.34         | 0.69               | 0.04          | 16.0              | 43.5             | 1.20             | 8.88              | 7.40             | 1.63                              | 6.50              |
| EZ402B | 94                          | 3000           | 5.90          | 5.50         | 1.07                | 1.9           | 6.30          | 5.80         | 1.09               | 0.04          | 16.0              | 26.5             | 3.00             | 21.80             | 7.26             | 1.63                              | 6.50              |
| EZ404B | 78                          | 6000           | 8.00          | 9.98         | 0.80                | 5.0           | 10.5          | 12.0         | 0.88               | 0.04          | 29.0              | 51.0             | 0.89             | 7.07              | 7.94             | 2.98                              | 8.60              |
| EZ404B | 116                         | 3000           | 10.2          | 8.20         | 1.24                | 3.2           | 11.2          | 8.70         | 1.29               | 0.04          | 29.0              | 35.0             | 1.85             | 15.00             | 8.11             | 2.98                              | 8.60              |
| EZ501B | 68                          | 6000           | 4.50          | 6.70         | 0.67                | 2.8           | 5.70          | 7.50         | 0.77               | 0.06          | 16.0              | 31.0             | 2.10             | 12.10             | 5.76             | 2.90                              | 7.00              |
| EZ501B | 97                          | 3000           | 5.40          | 4.70         | 1.15                | 1.7           | 5.80          | 5.00         | 1.17               | 0.06          | 16.0              | 22.0             | 3.80             | 23.50             | 6.18             | 2.90                              | 7.00              |
| EZ502B | 72                          | 6000           | 8.20          | 11.4         | 0.72                | 5.2           | 10.5          | 13.4         | 0.79               | 0.06          | 31.0              | 59.0             | 0.76             | 5.60              | 7.37             | 5.20                              | 8.50              |
| EZ502B | 121                         | 3000           | 10.3          | 7.80         | 1.32                | 3.2           | 11.2          | 8.16         | 1.38               | 0.06          | 31.0              | 33.0             | 2.32             | 16.80             | 7.24             | 5.20                              | 8.50              |
| EZ503B | 84                          | 6000           | 10.4          | 13.5         | 0.77                | 6.5           | 14.8          | 15.9         | 1.07               | 0.06          | 43.0              | 63.5             | 0.62             | 5.00              | 8.06             | 7.58                              | 10.0              |
| EZ503B | 119                         | 3000           | 14.4          | 10.9         | 1.32                | 4.5           | 15.9          | 11.8         | 1.35               | 0.06          | 43.0              | 41.0             | 1.25             | 10.00             | 8.00             | 7.58                              | 10.0              |
| EZ505B | 103                         | 4500           | 16.4          | 16.4         | 1.00                | 7.7           | 22.0          | 19.4         | 1.14               | 0.06          | 67.0              | 73.0             | 0.50             | 4.47              | 8.94             | 12.2                              | 12.9              |
| EZ505B | 141                         | 3000           | 20.2          | 13.7         | 1.47                | 6.4           | 23.4          | 14.7         | 1.60               | 0.06          | 67.0              | 52.0             | 0.93             | 8.33              | 8.96             | 12.2                              | 12.9              |
| EZ701B | 76                          | 6000           | 7.50          | 10.6         | 0.71                | 4.7           | 10.2          | 12.4         | 0.84               | 0.24          | 20.0              | 31.0             | 0.87             | 8.13              | 9.34             | 8.50                              | 11.2              |
| EZ701B | 95                          | 3000           | 9.70          | 9.50         | 1.02                | 3.1           | 10.5          | 10.0         | 1.07               | 0.24          | 20.0              | 25.0             | 1.30             | 12.83             | 9.87             | 8.50                              | 11.2              |
| EZ702B | 82                          | 6000           | 12.5          | 16.7         | 0.75                | 7.9           | 19.3          | 22.1         | 0.89               | 0.24          | 41.0              | 60.5             | 0.34             | 3.90              | 11.47            | 13.7                              | 13.7              |
| EZ702B | 133                         | 3000           | 16.6          | 11.8         | 1.41                | 5.2           | 19.3          | 12.9         | 1.51               | 0.24          | 41.0              | 36.0             | 1.00             | 11.73             | 11.73            | 13.7                              | 13.7              |
| EZ703B | 99                          | 4500           | 19.8          | 20.3         | 0.98                | 9.3           | 27.2          | 24.2         | 1.13               | 0.24          | 65.0              | 78.0             | 0.36             | 4.42              | 12.28            | 21.6                              | 15.7              |
| EZ703B | 122                         | 3000           | 24.0          | 18.2         | 1.32                | 7.5           | 28.0          | 20.0         | 1.41               | 0.24          | 65.0              | 62.0             | 0.52             | 6.80              | 13.08            | 21.6                              | 15.7              |
| EZ705B | 106                         | 4500           | 27.7          | 25.4         | 1.09                | 13            | 39.4          | 32.8         | 1.21               | 0.24          | 104               | 114              | 0.22             | 2.76              | 12.55            | 34.0                              | 21.2              |
| EZ705B | 140                         | 3000           | 33.8          | 22.9         | 1.48                | 11            | 41.8          | 26.5         | 1.59               | 0.24          | 104               | 87.0             | 0.33             | 4.80              | 14.55            | 34.0                              | 21.2              |
| EZ802B | 90                          | 4500           | 30.6          | 30.5         | 1.00                | 14            | 47.4          | 45.1         | 1.06               | 0.30          | 100               | 135              | 0.13             | 1.90              | 14.60            | 58.0                              | 31.6              |
| EZ802B | 136                         | 3000           | 34.3          | 26.5         | 1.29                | 11            | 47.9          | 28.9         | 1.67               | 0.30          | 100               | 84.0             | 0.30             | 5.00              | 16.66            | 58.0                              | 31.6              |
| EZ803B | 131                         | 3000           | 49.0          | 35.9         | 1.37                | 15            | 66.7          | 42.3         | 1.58               | 0.30          | 145               | 124              | 0.18             | 2.79              | 15.50            | 83.5                              | 37.7              |
| EZ805B | 142                         | 2000           | 77.2          | 45.2         | 1.71                | 16            | 94.0          | 53.9         | 1.75               | 0.30          | 205               | 155              | 0.13             | 2.22              | 17.08            | 133                               | 51.8              |

### 13.3 Torque/speed curves

Torque/speed curves depend on the nominal speed and/or winding design of the motor and the DC link voltage of the drive controller that is used. The following torque/speed curves apply to the DC link voltage DC 540 V.

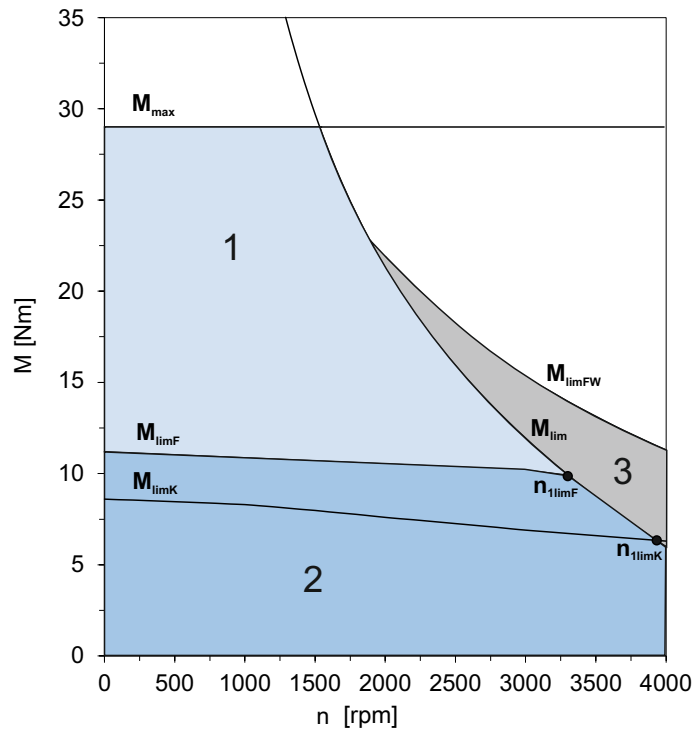
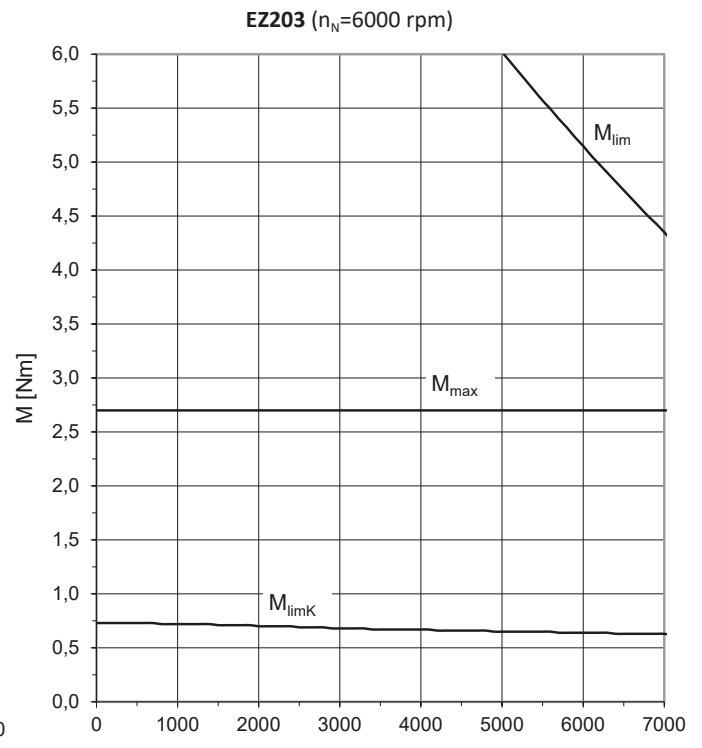
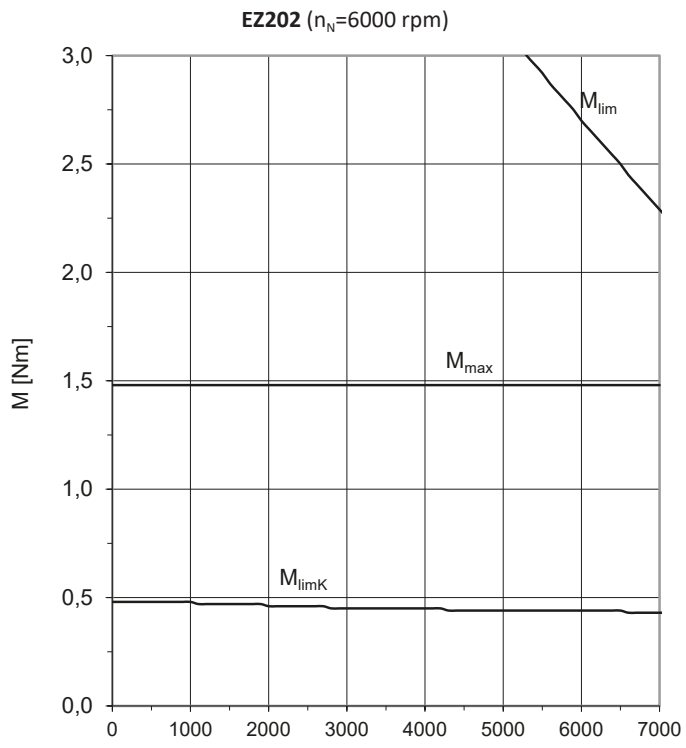
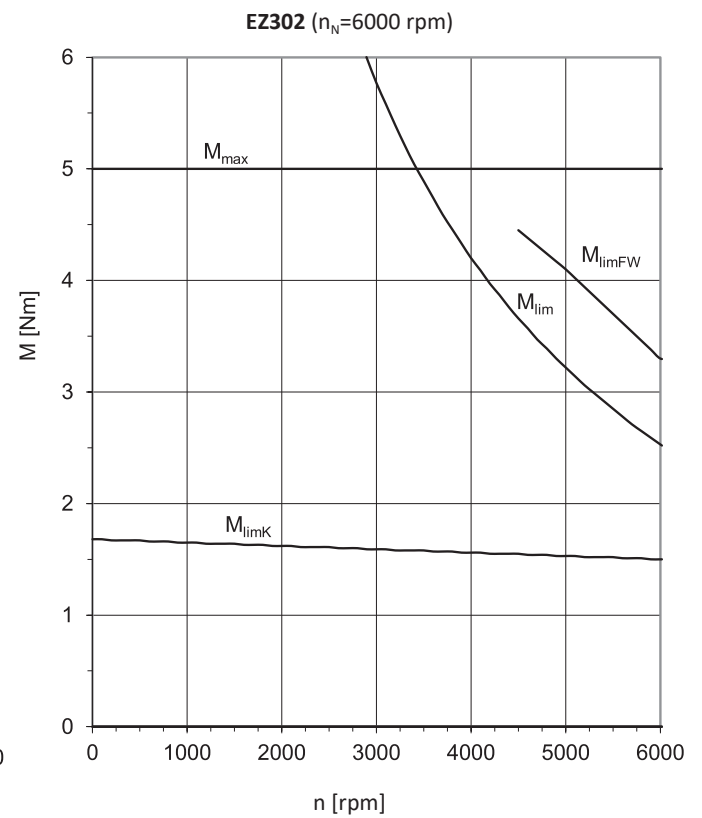
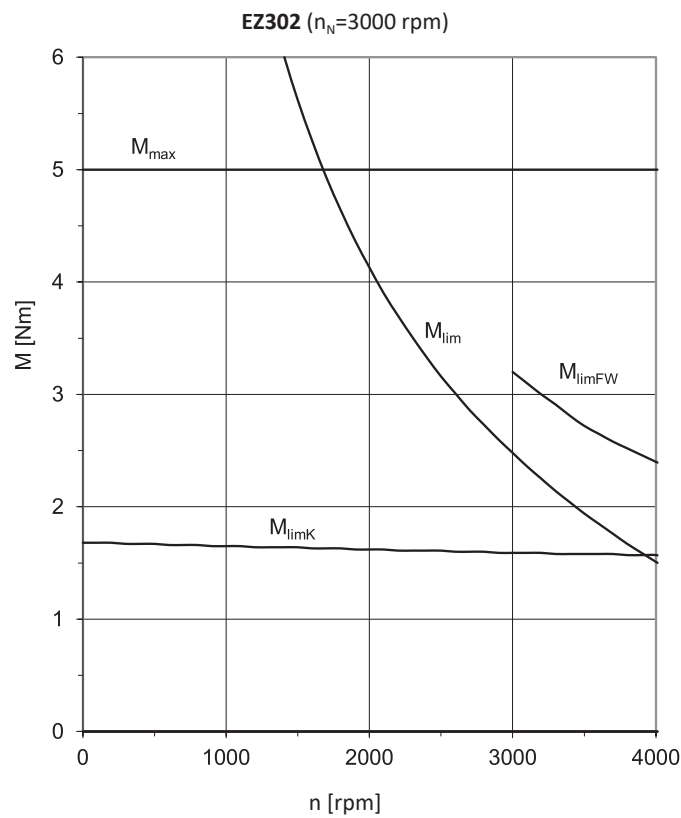
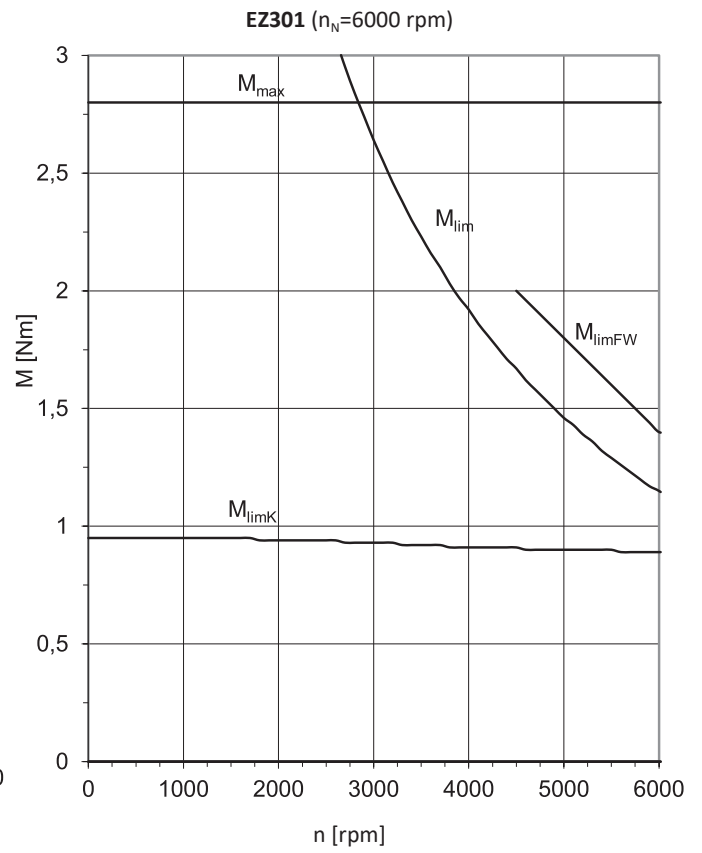
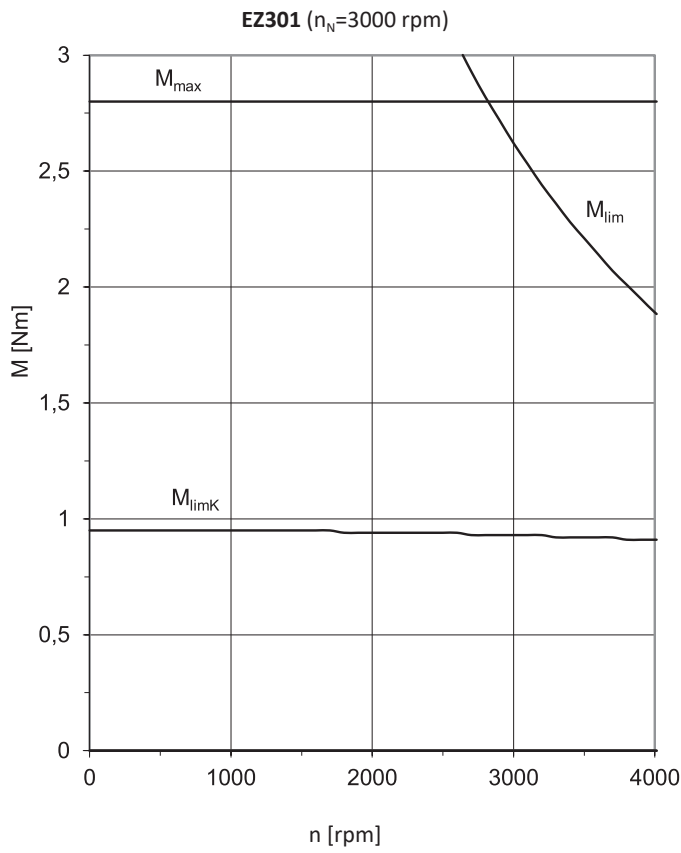


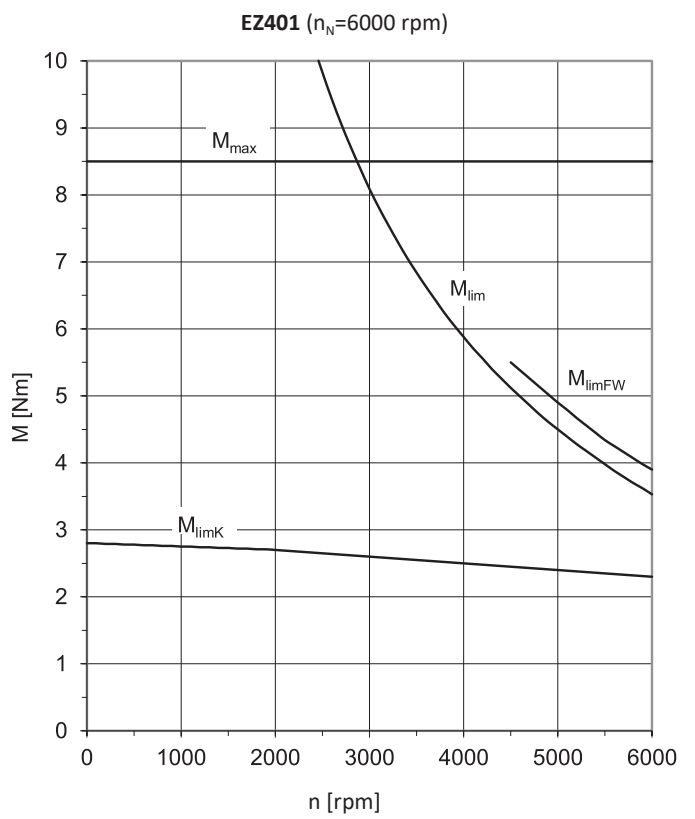
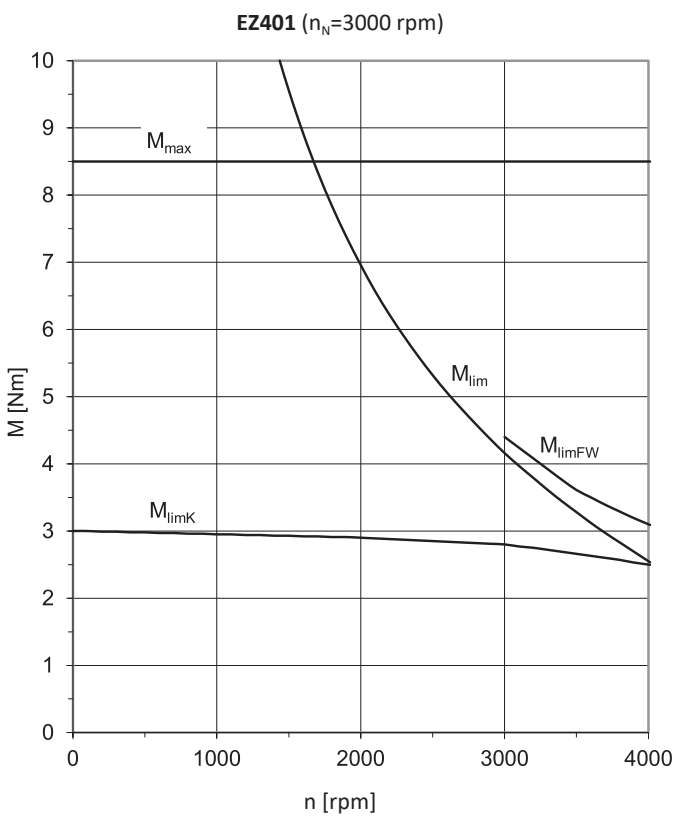
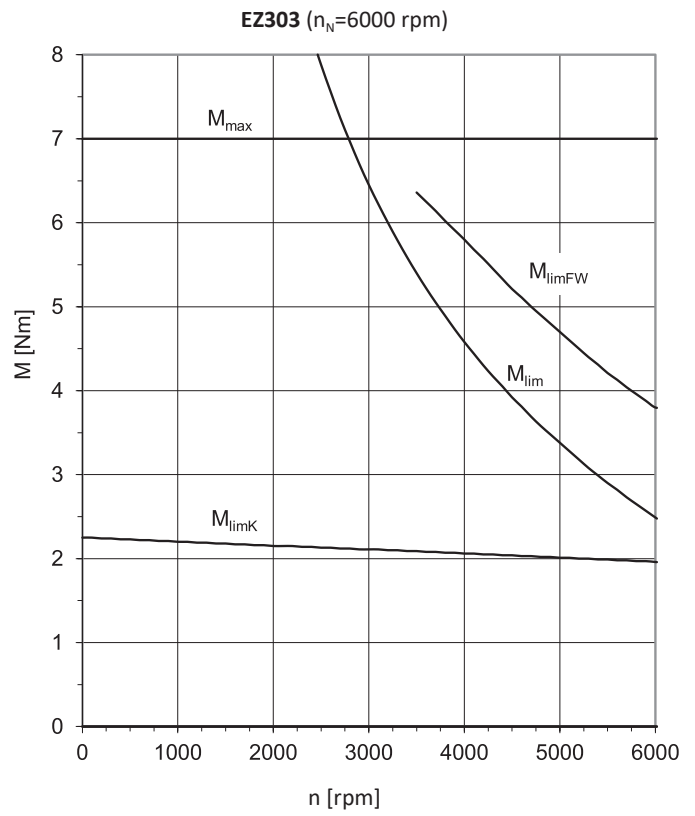
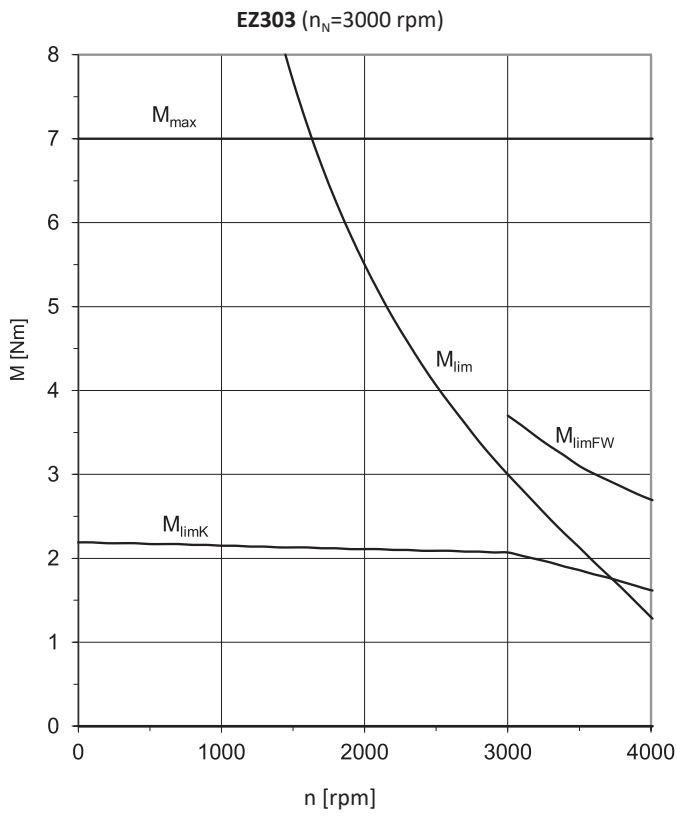
Fig. 1: Explanation of a torque/speed curve

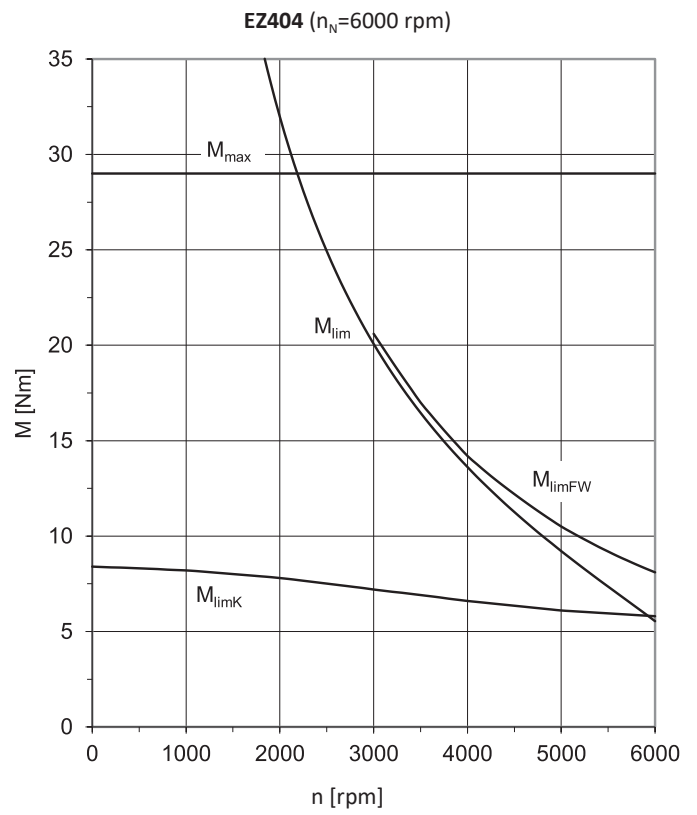
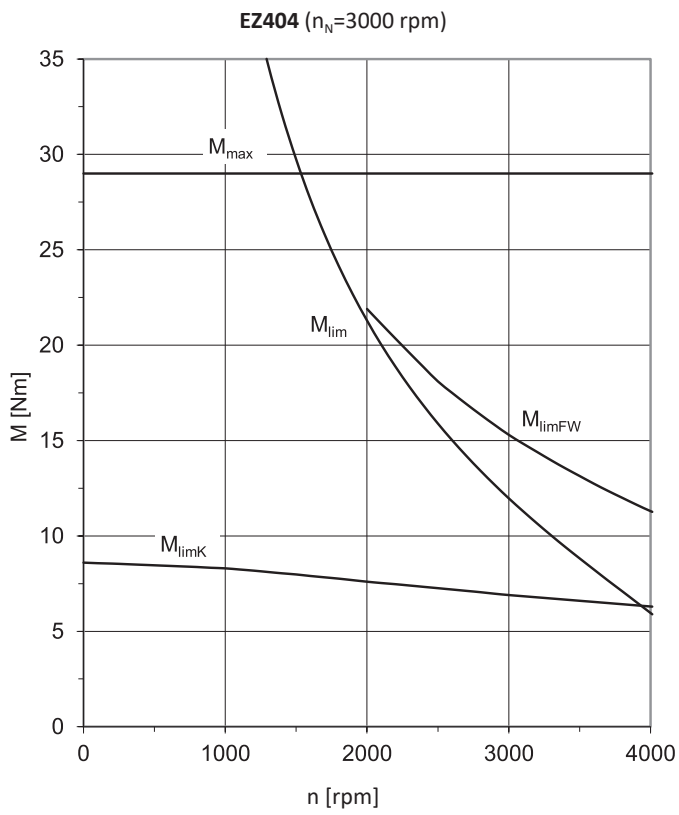
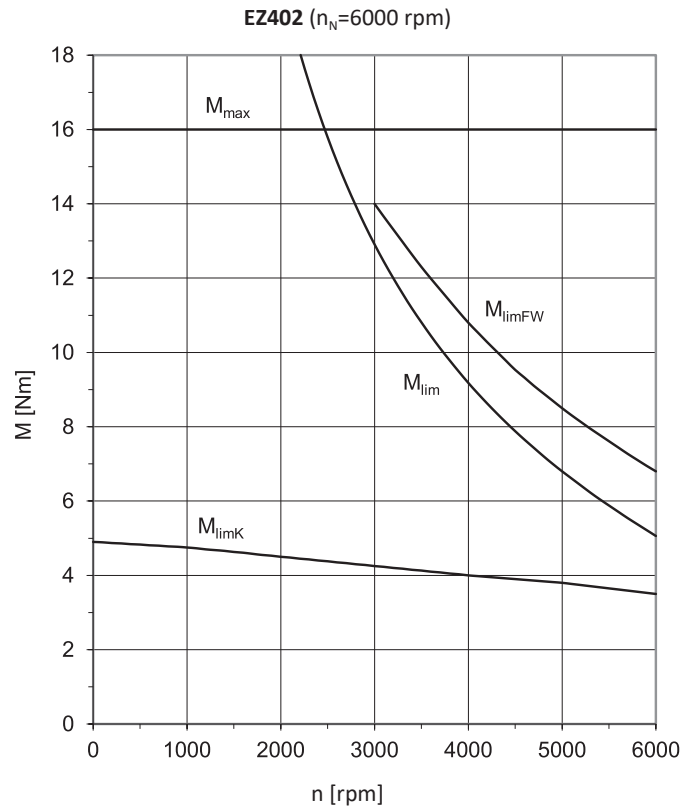
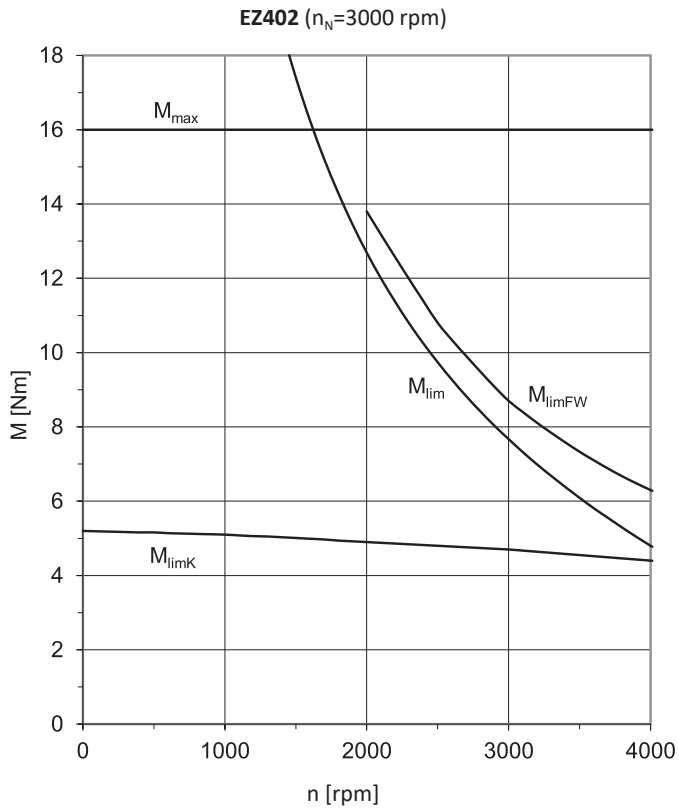
- |   |   |
|---|---|
| <p>1 Torque range for brief operation (<math>ED_{10} &lt; 100\%</math>) with <math>\Delta\vartheta = 100</math> K</p> | <p>2 Torque range for continuous operation with constant load (S1 mode, <math>ED_{10} = 100\%</math>) with <math>\Delta\vartheta = 100</math> K</p> |
| <p>3 Field weakening range (can be used only with operation on STOBBER drive controllers)</p>                         |   |

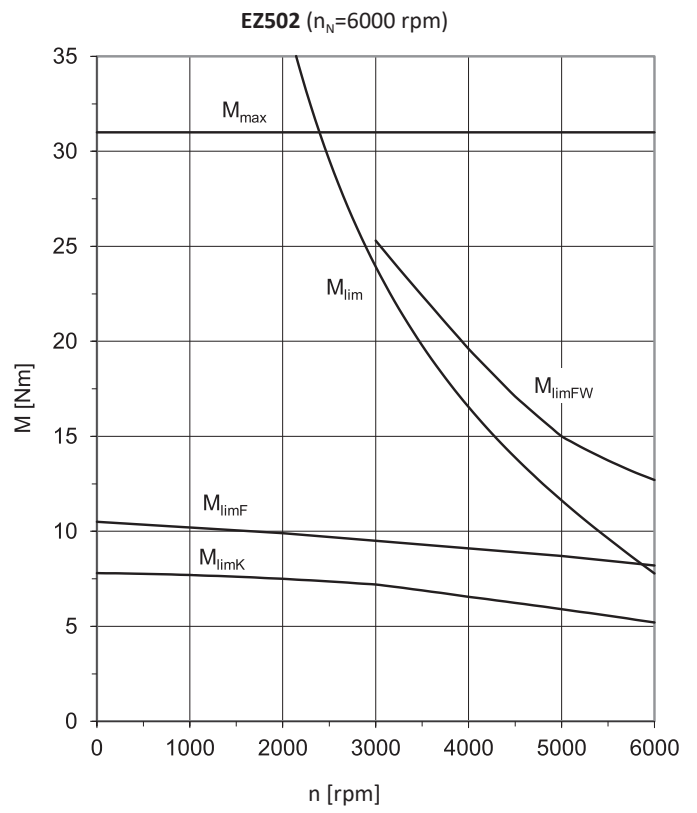
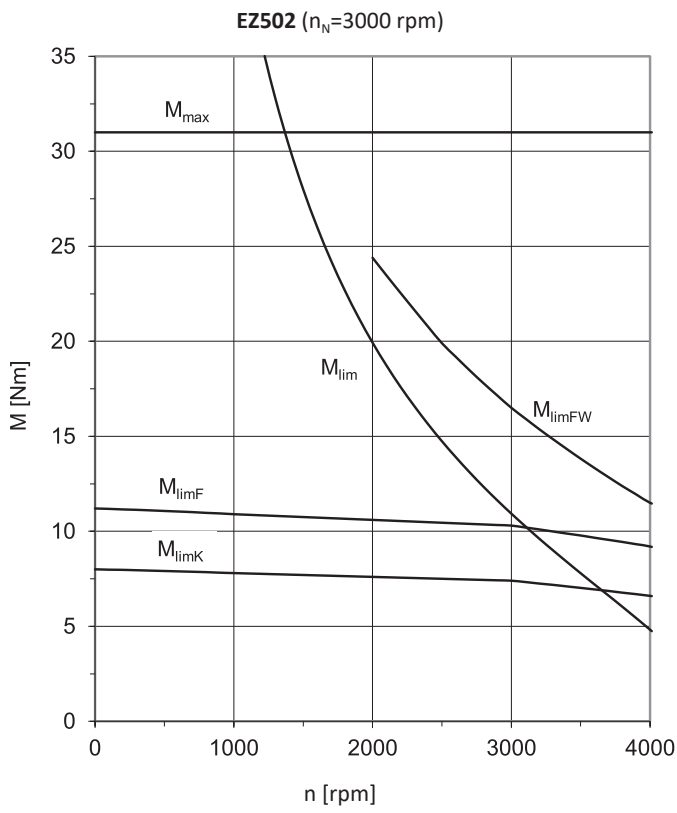
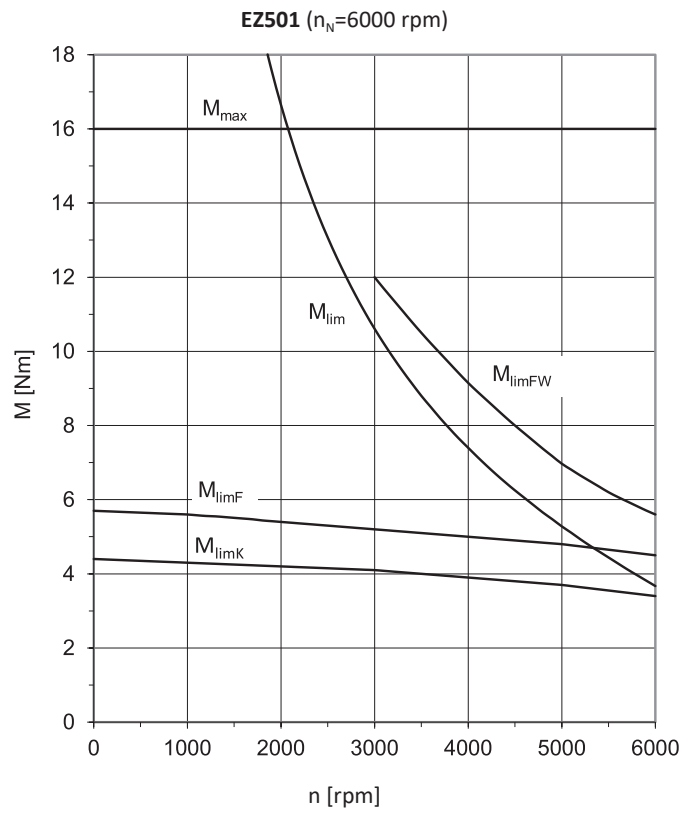
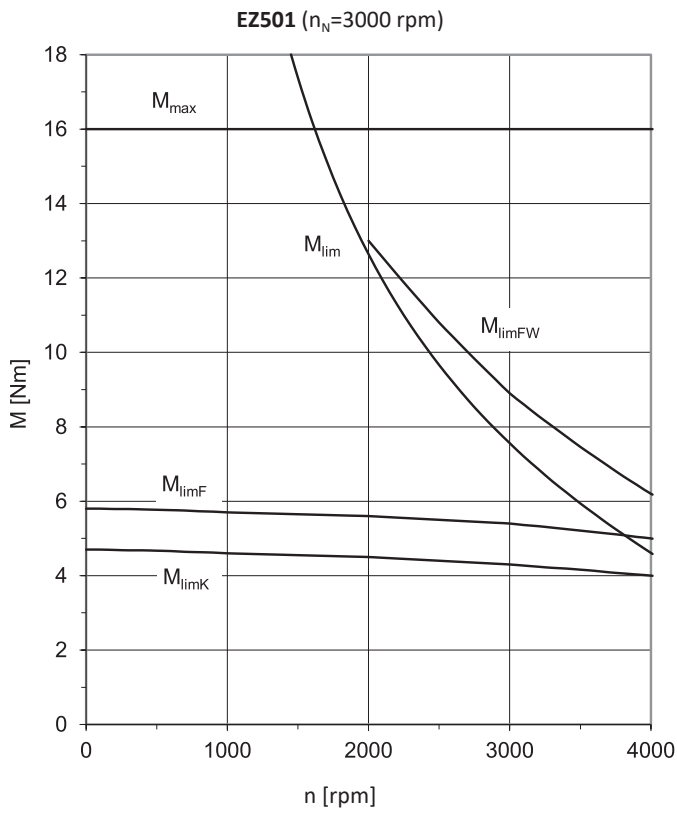


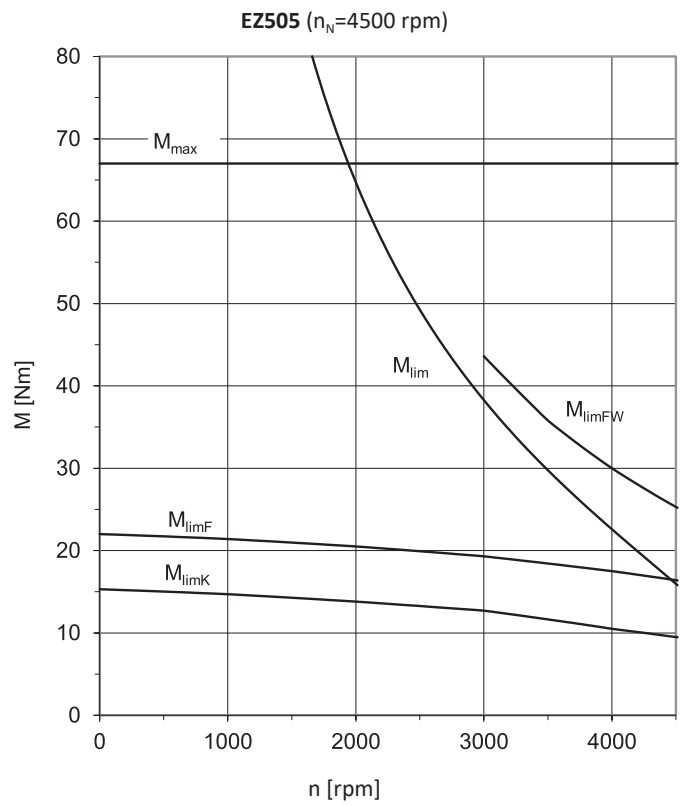
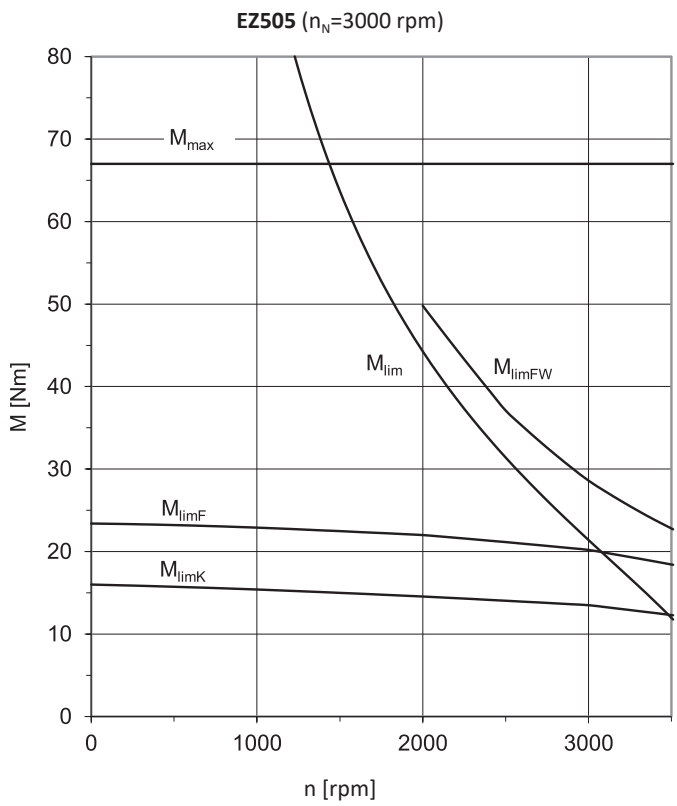
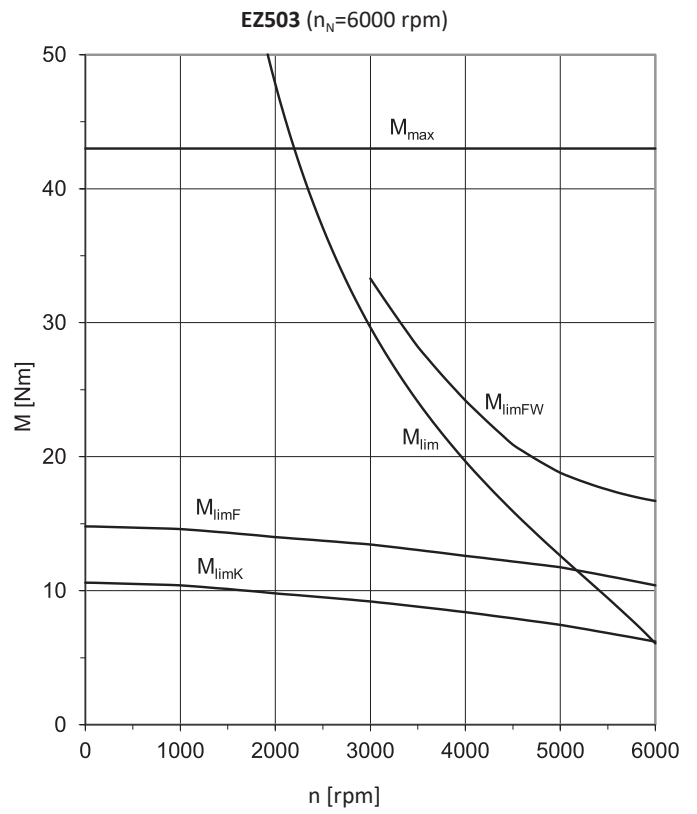
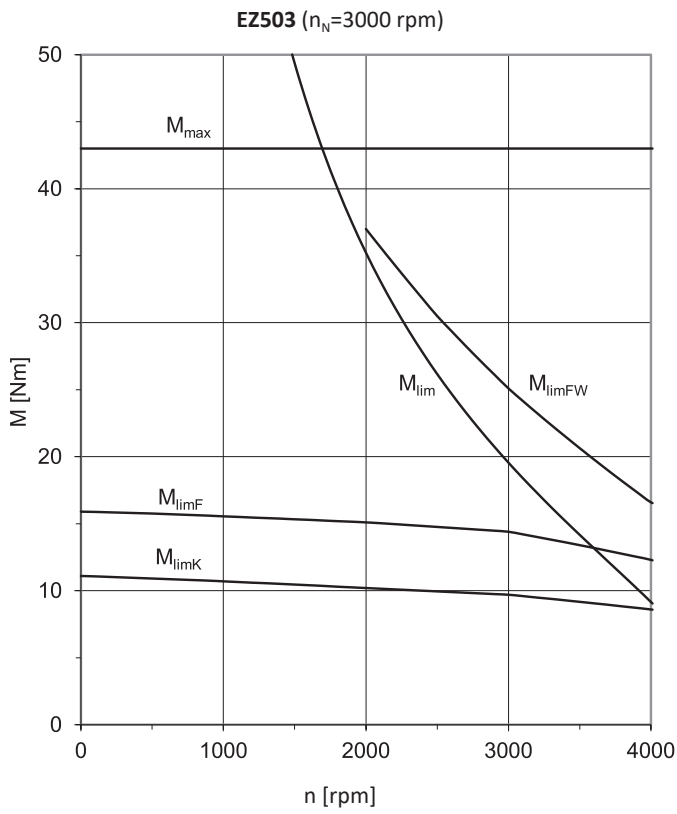


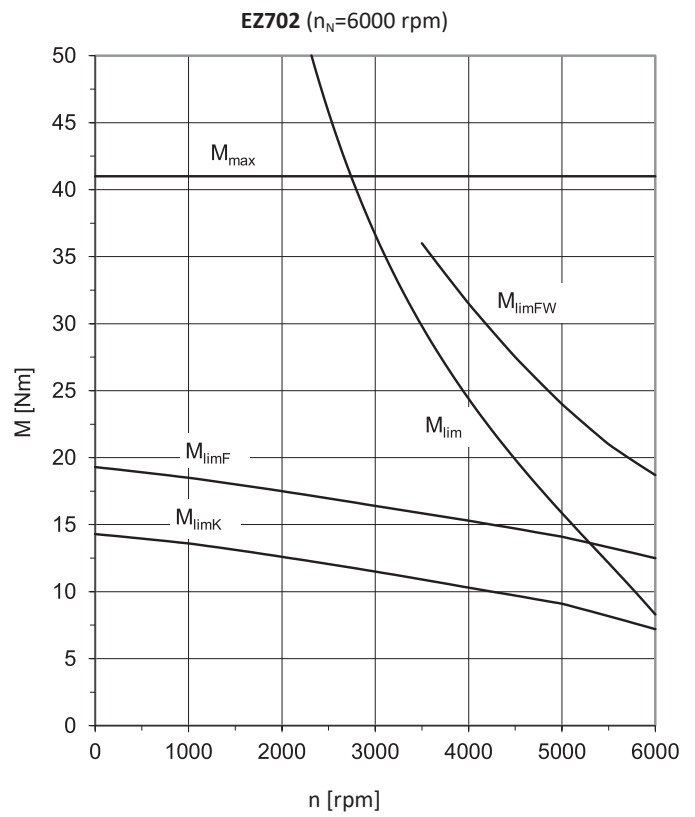
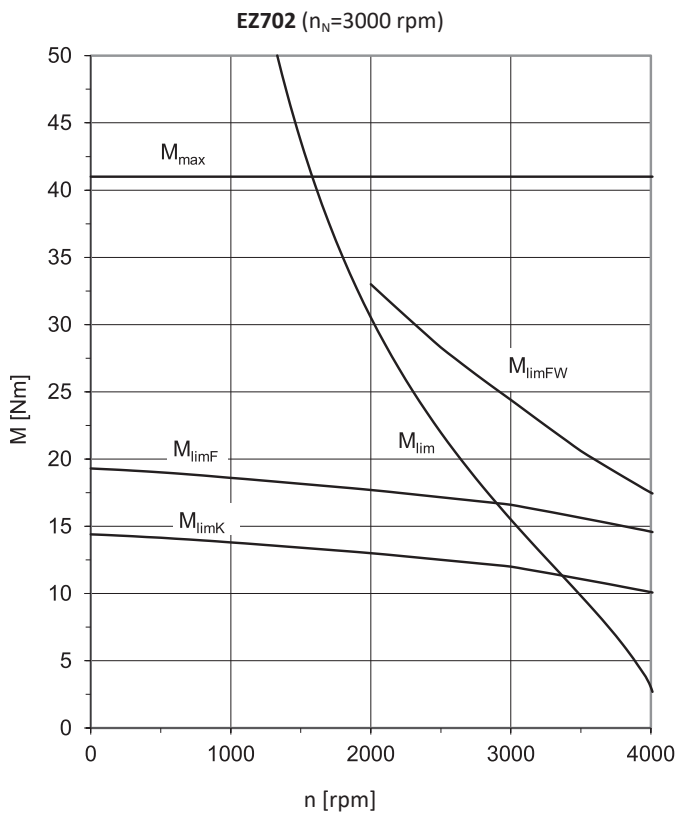
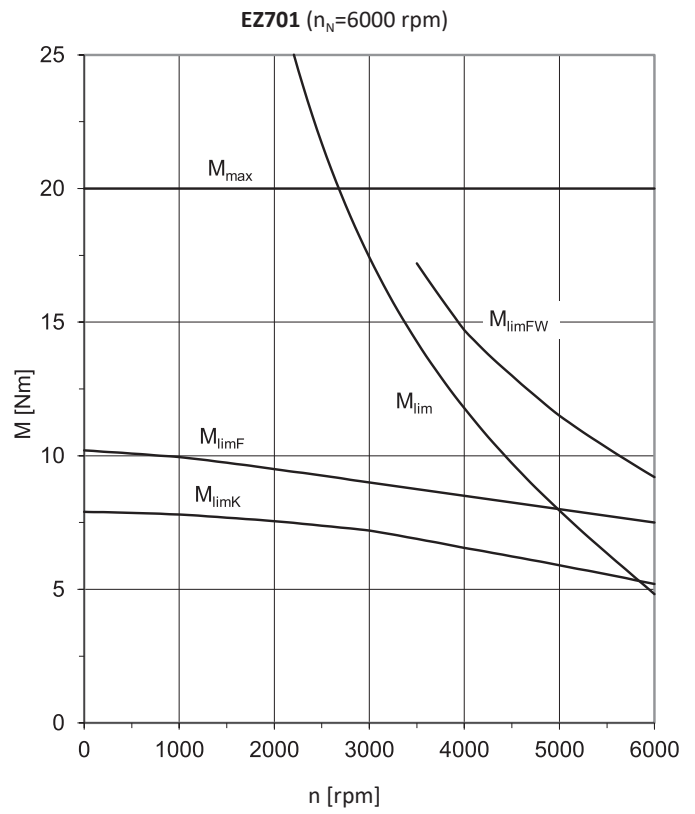
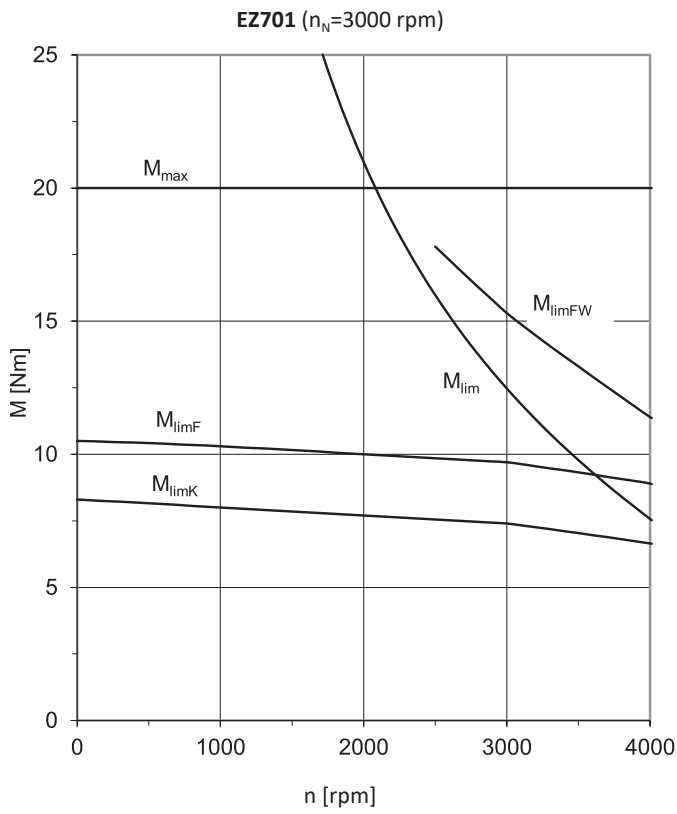


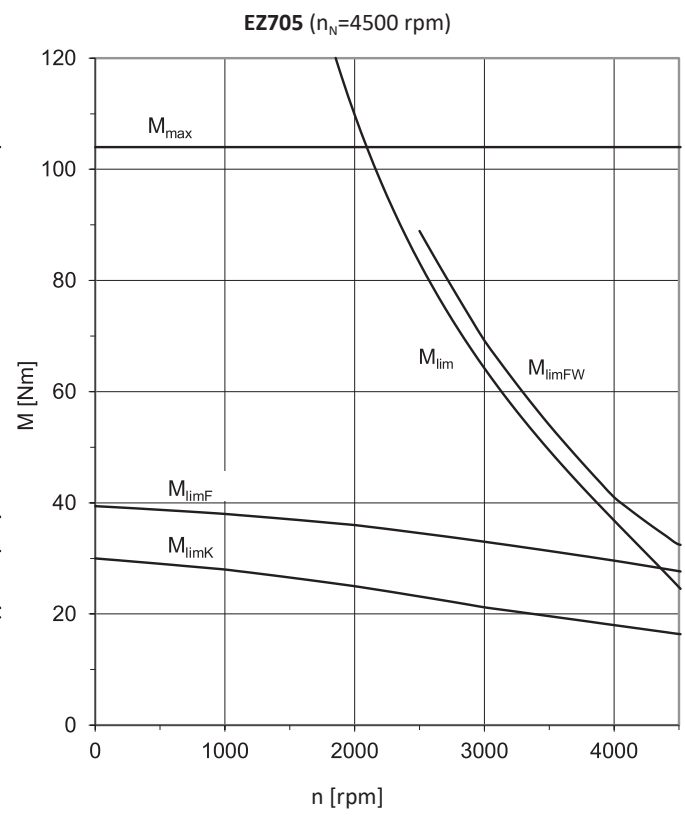
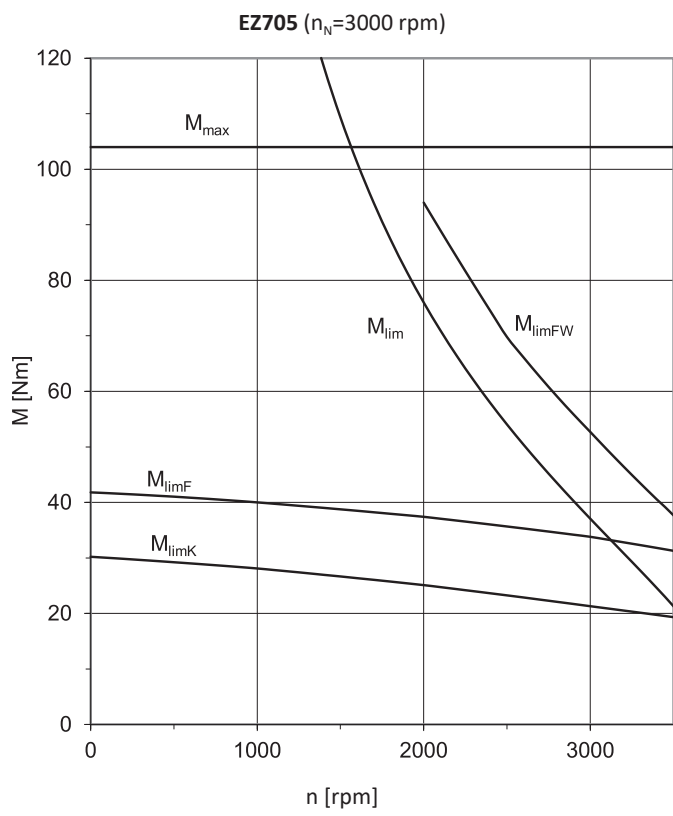
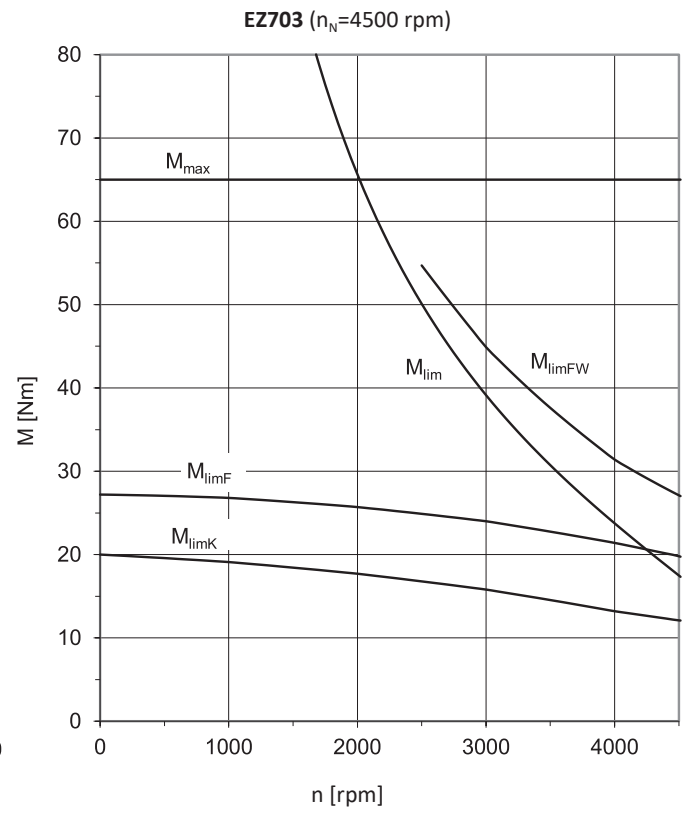
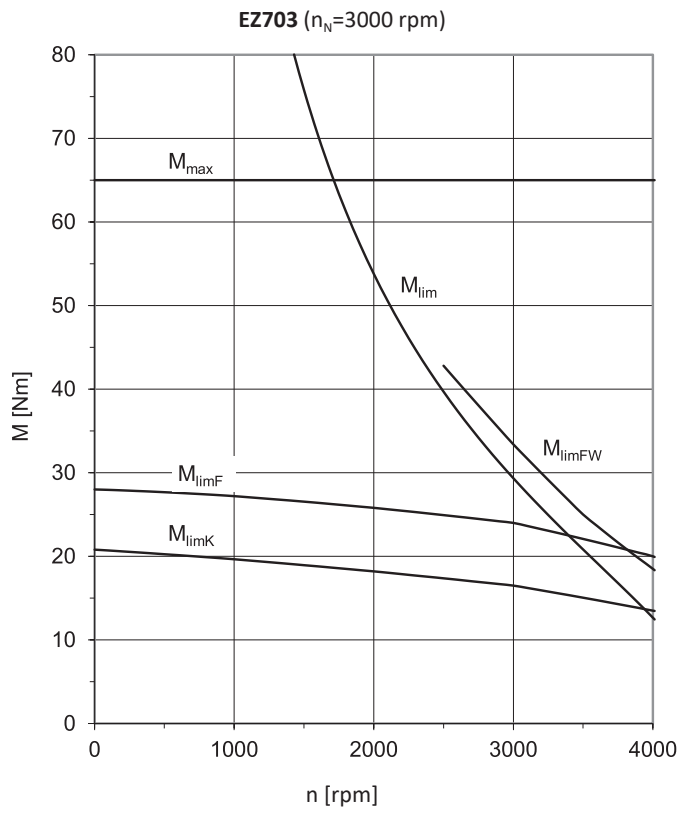




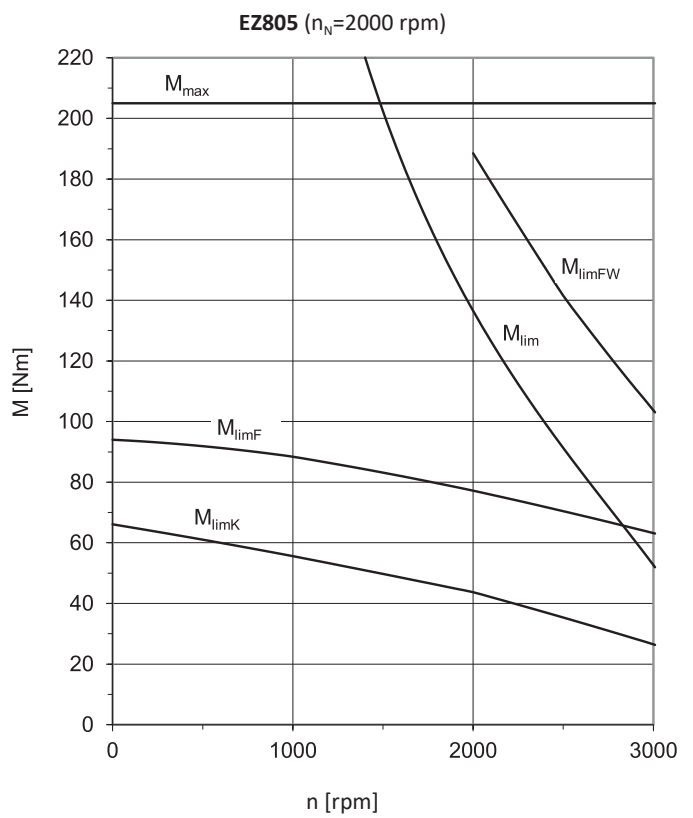
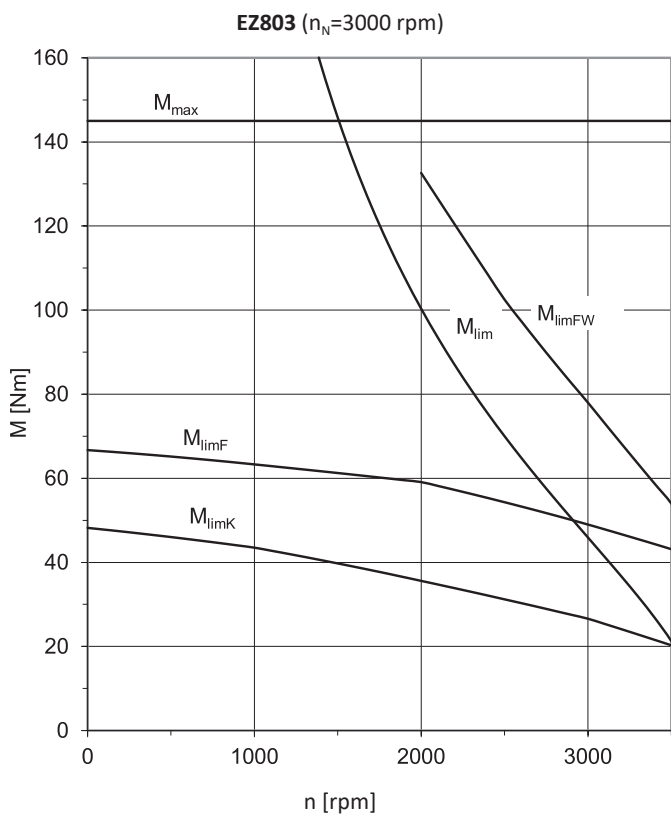
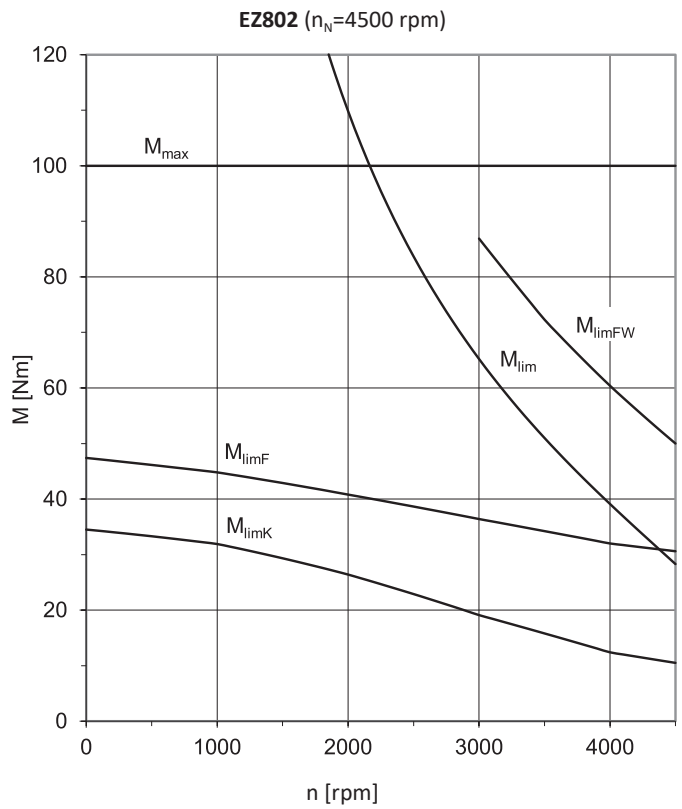
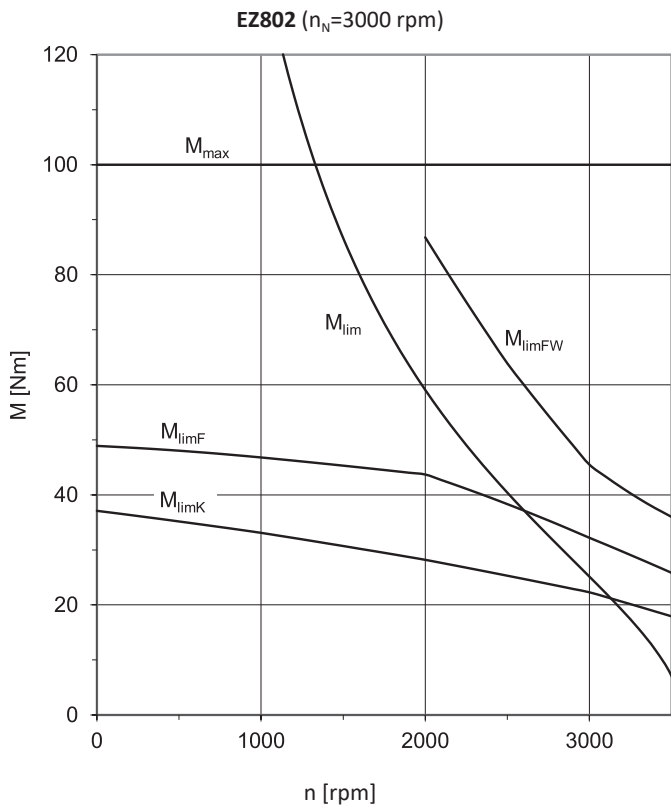












## 13.4 Dimensional drawings

In this chapter, you can find the dimensions of the motors.

Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at <https://configurator.stoeber.de/en-US/>.

In this chapter, the dimensions p1 and w1 for standard motor designs are presented. In designs for connection to drive controllers of third-party manufacturers, dimensions p1 and w1 may differ. You can find more details at <https://configurator.stoeber.de/en-US/>.

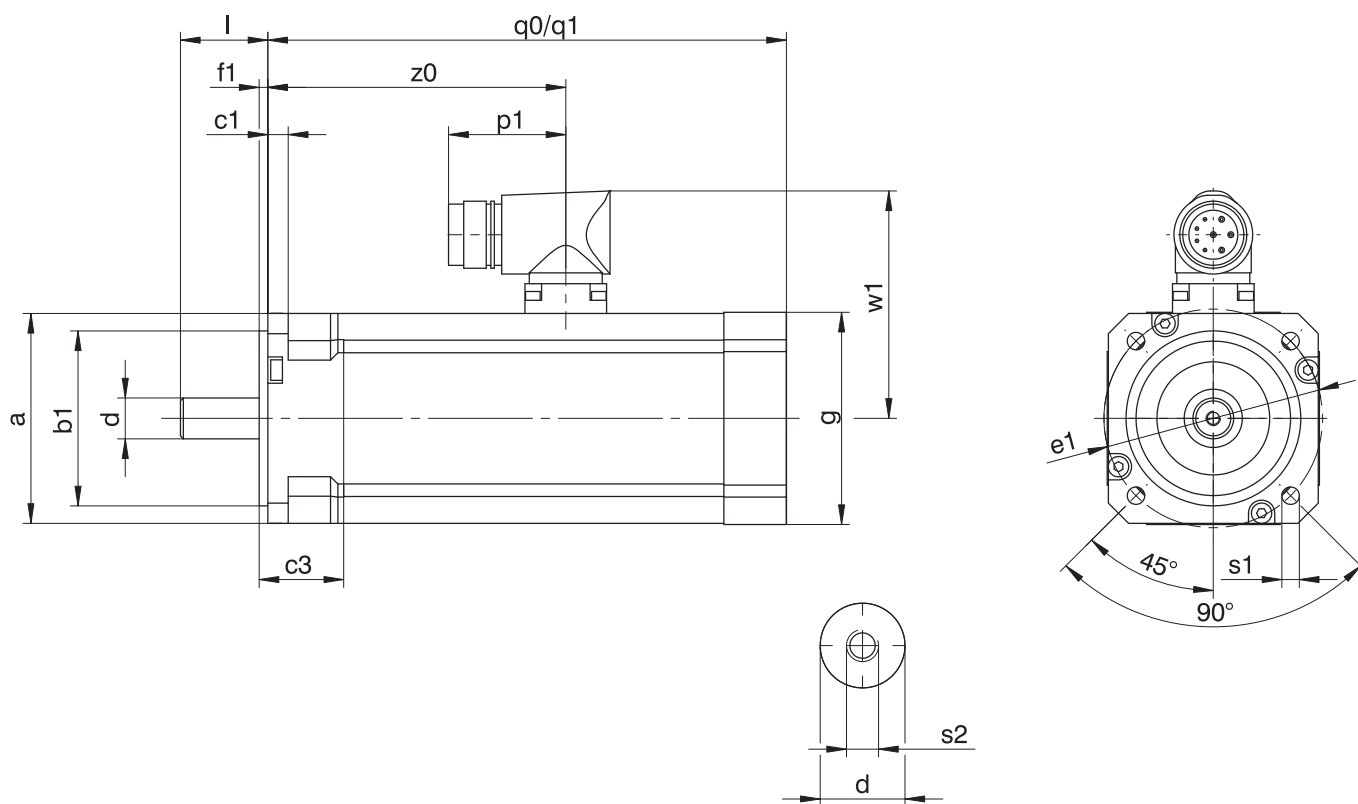
### Tolerances

| Solid shaft                          | Tolerance         |
|--------------------------------------|-------------------|
| Shaft $\varnothing$ fit $\leq$ 50 mm | DIN 748-1, ISO k6 |
| Shaft $\varnothing$ fit $>$ 50 mm    | DIN 748-1, ISO m6 |

### Centering holes in solid shafts in accordance with DIN 332-2, DR shape

| Thread size       | M4 | M5   | M6 | M8 | M10 | M12 | M16 | M20 | M24 |
|-------------------|----|------|----|----|-----|-----|-----|-----|-----|
| Thread depth [mm] | 10 | 12.5 | 16 | 19 | 22  | 28  | 36  | 42  | 50  |

### 13.4.1 EZ2 – EZ3 motors (One Cable Solution)

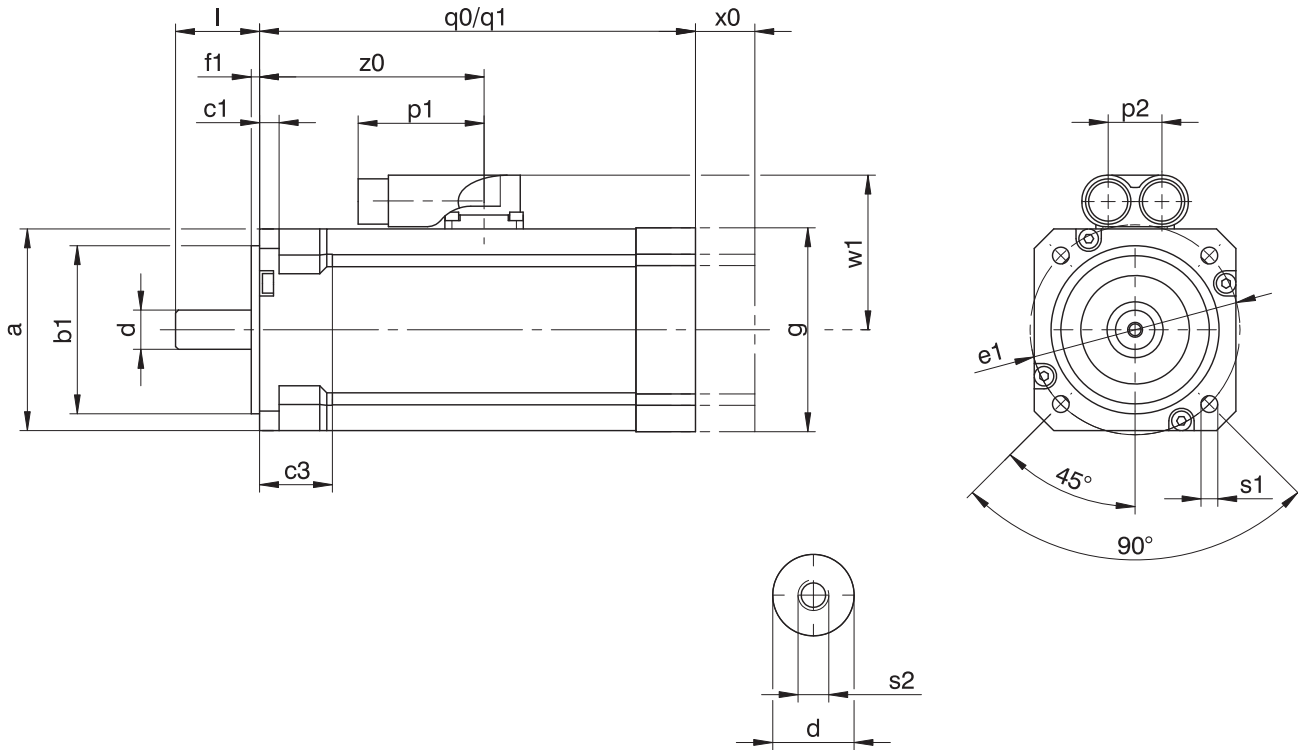


q0 Applies to motors without holding brake

q1 Applies to motors with holding brake

| Type   | □a | ∅b1             | c1 | c3 | ∅d               | ∅e1 | f1  | □g | l  | p1 | q0  | q1  | ∅s1 | s2 | w1   | z0    |
|--------|----|-----------------|----|----|------------------|-----|-----|----|----|----|-----|-----|-----|----|------|-------|
| EZ202U | 55 | 40 <sub>β</sub> | 7  | 7  | 9 <sub>k6</sub>  | 63  | 3.5 | 55 | 20 | 40 | 148 | 157 | 5.8 | M4 | 69.5 | 93.0  |
| EZ203U | 55 | 40 <sub>β</sub> | 7  | 7  | 9 <sub>k6</sub>  | 63  | 3.5 | 55 | 20 | 40 | 166 | 175 | 5.8 | M4 | 69.5 | 111.0 |
| EZ301U | 72 | 60 <sub>β</sub> | 7  | 26 | 14 <sub>k6</sub> | 75  | 3.0 | 72 | 30 | 40 | 116 | 156 | 6.0 | M5 | 78.0 | 80.5  |
| EZ302U | 72 | 60 <sub>β</sub> | 7  | 26 | 14 <sub>k6</sub> | 75  | 3.0 | 72 | 30 | 40 | 138 | 178 | 6.0 | M5 | 78.0 | 102.5 |
| EZ303U | 72 | 60 <sub>β</sub> | 7  | 26 | 14 <sub>k6</sub> | 75  | 3.0 | 72 | 30 | 40 | 160 | 200 | 6.0 | M5 | 78.0 | 124.5 |

### 13.4.2 EZ2 – EZ3 motors



q0 Applies to motors without holding brake

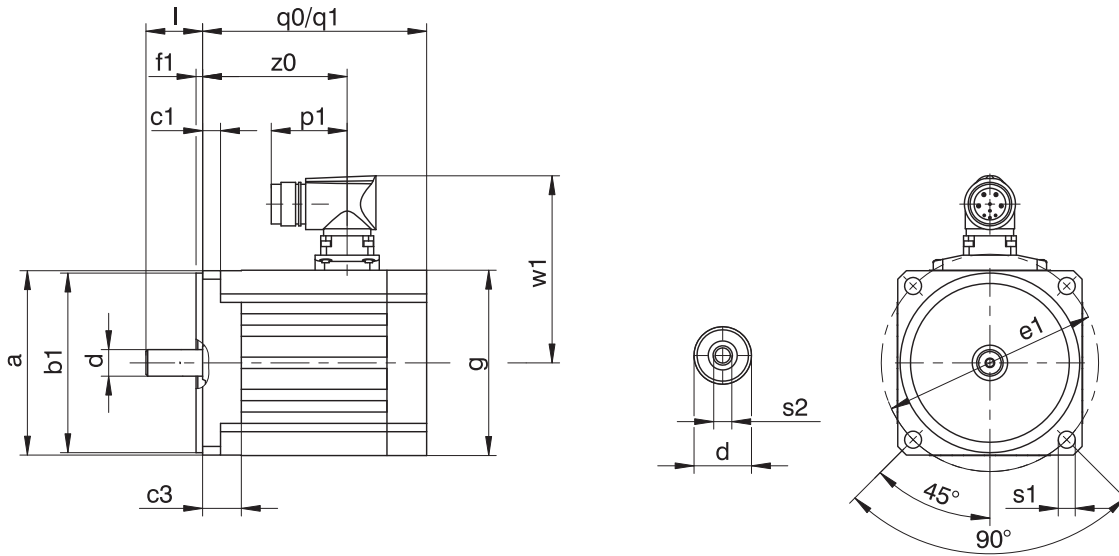
q1 Applies to motors with holding brake

x0 EZ2: Applies only to motors with holding brake and encoders using an optical or inductive measuring method

EZ3 – EZ8: Applies to encoders using an optical measuring method

| Type   | $\square a$ | $\varnothing b1$ | c1 | c3 | $\varnothing d$  | $\varnothing e1$ | f1  | $\square g$ | l  | p1 | p2 | q0  | q1  | $\varnothing s1$ | s2 | w1   | x0 | z0    |
|--------|-------------|------------------|----|----|------------------|------------------|-----|-------------|----|----|----|-----|-----|------------------|----|------|----|-------|
| EZ202U | 55          | 40 <sub>j6</sub> | 7  | 7  | 9 <sub>k6</sub>  | 63               | 3.5 | 55          | 20 | 45 | 19 | 148 | 157 | 5.8              | M4 | 47.0 | 25 | 93.0  |
| EZ203U | 55          | 40 <sub>j6</sub> | 7  | 7  | 9 <sub>k6</sub>  | 63               | 3.5 | 55          | 20 | 45 | 19 | 166 | 175 | 5.8              | M4 | 47.0 | 25 | 111.0 |
| EZ301U | 72          | 60 <sub>j6</sub> | 7  | 26 | 14 <sub>k6</sub> | 75               | 3.0 | 72          | 30 | 45 | 19 | 116 | 156 | 6.0              | M5 | 55.5 | 21 | 80.5  |
| EZ302U | 72          | 60 <sub>j6</sub> | 7  | 26 | 14 <sub>k6</sub> | 75               | 3.0 | 72          | 30 | 45 | 19 | 138 | 178 | 6.0              | M5 | 55.5 | 21 | 102.5 |
| EZ303U | 72          | 60 <sub>j6</sub> | 7  | 26 | 14 <sub>k6</sub> | 75               | 3.0 | 72          | 30 | 45 | 19 | 160 | 200 | 6.0              | M5 | 55.5 | 21 | 124.5 |

### 13.4.3 EZ4 – EZ7 motors with convection cooling (One Cable Solution)

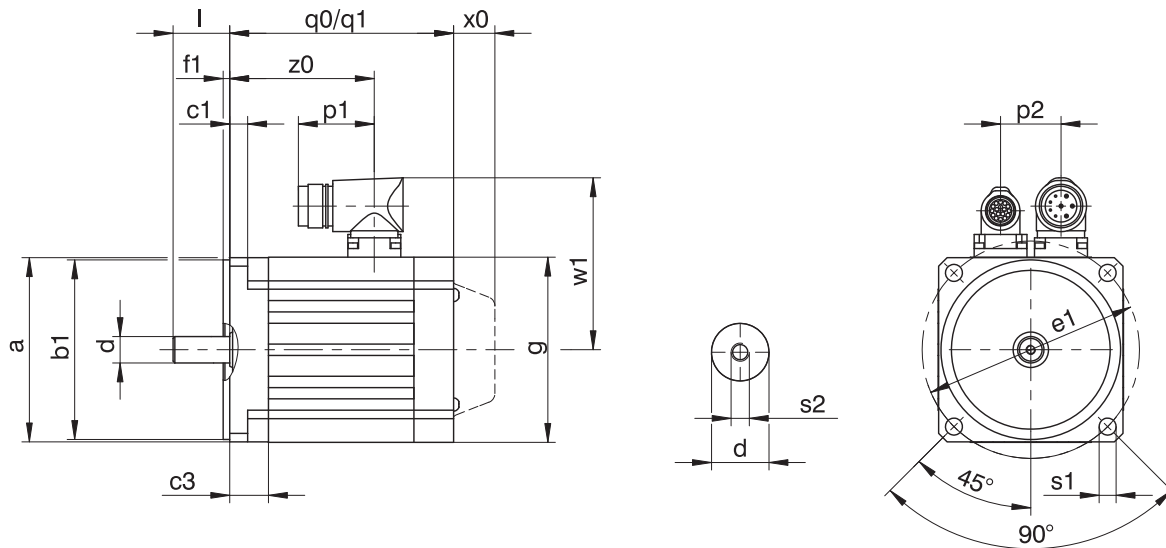


q0 Applies to motors without holding brake

q1 Applies to motors with holding brake

| Type   | □a  | ∅b1               | c1   | c3   | ∅d               | ∅e1 | f1  | □g  | l  | p1 | q0    | q1    | ∅s1 | s2  | w1  | z0    |
|--------|-----|-------------------|------|------|------------------|-----|-----|-----|----|----|-------|-------|-----|-----|-----|-------|
| EZ401U | 98  | 95 <sub>js</sub>  | 9.5  | 20.5 | 14 <sub>ks</sub> | 115 | 3.5 | 98  | 30 | 40 | 118.5 | 167.0 | 9   | M5  | 99  | 76.5  |
| EZ402U | 98  | 95 <sub>js</sub>  | 9.5  | 20.5 | 19 <sub>ks</sub> | 115 | 3.5 | 98  | 40 | 40 | 143.5 | 192.0 | 9   | M6  | 99  | 101.5 |
| EZ404U | 98  | 95 <sub>js</sub>  | 9.5  | 20.5 | 19 <sub>ks</sub> | 115 | 3.5 | 98  | 40 | 40 | 193.5 | 242.0 | 9   | M6  | 99  | 151.5 |
| EZ501U | 115 | 110 <sub>js</sub> | 10.0 | 16.0 | 19 <sub>ks</sub> | 130 | 3.5 | 115 | 40 | 40 | 109.0 | 163.5 | 9   | M6  | 110 | 74.5  |
| EZ502U | 115 | 110 <sub>js</sub> | 10.0 | 16.0 | 19 <sub>ks</sub> | 130 | 3.5 | 115 | 40 | 40 | 134.0 | 188.5 | 9   | M6  | 110 | 99.5  |
| EZ503U | 115 | 110 <sub>js</sub> | 10.0 | 16.0 | 24 <sub>ks</sub> | 130 | 3.5 | 115 | 50 | 40 | 159.0 | 213.5 | 9   | M8  | 110 | 124.5 |
| EZ505U | 115 | 110 <sub>js</sub> | 10.0 | 16.0 | 24 <sub>ks</sub> | 130 | 3.5 | 115 | 50 | 40 | 209.0 | 263.5 | 9   | M8  | 110 | 174.5 |
| EZ701U | 145 | 130 <sub>js</sub> | 10.0 | 19.0 | 24 <sub>ks</sub> | 165 | 3.5 | 145 | 50 | 40 | 121.0 | 180.0 | 11  | M8  | 125 | 83.0  |
| EZ702U | 145 | 130 <sub>js</sub> | 10.0 | 19.0 | 24 <sub>ks</sub> | 165 | 3.5 | 145 | 50 | 40 | 146.0 | 205.0 | 11  | M8  | 125 | 108.0 |
| EZ703U | 145 | 130 <sub>js</sub> | 10.0 | 19.0 | 24 <sub>ks</sub> | 165 | 3.5 | 145 | 50 | 40 | 171.0 | 230.0 | 11  | M8  | 125 | 133.0 |
| EZ705U | 145 | 130 <sub>js</sub> | 10.0 | 19.0 | 32 <sub>ks</sub> | 165 | 3.5 | 145 | 58 | 40 | 226.0 | 285.0 | 11  | M12 | 125 | 184.0 |

### 13.4.4 EZ4 – EZ8 motors with convection cooling



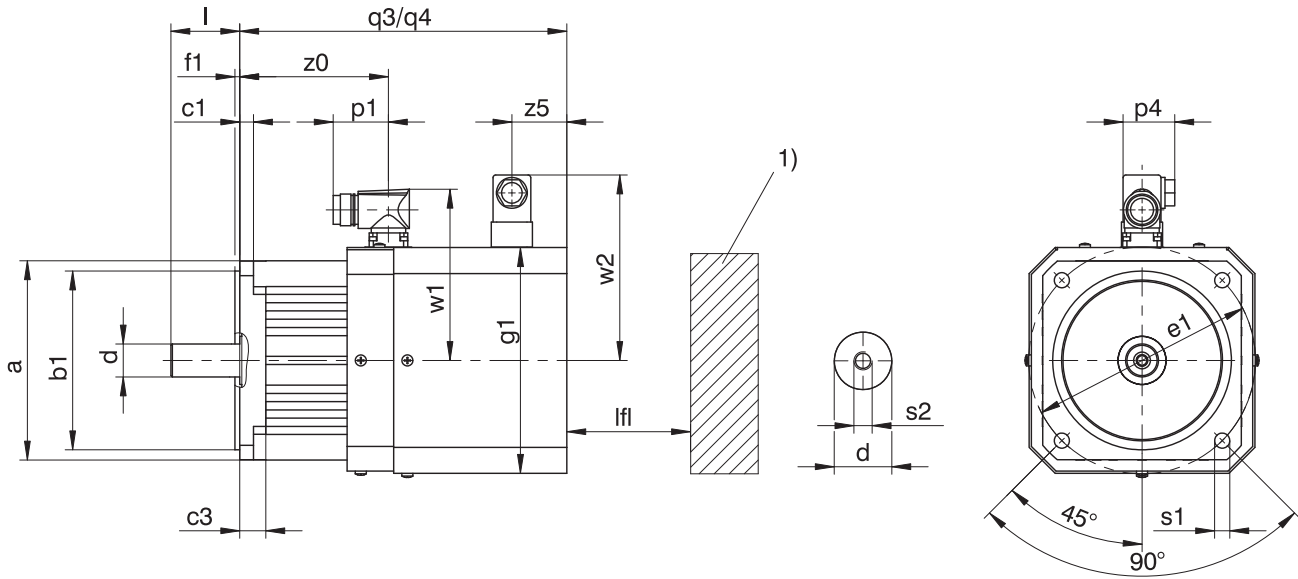
$q_0$  Applies to motors without holding brake

$q_1$  Applies to motors with holding brake

$x_0$  Applies to encoders based on an optical measuring method

| Type   | $\square a$ | $\varnothing b_1$ | $c_1$ | $c_3$ | $\varnothing d$  | $\varnothing e_1$ | $f_1$ | $\square g$ | $l$ | $p_1$ | $p_2$ | $q_0$ | $q_1$ | $\varnothing s_1$ | $s_2$ | $w_1$ | $x_0$ | $z_0$ |
|--------|-------------|-------------------|-------|-------|------------------|-------------------|-------|-------------|-----|-------|-------|-------|-------|-------------------|-------|-------|-------|-------|
| EZ401U | 98          | 95 <sub>h6</sub>  | 9.5   | 20.5  | 14 <sub>h6</sub> | 115               | 3.5   | 98          | 30  | 40    | 32    | 118.5 | 167.0 | 9.0               | M5    | 91.0  | 22    | 76.5  |
| EZ402U | 98          | 95 <sub>h6</sub>  | 9.5   | 20.5  | 19 <sub>h6</sub> | 115               | 3.5   | 98          | 40  | 40    | 32    | 143.5 | 192.0 | 9.0               | M6    | 91.0  | 22    | 101.5 |
| EZ404U | 98          | 95 <sub>h6</sub>  | 9.5   | 20.5  | 19 <sub>h6</sub> | 115               | 3.5   | 98          | 40  | 40    | 32    | 193.5 | 242.0 | 9.0               | M6    | 91.0  | 22    | 151.5 |
| EZ501U | 115         | 110 <sub>h6</sub> | 10.0  | 16.0  | 19 <sub>h6</sub> | 130               | 3.5   | 115         | 40  | 40    | 36    | 109.0 | 163.5 | 9.0               | M6    | 100.0 | 22    | 74.5  |
| EZ502U | 115         | 110 <sub>h6</sub> | 10.0  | 16.0  | 19 <sub>h6</sub> | 130               | 3.5   | 115         | 40  | 40    | 36    | 134.0 | 188.5 | 9.0               | M6    | 100.0 | 22    | 99.5  |
| EZ503U | 115         | 110 <sub>h6</sub> | 10.0  | 16.0  | 24 <sub>h6</sub> | 130               | 3.5   | 115         | 50  | 40    | 36    | 159.0 | 213.5 | 9.0               | M8    | 100.0 | 22    | 124.5 |
| EZ505U | 115         | 110 <sub>h6</sub> | 10.0  | 16.0  | 24 <sub>h6</sub> | 130               | 3.5   | 115         | 50  | 40    | 36    | 209.0 | 263.5 | 9.0               | M8    | 100.0 | 22    | 174.5 |
| EZ701U | 145         | 130 <sub>h6</sub> | 10.0  | 19.0  | 24 <sub>h6</sub> | 165               | 3.5   | 145         | 50  | 40    | 42    | 121.0 | 180.0 | 11.0              | M8    | 115.0 | 22    | 83.0  |
| EZ702U | 145         | 130 <sub>h6</sub> | 10.0  | 19.0  | 24 <sub>h6</sub> | 165               | 3.5   | 145         | 50  | 40    | 42    | 146.0 | 205.0 | 11.0              | M8    | 115.0 | 22    | 108.0 |
| EZ703U | 145         | 130 <sub>h6</sub> | 10.0  | 19.0  | 24 <sub>h6</sub> | 165               | 3.5   | 145         | 50  | 40    | 42    | 171.0 | 230.0 | 11.0              | M8    | 115.0 | 22    | 133.0 |
| EZ705U | 145         | 130 <sub>h6</sub> | 10.0  | 19.0  | 32 <sub>h6</sub> | 165               | 3.5   | 145         | 58  | 71    | 42    | 226.0 | 285.0 | 11.0              | M12   | 134.0 | 22    | 184.0 |
| EZ802U | 190         | 180 <sub>h6</sub> | 15.0  | 25.0  | 32 <sub>h6</sub> | 215               | 3.5   | 190         | 58  | 71    | 60    | 222.0 | 299.0 | 13.5              | M12   | 156.5 | 22    | 168.0 |
| EZ803U | 190         | 180 <sub>h6</sub> | 15.0  | 25.0  | 38 <sub>h6</sub> | 215               | 3.5   | 190         | 80  | 71    | 60    | 263.0 | 340.0 | 13.5              | M12   | 156.5 | 22    | 209.0 |
| EZ805U | 190         | 180 <sub>h6</sub> | 15.0  | 25.0  | 38 <sub>h6</sub> | 215               | 3.5   | 190         | 80  | 71    | 60    | 345.0 | 422.0 | 13.5              | M12   | 156.5 | 22    | 291.0 |

### 13.4.5 EZ4 – EZ7 motors with forced ventilation (One Cable Solution)



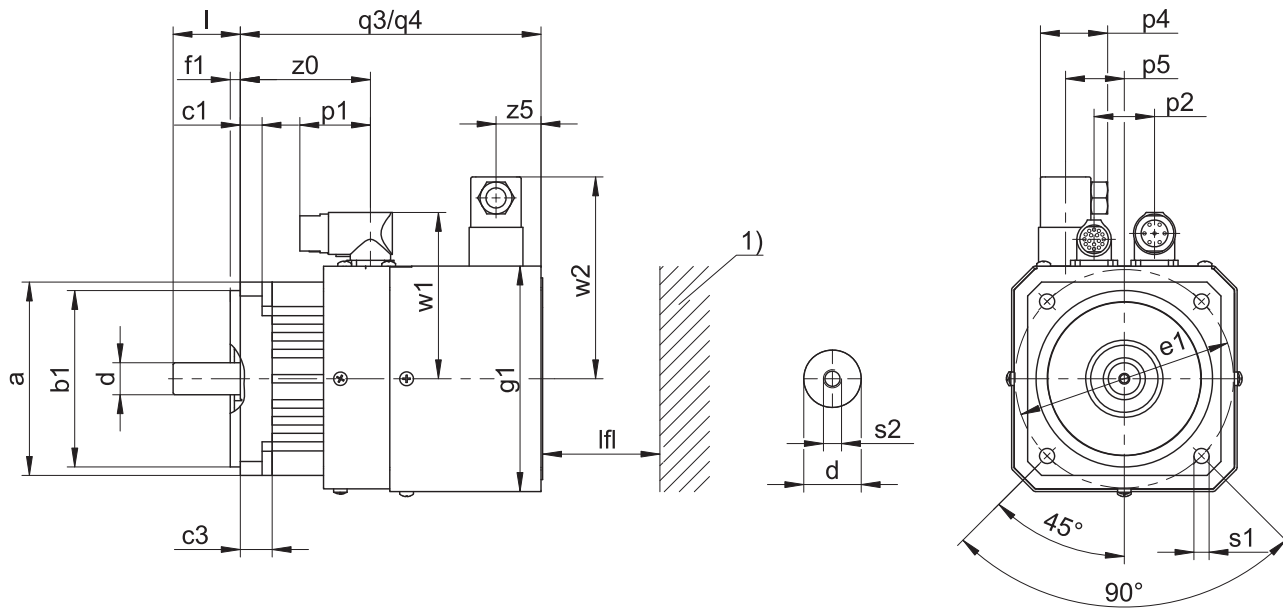
q3 Applies to motors without holding brake

q4 Applies to motors with holding brake

1) Machine wall

| Type   | □a  | ∅b1               | c1   | c3   | ∅d               | ∅e1 | f1  | □g1 | l  | lfl <sub>min</sub> | p1 | p4   | q3  | q4  | ∅s1  | s2 | w1  | w2  | z0    | z5 |
|--------|-----|-------------------|------|------|------------------|-----|-----|-----|----|--------------------|----|------|-----|-----|------|----|-----|-----|-------|----|
| EZ401B | 98  | 95 <sub>j6</sub>  | 9.5  | 20.5 | 14 <sub>k6</sub> | 115 | 3.5 | 118 | 30 | 20                 | 40 | 37.5 | 175 | 224 | 9.0  | M5 | 99  | 111 | 76.5  | 25 |
| EZ402B | 98  | 95 <sub>j6</sub>  | 9.5  | 20.5 | 19 <sub>k6</sub> | 115 | 3.5 | 118 | 40 | 20                 | 40 | 37.5 | 200 | 249 | 9.0  | M6 | 99  | 111 | 101.5 | 25 |
| EZ404B | 98  | 95 <sub>j6</sub>  | 9.5  | 20.5 | 19 <sub>k6</sub> | 115 | 3.5 | 118 | 40 | 20                 | 40 | 37.5 | 250 | 299 | 9.0  | M6 | 99  | 111 | 151.5 | 25 |
| EZ501B | 115 | 110 <sub>j6</sub> | 10.0 | 16.0 | 19 <sub>k6</sub> | 130 | 3.5 | 135 | 40 | 20                 | 40 | 37.5 | 179 | 234 | 9.0  | M6 | 110 | 120 | 74.5  | 25 |
| EZ502B | 115 | 110 <sub>j6</sub> | 10.0 | 16.0 | 19 <sub>k6</sub> | 130 | 3.5 | 135 | 40 | 20                 | 40 | 37.5 | 204 | 259 | 9.0  | M6 | 110 | 120 | 99.5  | 25 |
| EZ503B | 115 | 110 <sub>j6</sub> | 10.0 | 16.0 | 24 <sub>k6</sub> | 130 | 3.5 | 135 | 50 | 20                 | 40 | 37.5 | 229 | 284 | 9.0  | M8 | 110 | 120 | 124.5 | 25 |
| EZ505B | 115 | 110 <sub>j6</sub> | 10.0 | 16.0 | 24 <sub>k6</sub> | 130 | 3.5 | 135 | 50 | 20                 | 40 | 37.5 | 279 | 334 | 9.0  | M8 | 110 | 120 | 174.5 | 25 |
| EZ701B | 145 | 130 <sub>j6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 37.5 | 213 | 272 | 11.0 | M8 | 125 | 134 | 83.0  | 40 |
| EZ702B | 145 | 130 <sub>j6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 37.5 | 238 | 297 | 11.0 | M8 | 125 | 134 | 108.0 | 40 |
| EZ703B | 145 | 130 <sub>j6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 37.5 | 263 | 322 | 11.0 | M8 | 125 | 134 | 133.0 | 40 |

### 13.4.6 EZ4 – EZ8 motors with forced ventilation



q3 Applies to motors without holding brake

q4 Applies to motors with holding brake

1) Machine wall

| Type   | □a  | ∅b1               | c1   | c3   | ∅d               | ∅e1 | f1  | □g1 | l  | lfl <sub>min</sub> | p1 | p2 | p4   | p5 | q3  | q4  | ∅s1  | s2  | w1    | w2  | z0    | z5 |
|--------|-----|-------------------|------|------|------------------|-----|-----|-----|----|--------------------|----|----|------|----|-----|-----|------|-----|-------|-----|-------|----|
| EZ401B | 98  | 95 <sub>f6</sub>  | 9.5  | 20.5 | 14 <sub>k6</sub> | 115 | 3.5 | 118 | 30 | 20                 | 40 | 32 | 37.5 | 0  | 175 | 224 | 9.0  | M5  | 91.0  | 111 | 76.5  | 25 |
| EZ402B | 98  | 95 <sub>f6</sub>  | 9.5  | 20.5 | 19 <sub>k6</sub> | 115 | 3.5 | 118 | 40 | 20                 | 40 | 32 | 37.5 | 0  | 200 | 249 | 9.0  | M6  | 91.0  | 111 | 101.5 | 25 |
| EZ404B | 98  | 95 <sub>f6</sub>  | 9.5  | 20.5 | 19 <sub>k6</sub> | 115 | 3.5 | 118 | 40 | 20                 | 40 | 32 | 37.5 | 0  | 250 | 299 | 9.0  | M6  | 91.0  | 111 | 151.5 | 25 |
| EZ501B | 115 | 110 <sub>f6</sub> | 10.0 | 16.0 | 19 <sub>k6</sub> | 130 | 3.5 | 135 | 40 | 20                 | 40 | 36 | 37.5 | 0  | 179 | 234 | 9.0  | M6  | 100.0 | 120 | 74.5  | 25 |
| EZ502B | 115 | 110 <sub>f6</sub> | 10.0 | 16.0 | 19 <sub>k6</sub> | 130 | 3.5 | 135 | 40 | 20                 | 40 | 36 | 37.5 | 0  | 204 | 259 | 9.0  | M6  | 100.0 | 120 | 99.5  | 25 |
| EZ503B | 115 | 110 <sub>f6</sub> | 10.0 | 16.0 | 24 <sub>k6</sub> | 130 | 3.5 | 135 | 50 | 20                 | 40 | 36 | 37.5 | 0  | 229 | 284 | 9.0  | M8  | 100.0 | 120 | 124.5 | 25 |
| EZ505B | 115 | 110 <sub>f6</sub> | 10.0 | 16.0 | 24 <sub>k6</sub> | 130 | 3.5 | 135 | 50 | 20                 | 40 | 36 | 37.5 | 0  | 279 | 334 | 9.0  | M8  | 100.0 | 120 | 174.5 | 25 |
| EZ701B | 145 | 130 <sub>f6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 42 | 37.5 | 0  | 213 | 272 | 11.0 | M8  | 115.0 | 134 | 83.0  | 40 |
| EZ702B | 145 | 130 <sub>f6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 42 | 37.5 | 0  | 238 | 297 | 11.0 | M8  | 115.0 | 134 | 108.0 | 40 |
| EZ703B | 145 | 130 <sub>f6</sub> | 10.0 | 19.0 | 24 <sub>k6</sub> | 165 | 3.5 | 165 | 50 | 30                 | 40 | 42 | 37.5 | 0  | 263 | 322 | 11.0 | M8  | 115.0 | 134 | 133.0 | 40 |
| EZ705B | 145 | 130 <sub>f6</sub> | 10.0 | 19.0 | 32 <sub>k6</sub> | 165 | 3.5 | 165 | 58 | 30                 | 71 | 42 | 37.5 | 0  | 318 | 377 | 11.0 | M12 | 134.0 | 134 | 184.0 | 40 |
| EZ802B | 190 | 180 <sub>f6</sub> | 15.0 | 25.0 | 32 <sub>k6</sub> | 215 | 3.5 | 215 | 58 | 30                 | 71 | 60 | 37.5 | 62 | 322 | 399 | 13.5 | M12 | 156.5 | 160 | 168.0 | 40 |
| EZ803B | 190 | 180 <sub>f6</sub> | 15.0 | 25.0 | 38 <sub>k6</sub> | 215 | 3.5 | 215 | 80 | 30                 | 71 | 60 | 37.5 | 62 | 363 | 440 | 13.5 | M12 | 156.5 | 160 | 209.0 | 40 |
| EZ805B | 190 | 180 <sub>f6</sub> | 15.0 | 25.0 | 38 <sub>k6</sub> | 215 | 3.5 | 215 | 80 | 30                 | 71 | 60 | 37.5 | 62 | 445 | 522 | 13.5 | M12 | 156.5 | 160 | 291.0 | 40 |

## 13.5 Type designation

### Example code

|    |   |   |   |   |   |    |    |   |     |
|----|---|---|---|---|---|----|----|---|-----|
| EZ | 4 | 0 | 1 | U | D | BB | Q7 | O | 096 |
|----|---|---|---|---|---|----|----|---|-----|

### Explanation

| Code | Designation               | Design                         |
|------|---------------------------|--------------------------------|
| EZ   | Type                      | Synchronous servo motor        |
| 4    | Size                      | 4 (example)                    |
| 0    | Generation                | 0                              |
| 1    | Length                    | 1 (example)                    |
| U    | Cooling <sup>1</sup>      | Convection cooling             |
| B    |                           | Forced ventilation             |
| D    | Design                    | Dynamic                        |
| BB   | Drive controller          | SI6 (example)                  |
| Q7   | Encoder                   | EnDat 3 EQI 1131 (example)     |
| O    | Brake                     | Without holding brake          |
| P    |                           | Permanent magnet holding brake |
| 096  | Voltage constant $K_{EM}$ | 96 V/1000 rpm (example)        |

### Notes

- In Chapter Encoders, you can find information about available encoders.
- In Chapter Possible combinations with drive controllers, you can find information about connecting synchronous servo motors to other drive controllers from STOBBER.
- In Chapter [▶ 14](#), you can find information about options for connecting STOBBER synchronous servo motors to drive controllers from other manufacturers.

## 13.6 Product description

### 13.6.1 General features

| Feature             | Description  |
|---------------------|--|
| Design              | IM B5, IM V1, IM V3 in accordance with EN 60034-7  |
| Protection class    | IP56 / IP66 (option)   |
| Thermal class       | 155 (F) in accordance with EN 60034-1 (155 °C, heating $\Delta\theta = 100$ K)                   |
| Surface             | Matte black as per RAL 9005  |
| Cooling             | IC 410 convection cooling<br>(IC 416 convection cooling with forced ventilation units, optional) |
| Bearing             | Rolling bearing with lifetime lubrication and non-contact sealing                                |
| Sealing             | Radial shaft seal rings made of FKM (A side)   |
| Shaft               | Shaft without feather key, diameter quality k6   |
| Radial runout       | Normal tolerance class in accordance with IEC 60072-1  |
| Concentricity       | Normal tolerance class in accordance with IEC 60072-1  |
| Axial runout        | Normal tolerance class in accordance with IEC 60072-1  |
| Vibration intensity | A in accordance with EN 60034-14   |
| Noise level         | Limit values in accordance with EN 60034-9   |



## 13.6.2 Electrical features

General electrical features of the motor are described in this chapter. Details can be found in the "Selection tables" chapter.

| Feature                                 | Description   |
|---|---|
| DC link voltage                         | DC 540 V (max. 620 V) on STOBER drive controllers                                     |
| Winding                                 | Three-phase, single-tooth coil design   |
| Circuit                                 | Star, center not led through  |
| Protection class                        | I (protective grounding) in accordance with EN 61140                                  |
| Impulse voltage insulation class (IVIC) | C in accordance with DIN EN 60034-18-41 (inverter connection voltage 0 – 480 V ± 10%) |
| Number of pole pairs                    | 2 (EZ2)<br>5 (EZ3)<br>7 (EZ4/EZ5/EZ7)<br>8 (EZ8)                                      |

## 13.6.3 Ambient conditions

Standard ambient conditions for transport, storage and operation of the motor are described in this chapter. Information about differing ambient conditions can be found in the chapter Derating.

| Feature                                       | Description  |
|---|--|
| Surrounding temperature for transport/storage | –30 °C to +85 °C   |
| Surrounding temperature for operation         | –15 °C to +40 °C   |
| Relative humidity                             | 5% to 95%, no condensation   |
| Installation altitude                         | ≤ 1000 m above sea level   |
| Shock load                                    | ≤ 50 m/s <sup>2</sup> (5 g), 6 ms in accordance with EN 60068-2-27 |

### Notes

- STOBER synchronous servo motors are not suitable for potentially explosive atmospheres.
- Secure the power cables close to the motor so that vibrations of the cable do not place impermissible loads on the motor plug connector.
- Note that the braking torques of the holding brake (optional) may be reduced by shock loading.
- At operating temperatures below 0 °C, note that the discs of the holding brake (optional) may ice up.
- Also take into consideration the shock load of the motor due to output units (such as gear units and pumps) which are coupled with the motor.

## 13.6.4 Encoders

STOBER synchronous servo motors can be designed with different encoder models. The following chapters include information for choosing the optimal encoder for your application.

### 13.6.4.1 Encoder measuring method selection tool

The following table offers a selection tool for an encoder measuring method that is optimally suited for your application.

| Feature  | Absolute encoder |           | Resolver        |
|--|------------------|-----------|-----------------|
|  | Optical          | Inductive | Electromagnetic |
| Measuring method   |                  |           |                 |
| Temperature resistance   | ★★☆              | ★★★       | ★★★             |
| Vibration strength and shock resistance  | ★★☆              | ★★★       | ★★★             |
| System accuracy  | ★★★              | ★★☆       | ★☆☆             |
| FMA version with fault exclusion for mechanical coupling (option with EnDat interface) | ✓                | ✓         | –               |
| Elimination of referencing with multi-turn design (optional)                           | ✓                | ✓         | –               |
| Simple commissioning with electronic nameplate   | ✓                | ✓         | –               |
| Key: ★☆☆ = satisfactory, ★★☆ = good, ★★★ = very good                                   |                  |           |                 |

### 13.6.4.2 Selection tool for EnDat interface

The following table offers a selection tool for the EnDat interface of absolute encoders.

| Feature  | EnDat 2.1 | EnDat 2.2 | EnDat 3 |
|--|-----------|-----------|---------|
| Short cycle times  | ★★☆       | ★★★       | ★★★     |
| Transfer of additional information along with the position value | –         | ✓         | ✓       |
| Expanded power supply range                                      | ★★☆       | ★★★       | ★★★     |
| One Cable Solution (OCS)   | –         | –         | ✓       |
| Key: ★★☆ = good, ★★★ = very good                                 |           |           |         |

### 13.6.4.3 EnDat 3 encoders

EnDat 3 is a robust, purely digital protocol that functions with minimal connection lines. EnDat 3 facilitates the One Cable Solution, which allows the connection lines between the encoder and drive controller to be routed along in the motor's power cable.

The One Cable Solution offers the following advantages:

- Significantly reduced wiring effort by eliminating the encoder cable
- For cable lengths up to 50 m, a choke between the drive controller and motor is not necessary
- Advanced safety functions possible (up to SIL2 / category 3, PLd)
- Significantly reduced space requirements by eliminating the encoder plug connector
- Transmission of measured values from the temperature sensor using the EnDat 3 protocol

A motor with the EnDat 3 encoder can be operated only on a SI6 or SC6 drive controller from STOBBER.

The EnDat 3 encoder has the following features:

| Encoder model    | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                  |
|------------------|------|------------------|------------------------|------------|--------------------------------|--------------|--------------------------|
| EnDat 3 EQI 1131 | Q7   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$ |

### 13.6.4.4 EnDat 2 encoders

In this chapter, you can find detailed technical data for encoder models that can be selected with EnDat interface.

#### Encoders with EnDat 2.2 interface

| Encoder model             | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                   |
|---------------------------|------|------------------|------------------------|------------|--------------------------------|--------------|---------------------------|
| EnDat 2.2 EQI 1131        | Q6   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 EBI 1135        | B0   | Inductive        | 65536                  | 18 bit     | 262144                         | > 100        | $\leq 600 \times 10^{-9}$ |
| EnDat 2.2 ECI 1118-G2     | C5   | Inductive        | –                      | 18 bit     | 262144                         | > 76         | $\leq 1.5 \times 10^{-6}$ |
| EnDat 2.2 EQN 1135<br>FMA | M3   | Optical          | 4096                   | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 EQN 1135        | Q5   | Optical          | 4096                   | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 ECN 1123<br>FMA | M1   | Optical          | –                      | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 ECN 1123        | C7   | Optical          | –                      | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |

## Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]                 |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|-------------------------|
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113 FMA | M0   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113     | C6   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECI 1118-G3  | C2   | Inductive        | –                      | 18 bit     | 262144                         | Sin/cos 512            | > 100        | $\leq 6 \times 10^{-7}$ |

## Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- MTTF = Average time before dangerous failure. MTTF values greater than 100 years were reduced in accordance with DIN EN ISO 13849.
- PFH = Probability of a dangerous failure per hour
- The EnDat 2.2 EBI 1135 encoder requires an external buffer battery so that absolute position information is retained after the power supply is turned off (AES option for STOBBER drive controllers).
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

## 13.6.4.5 Resolver

In this chapter, you can find detailed technical data for the resolver that can be installed as an encoder in a STOBBER synchronous servo motor.

| Feature                         | Description                                |
|---------------------------------|--|
| Number of poles                 | 2  |
| Input voltage $U_{1\text{eff}}$ | $7 \text{ V} \pm 5\%$                      |
| Input frequency $f_1$           | 10 kHz                                     |
| Output voltage $U_{2,51-53}$    | $K_{tr} \cdot U_{R1-R2} \cdot \cos \theta$ |
| Output voltage $U_{2,52-54}$    | $K_{tr} \cdot U_{R1-R2} \cdot \sin \theta$ |
| Transformation ratio $K_{tr}$   | $0.5 \pm 5\%$                              |
| Electrical fault                | $\pm 10$ arcmin                            |
| MTTF                            | > 100 years                                |
| PHF                             | $\leq 10^{-9}$                             |

### 13.6.4.6 Possible combinations with drive controllers

The following table shows the options for combining STOBBER drive controllers with selectable encoder models.

| Drive controller       |              | SDS 5000 |        | SD6    |        | SI6    |        |               | SC6    |        |               |
|------------------------|--------------|----------|--------|--------|--------|--------|--------|---------------|--------|--------|---------------|
| Drive controller code  |              | AA       | AC     | AD     | AE     | AP     | AQ     | BB            | AU     | AV     | BA            |
| Connection plan ID     |              | 442305   | 442307 | 442450 | 442451 | 442771 | 442772 | <b>443175</b> | 443052 | 443053 | <b>443174</b> |
| Encoder                | Encoder code |          |        |        |        |        |        |               |        |        |               |
| EnDat 3 EQI 1131       | Q7           | –        | –      | –      | –      | –      | –      | ✓             | –      | –      | ✓             |
| EnDat 2.2 EQI 1131     | Q6           | ✓        | –      | ✓      | –      | ✓      | –      | –             | ✓      | –      | –             |
| EnDat 2.2 EQN 1135 FMA | M3           | ✓        | –      | ✓      | –      | –      | –      | –             | –      | –      | –             |
| EnDat 2.2 EQN 1135     | Q5           | ✓        | –      | ✓      | –      | ✓      | –      | –             | ✓      | –      | –             |
| EnDat 2.2 ECN 1123 FMA | M1           | ✓        | –      | ✓      | –      | –      | –      | –             | –      | –      | –             |
| EnDat 2.2 ECN 1123     | C7           | ✓        | –      | ✓      | –      | ✓      | –      | –             | ✓      | –      | –             |
| EnDat 2.2 ECI 1118-G2  | C5           | ✓        | –      | ✓      | –      | ✓      | –      | –             | ✓      | –      | –             |
| EnDat 2.1 EQN 1125 FMA | M2           | ✓        | ✓      | ✓      | ✓      | –      | –      | –             | –      | –      | –             |
| EnDat 2.1 EQN 1125     | Q4           | ✓        | ✓      | ✓      | ✓      | –      | –      | –             | –      | –      | –             |
| EnDat 2.1 ECN 1113 FMA | M0           | ✓        | ✓      | ✓      | ✓      | –      | –      | –             | –      | –      | –             |
| EnDat 2.1 ECN 1113     | C6           | ✓        | ✓      | ✓      | ✓      | –      | –      | –             | –      | –      | –             |
| Resolver               | R0           | ✓        | –      | –      | ✓      | –      | ✓      | –             | –      | ✓      | –             |

#### Notes

- The drive controller and encoder codes are a part of the type designation of the motor (see the "Type designation" chapter).
- In Chapter [14](#), you can find information about options for connecting STOBBER synchronous servo motors to drive controllers from other manufacturers.

## 13.6.5 Temperature sensor

In this chapter, you can find technical data for the temperature sensors that are installed in STOBBER synchronous servo motors for implementing thermal winding protection. To prevent damage to the motor, always monitor the temperature sensor with appropriate devices that will turn off the motor if the maximum permitted winding temperature is exceeded.

Some encoders feature integrated temperature monitoring, the warning and switch-off thresholds of which may overlap with the corresponding values set for the temperature sensor in the drive controller. In some cases, this may result in an instance where an encoder with internal temperature monitoring forces the motor to shut down, even before the motor has reached its nominal data.

You can find information about the electrical connection of the temperature sensor in the "Connection method" chapter.

### 13.6.5.1 PTC thermistor

The PTC thermistor is installed as a standard temperature sensor in STOBBER synchronous servo motors.

The PTC thermistor is a triple thermistor in accordance with DIN 44082 that can be used for monitoring the temperature of each winding phase. The resistance values in the following table and curve refer to a single thermistor in accordance with DIN 44081. These values must be multiplied by 3 for a triple thermistor in accordance with DIN 44082.

| Feature   | Description   |
|---|---|
| Nominal response temperature $\vartheta_{\text{NAT}}$     | 145 °C ± 5 K  |
| Resistance R -20 °C up to $\vartheta_{\text{NAT}} - 20$ K | ≤ 250 Ω   |
| Resistance R with $\vartheta_{\text{NAT}} - 5$ K          | ≤ 550 Ω   |
| Resistance R with $\vartheta_{\text{NAT}} + 5$ K          | ≥ 1330 Ω  |
| Resistance R with $\vartheta_{\text{NAT}} + 15$ K         | ≥ 4000 Ω  |
| Operating voltage   | ≤ DC 7.5 V  |
| Thermal response time                                     | < 5 s   |
| Thermal class   | 155 (F) in accordance with EN 60034-1 (155 °C, heating $\Delta\vartheta = 100$ K) |

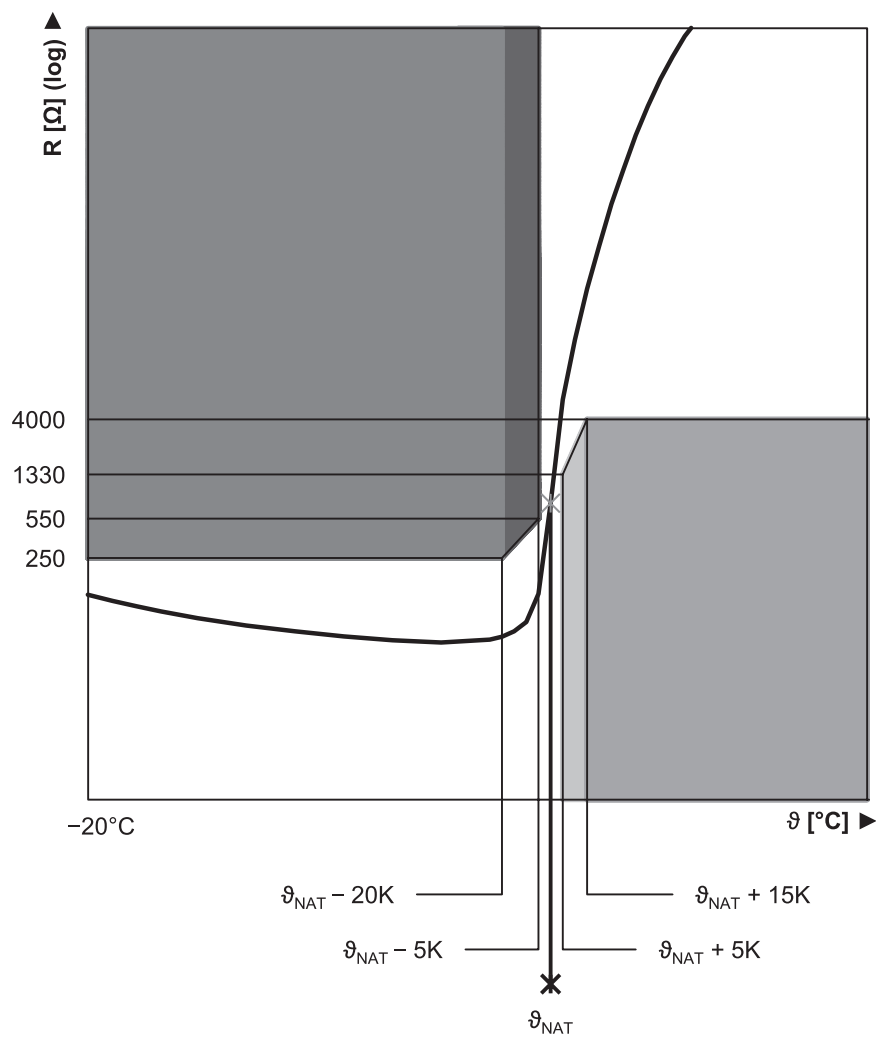


Fig. 2: PTC thermistor curve (single thermistor)

### 13.6.5.2 Pt1000 temperature sensor

STOBER synchronous servo motors are available in versions with a Pt1000 temperature sensor. The Pt1000 is a temperature-dependent resistor that has a resistance curve with a linear relationship with temperature. As a result, the Pt1000 allows for measurements of the winding temperature. These measurements are limited to one phase of the motor winding, however. In order to adequately protect the motor from exceeding the maximum permitted winding temperature, use a  $i^2t$  model in the drive controller to monitor the winding temperature.

Pt1000 temperature sensors can also be used with the One Cable Solution.

Avoid exceeding the specified measurement current so that the measured values are not falsified due to self-heating of the temperature sensor.

| Feature                                      | Description   |
|--|---------------|
| Measurement current (constant)               | 2 mA          |
| Resistance R for $\vartheta = 0\text{ °C}$   | 1000 $\Omega$ |
| Resistance R for $\vartheta = 80\text{ °C}$  | 1300 $\Omega$ |
| Resistance R for $\vartheta = 150\text{ °C}$ | 1570 $\Omega$ |

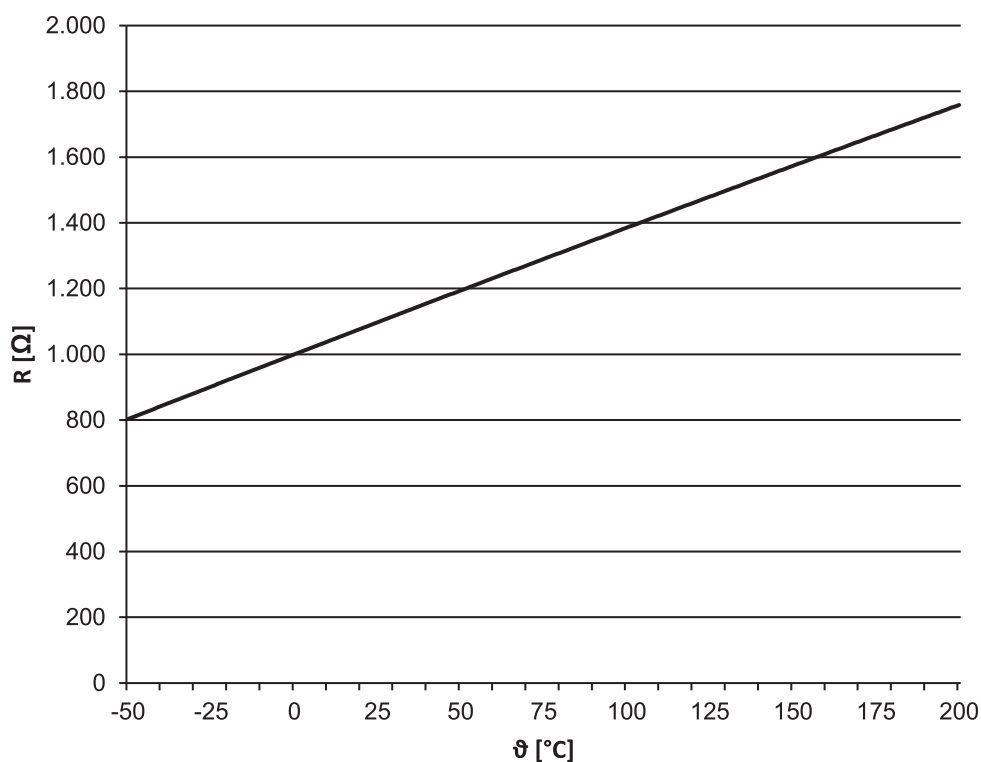


Fig. 3: Pt1000 temperature sensor characteristic curve

## 13.6.6 Cooling

A synchronous servo motor in the standard version is cooled by convection cooling (IC 410 in accordance with EN 60034-6). Optionally, forced ventilation can be used to cool the motor.

### 13.6.6.1 Forced ventilation



STOBER synchronous servo motors offer the option of being cooled with forced ventilation in order to increase performance data while maintaining the same size. Retrofitting with a forced ventilation unit is also possible in order to optimize the drive at a later date. When retrofitting, check whether the conductor cross-section of the power cable of the motor must be increased. Also take into account the dimensions of the forced ventilation unit.

The performance data for motors with forced ventilation can be found in the chapter Selection tables and the dimensions in the chapter Dimensional drawings.

## Technical data

| Motor | Forced ventilation unit | $U_{N,F}$<br>[V]        | $I_{N,F}$<br>[A] | $P_{N,F}$<br>[W] | $q_{VF}$<br>[m <sup>3</sup> /h] | $L_{pA,F}$<br>[dBA] | $m_F$<br>[kg] | Protection class |
|-------|-------------------------|-------------------------|------------------|------------------|---------------------------------|---------------------|---------------|------------------|
| EZ4_B | FL4                     | 230 V ± 5%,<br>50/60 Hz | 0.07             | 10               | 59                              | 41                  | 1.4           | IP44             |
| EZ5_B | FL5                     |                         | 0.10             | 14               | 160                             | 45                  | 1.9           | IP54             |
| EZ7_B | FL7                     |                         | 0.10             | 14               | 160                             | 45                  | 2.9           | IP54             |
| EZ8_B | FL8                     |                         | 0.20             | 26               | 420                             | 54                  | 5.0           | IP55             |

## Terminal assignment for forced ventilation unit plug connectors

| Connection diagram  | Pin   | Connection            |
|---|---|-----------------------|
|  | 1   | L1 (phase)            |
|   | 2   | N (neutral conductor) |
|   | 3   |                       |
|   |  | Grounding conductor   |

## 13.6.7 Holding brake

STOBER synchronous servo motors can be equipped with a backlash-free holding brake using permanent magnets in order to secure the motor shaft when at a standstill. The holding brake engages automatically if the voltage drops.

The holding brake is designed for a high number of operations ( $B_{10} = 10$  million operations,  $B_{10d} = 20$  million operations).

Nominal voltage of permanent magnet holding brake: DC 24 V ± 5%, smoothed.

## Observe the following during project configuration:

- The holding brake is designed to keep the motor shaft from moving. Activate braking processes during operation using the corresponding electrical functions of the drive controller. In exceptional circumstances, the holding brake can be used for braking from full speed (following a power failure or when setting up the machine). The maximum permitted work done by friction  $W_{B,Rmax/h}$  may not be exceeded.
- Note that the braking torque  $M_{Bdyn}$  may initially be up to 50% less when braking from full speed. As a result, the braking effect has a delayed action and braking distances become longer.
- Regularly perform a brake test to ensure the functional safety of the brakes. Details can be found in the documentation of the motor and the drive controller.
- Connect a varistor of type S14 K35 (or comparable) in parallel to the brake coil to protect your machine from switching surges. (Not necessary for connecting the holding brake to STOBER drive controllers of the 5th and 6th generation with a BRS/BRM brake module).
- The holding brake of the motor does not offer adequate safety for persons in the hazardous area of gravity-loaded vertical axes. Therefore take additional measures to minimize risk, e.g. by providing a mechanical substructure for maintenance work.
- Take into consideration voltage losses in the connection cables that connect the voltage source to the holding brake connections.
- The holding torque of the brake can be reduced by shock loading. Information about shock loading can be found in the "Ambient conditions" chapter.
- At operating temperatures from -15 °C to 0 °C, a cold holding brake in the released state may cause operating noises. As the temperature of the holding brake increases, these noises decrease such that operating noises are not heard when using holding brake at operating temperature in the released state.

## Calculation of work done by friction per braking process

$$W_{B,R/B} = \frac{J_{tot} \cdot n^2}{182.4} \cdot \frac{M_{Bdyn}}{M_{Bdyn} \pm M_L}, \quad M_{Bdyn} > M_L$$

The sign of  $M_L$  is positive if the movement runs vertically upwards or horizontally and it is negative if the movement runs vertically down.

Calculation of the stop time

$$t_{dec} = 2.66 \cdot t_{1B} + \frac{n \cdot J_{tot}}{9.55 \cdot M_{Bdyn}}$$

Switching behavior

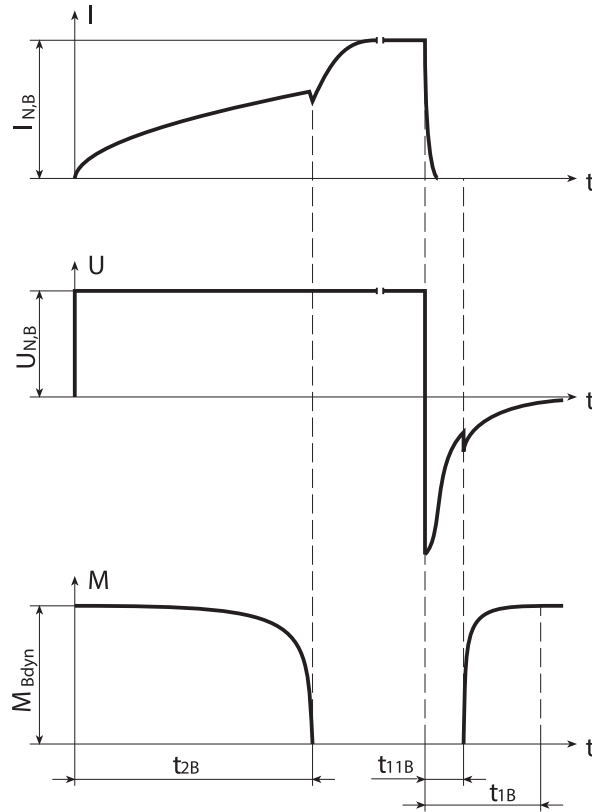


Fig. 4: Holding brake – Switching behavior

Technical data

| Type  | M <sub>Bstat</sub><br>[Nm] | M <sub>Bdyn</sub><br>[Nm] | I <sub>N,B</sub><br>[A] | W <sub>B,Rmax/h</sub><br>[kJ/h] | N <sub>Bstop</sub> | J <sub>Bstop</sub><br>[kgcm <sup>2</sup> ] | W <sub>B,Rlim</sub><br>[kJ] | t <sub>2B</sub><br>[ms] | t <sub>11B</sub><br>[ms] | t <sub>1B</sub><br>[ms] | x <sub>B,N</sub><br>[mm] | ΔJ <sub>B</sub><br>[kgcm <sup>2</sup> ] | Δm <sub>B</sub><br>[kg] |
|-------|----------------------------|---------------------------|-------------------------|---------------------------------|--------------------|--|-----------------------------|-------------------------|--------------------------|-------------------------|--------------------------|---|-------------------------|
| EZ202 | 1.2                        | 1.0                       | 0.36                    | 3.0                             | 45000              | 0.310                                      | 70                          | 10                      | 2.0                      | 5                       | 0.15                     | 0.03                                    | 0.25                    |
| EZ203 | 1.2                        | 1.0                       | 0.38                    | 3.0                             | 36000              | 0.390                                      | 70                          | 10                      | 2.0                      | 5                       | 0.15                     | 0.03                                    | 0.25                    |
| EZ301 | 2.5                        | 2.3                       | 0.51                    | 6.0                             | 48000              | 0.752                                      | 180                         | 25                      | 3.0                      | 20                      | 0.20                     | 0.19                                    | 0.55                    |
| EZ302 | 4.0                        | 3.8                       | 0.50                    | 8.5                             | 38000              | 0.952                                      | 180                         | 44                      | 4.0                      | 26                      | 0.30                     | 0.19                                    | 0.55                    |
| EZ303 | 4.0                        | 3.8                       | 0.50                    | 8.5                             | 30000              | 1.17                                       | 180                         | 44                      | 4.0                      | 26                      | 0.30                     | 0.19                                    | 0.55                    |
| EZ401 | 4.0                        | 3.8                       | 0.50                    | 8.5                             | 16000              | 2.24                                       | 180                         | 44                      | 4.0                      | 26                      | 0.30                     | 0.19                                    | 0.76                    |
| EZ402 | 8.0                        | 7.0                       | 0.75                    | 8.5                             | 13500              | 4.39                                       | 300                         | 40                      | 2.0                      | 20                      | 0.30                     | 0.57                                    | 0.97                    |
| EZ404 | 8.0                        | 7.0                       | 0.75                    | 8.5                             | 8500               | 7.09                                       | 300                         | 40                      | 2.0                      | 20                      | 0.30                     | 0.57                                    | 0.97                    |
| EZ501 | 8.0                        | 7.0                       | 0.75                    | 8.5                             | 8700               | 6.94                                       | 300                         | 40                      | 2.0                      | 20                      | 0.30                     | 0.57                                    | 1.19                    |
| EZ502 | 8.0                        | 7.0                       | 0.80                    | 8.5                             | 5200               | 11.5                                       | 300                         | 40                      | 2.0                      | 20                      | 0.30                     | 0.57                                    | 1.19                    |
| EZ503 | 15                         | 12                        | 1.0                     | 11.0                            | 5900               | 18.6                                       | 550                         | 60                      | 5.0                      | 30                      | 0.30                     | 1.72                                    | 1.62                    |
| EZ505 | 15                         | 12                        | 1.0                     | 11.0                            | 4000               | 27.8                                       | 550                         | 60                      | 5.0                      | 30                      | 0.30                     | 1.72                                    | 1.62                    |
| EZ701 | 15                         | 12                        | 1.0                     | 11.0                            | 5400               | 20.5                                       | 550                         | 60                      | 5.0                      | 30                      | 0.30                     | 1.74                                    | 1.94                    |
| EZ702 | 15                         | 12                        | 1.0                     | 11.0                            | 3600               | 30.9                                       | 550                         | 60                      | 5.0                      | 30                      | 0.30                     | 1.74                                    | 1.94                    |
| EZ703 | 32                         | 28                        | 1.1                     | 25.0                            | 5200               | 54.6                                       | 1400                        | 100                     | 5.0                      | 25                      | 0.40                     | 5.68                                    | 2.81                    |
| EZ705 | 32                         | 28                        | 1.1                     | 25.0                            | 3500               | 79.4                                       | 1400                        | 100                     | 5.0                      | 25                      | 0.40                     | 5.68                                    | 2.81                    |
| EZ802 | 65                         | 35                        | 1.7                     | 45.0                            | 6000               | 149  | 2250                        | 200                     | 10                       | 50                      | 0.40                     | 16.5                                    | 5.40                    |
| EZ803 | 65                         | 35                        | 1.7                     | 45.0                            | 4500               | 200  | 2250                        | 200                     | 10                       | 50                      | 0.40                     | 16.5                                    | 5.40                    |
| EZ805 | 115                        | 70                        | 2.1                     | 65.0                            | 7000               | 376  | 6500                        | 190                     | 12                       | 65                      | 0.50                     | 55.5                                    | 8.40                    |




## 13.6.8 Connection method

The following chapters describe the connection technology of STOBBER synchronous servo motors in the standard version on STOBBER drive controllers. You can find further information relating to the drive controller type that was specified in your order in the connection plan that is delivered with every synchronous servo motor.

In Chapter [▶ 14], you can find information about options for connecting STOBBER synchronous servo motors to drive controllers from other manufacturers.

### 13.6.8.1 Connection of the motor housing to the grounding conductor system

Connect the motor housing to the grounding conductor system of the machine in order to prevent personal injury and faulty triggering of residual current protective devices.

All attachment parts required for the connection of the grounding conductor to the motor housing are delivered with the motor. The grounding screw of the motor is identified with the symbol  in accordance with IEC 60417-DB. The cross-section of the grounding conductor has to be at least as large as the cross-section of the lines in the power connection.

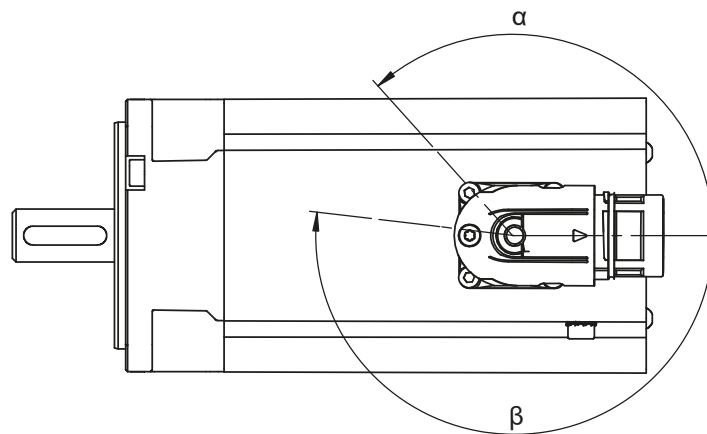
### 13.6.8.2 Plug connectors (One Cable Solution)

In the One Cable Solution design, the power and encoder lines are connected using a shared plug connector.

For motors with forced ventilation, avoid collisions between the motor connection cables and the plug connector of the forced ventilation unit. In the event of a collision, turn the motor plug connectors accordingly. Details regarding the position of the plug connector for the forced ventilation unit can be found in the "Dimensional drawings" chapter.

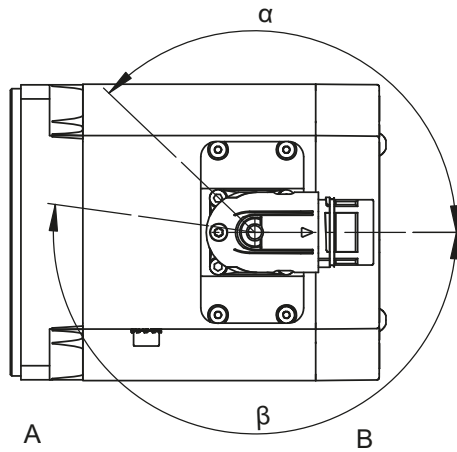
The figures represent the position of the plug connectors upon delivery.

#### Turning ranges of plug connectors (EZ2 – EZ3 motors)



|   |  |   |                 |
|---|--|---|-----------------|
| A | Attachment or output side of the motor | B | Not output side |
|---|--|---|-----------------|

**Turning ranges of plug connectors (EZ4 – EZ7 motors)**



|   |  |   |                 |
|---|--|---|-----------------|
| A | Attachment or output side of the motor | B | Not output side |
|---|--|---|-----------------|

**Plug connector features**

| Motor type                       | Size   | Connection | Turning range |      |
|----------------------------------|--------|------------|---------------|------|
|                                  |        |            | α             | β    |
| EZ2 – EZ5, EZ701 – EZ703, EZ705U | con.23 | Quick lock | 130°          | 190° |

**Notes**

- The number after "con." indicates the approximate external thread diameter of the plug connector in mm (for example, con.23 designates a plug connector with an external thread diameter of about 23 mm).

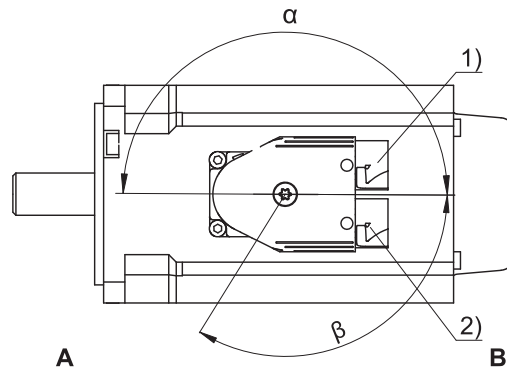
**13.6.8.3 Plug connectors**

STOBER synchronous servo motors are equipped with rotatable quick-lock plug connectors in the standard version. Details can be found in this chapter.

For motors with forced ventilation, avoid collisions between the motor connection cables and the plug connector of the forced ventilation unit. In the event of a collision, turn the motor plug connectors accordingly. Details regarding the position of the plug connector for the forced ventilation unit can be found in the "Dimensional drawings" chapter.

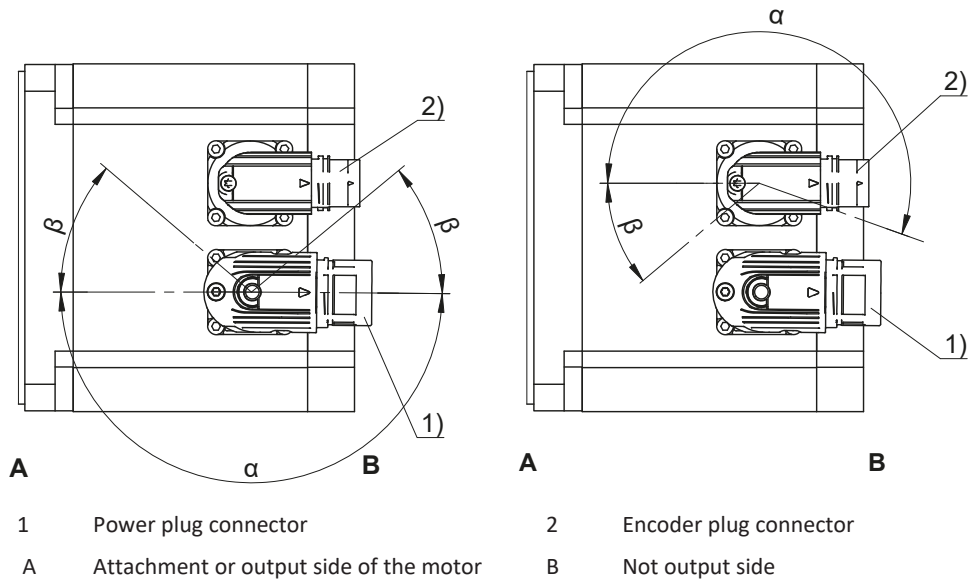
The figures represent the position of the plug connectors upon delivery.

**Turning ranges of plug connectors (EZ2 – EZ3 motors)**



|   |  |   |                        |
|---|--|---|------------------------|
| 1 | Power plug connector                   | 2 | Encoder plug connector |
| A | Attachment or output side of the motor | B | Not output side        |

Turning ranges of plug connectors (EZ4 – EZ8 motors)



Power plug connector features

| Motor type                    | Size   | Connection | Turning range |         |
|-------------------------------|--------|------------|---------------|---------|
|                               |        |            | $\alpha$      | $\beta$ |
| EZ2, EZ3                      | con.15 | Quick lock | 180°          | 140°    |
| EZ4, EZ5, EZ701, EZ702, EZ703 | con.23 | Quick lock | 180°          | 40°     |
| EZ705, EZ802, EZ803, EZ805    | con.40 | Quick lock | 180°          | 40°     |

Encoder plug connector features

| Motor type                         | Size   | Connection | Turning range |         |
|------------------------------------|--------|------------|---------------|---------|
|                                    |        |            | $\alpha$      | $\beta$ |
| EZ2, EZ3                           | con.15 | Quick lock | 180°          | 140°    |
| EZ4, EZ5, EZ7, EZ802, EZ803, EZ805 | con.17 | Quick lock | 195°          | 35°     |

Notes

- The number after "con." indicates the approximate external thread diameter of the plug connector in mm (for example, con.23 designates a plug connector with an external thread diameter of about 23 mm).
- In turning range  $\beta$ , the power or encoder plug connectors can be turned only if doing so does not cause them to collide.
- For the EZ2/EZ3 motor, the power and encoder plug connectors are mechanically connected and can only be turned together.

13.6.8.4 Terminal assignment for plug connectors (One Cable Solution)

In the One Cable Solution design, the power and encoder lines are connected using a shared plug connector. The temperature sensor of the motor is connected to the encoder internally. The measured values from the temperature sensor are transmitted via the EnDat 3 protocol of the encoder.

Plug connector size con.23

| Connection diagram | Pin | Connection          | Color |
|--------------------|-----|---------------------|-------|
|                    | A   | U phase             | BK    |
|                    | B   | V phase             | BU    |
|                    | C   | W phase             | RD    |
|                    | E   | P_SD –              | YE    |
|                    | F   |                     |       |
|                    | G   | Brake +             |       |
|                    | H   | P_SD +              | VT    |
|                    | L   | Brake –             |       |
|                    | ⊕   | Grounding conductor | GNYE  |

### 13.6.8.5 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

Plug connector size con.15

| Connection diagram | Pin | Connection           | Color |
|--------------------|-----|----------------------|-------|
|                    | A   | U phase              | BK    |
|                    | B   | V phase              | BU    |
|                    | C   | W phase              | RD    |
|                    | 1   | Temperature sensor + |       |
|                    | 2   | Temperature sensor - |       |
|                    | 3   | Brake +              | RD    |
|                    | 4   | Brake -              | BK    |
|                    | ⊕   | Grounding conductor  | GNYE  |

Plug connector size con.23

| Connection diagram | Pin | Connection           | Color |
|--------------------|-----|----------------------|-------|
|                    | 1   | U phase              | BK    |
|                    | 3   | V phase              | BU    |
|                    | 4   | W phase              | RD    |
|                    | A   | Brake +              | RD    |
|                    | B   | Brake -              | BK    |
|                    | C   | Temperature sensor + |       |
|                    | D   | Temperature sensor - |       |
|                    | ⊕   | Grounding conductor  | GNYE  |

Plug connector size con.40 (1.5)

| Connection diagram | Pin | Connection           | Color |
|--------------------|-----|----------------------|-------|
|                    | U   | U phase              | BK    |
|                    | V   | V phase              | BU    |
|                    | W   | W phase              | RD    |
|                    | +   | Brake +              | RD    |
|                    | -   | Brake -              | BK    |
|                    | 1   | Temperature sensor + |       |
|                    | 2   | Temperature sensor - |       |
|                    | ⊕   | Grounding conductor  | GNYE  |


### 13.6.8.6 Connection assignment of the encoder plug connector

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor.

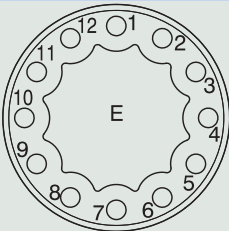
EnDat 2.1/2.2 digital encoders, plug connector size con.15

| Connection diagram | Pin | Connection | Color |
|--------------------|-----|------------|-------|
|                    | 1   | Clock +    | VT    |
|                    | 2   | Up sense   | BNGN  |
|                    | 3   |            |       |
|                    | 4   |            |       |
|                    | 5   | Data -     | PK    |
|                    | 6   | Data +     | GY    |
|                    | 7   |            |       |
|                    | 8   | Clock -    | YE    |
|                    | 9   |            |       |
|                    | 10  | 0 V GND    | WHGN  |
|                    | 11  |            |       |
|                    | 12  | Up +       | BNGN  |

## EnDat 2.1/2.2 digital encoders, plug connector size con.17


| Connection diagram  | Pin | Connection | Color |
|---|-----|------------|-------|
|  | 1   | Clock +    | VT    |
|   | 2   | Up sense   | BNGN  |
|   | 3   |            |       |
|   | 4   |            |       |
|   | 5   | Data -     | PK    |
|   | 6   | Data +     | GY    |
|   | 7   |            |       |
|   | 8   | Clock -    | YE    |
|   | 9   |            |       |
|   | 10  | 0 V GND    | WHGN  |
|   | 11  |            |       |
|   | 12  | Up +       | BNGN  |

## EnDat 2.2 digital encoder with battery buffering, plug connector size con.15

| Connection diagram  | Pin | Connection | Color |
|---|-----|------------|-------|
|  | 1   | Clock +    | VT    |
|   | 2   | UBatt +    | BU    |
|   | 3   | UBatt -    | WH    |
|   | 4   |            |       |
|   | 5   | Data -     | PK    |
|   | 6   | Data +     | GY    |
|   | 7   |            |       |
|   | 8   | Clock -    | YE    |
|   | 9   |            |       |
|   | 10  | 0 V GND    | WHGN  |
|   | 11  |            |       |
|   | 12  | Up +       | BNGN  |

UBatt+ = DC 3.6 V for encoder model EBI in combination with the AES option of STOBER drive controllers

## EnDat 2.2 digital encoder with battery buffering, plug connector size con.17

| Connection diagram  | Pin | Connection | Color |
|---|-----|------------|-------|
|  | 1   | Clock +    | VT    |
|   | 2   | UBatt +    | BU    |
|   | 3   | UBatt -    | WH    |
|   | 4   |            |       |
|   | 5   | Data -     | PK    |
|   | 6   | Data +     | GY    |
|   | 7   |            |       |
|   | 8   | Clock -    | YE    |
|   | 9   |            |       |
|   | 10  | 0 V GND    | WHGN  |
|   | 11  |            |       |
|   | 12  | Up +       | BNGN  |

UBatt+ = DC 3.6 V for encoder model EBI in combination with the AES option of STOBER drive controllers

**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.15**

| Connection diagram | Pin | Connection  | Color |
|--------------------|-----|-------------|-------|
|                    | 1   | Up sense    | BU    |
|                    | 2   | 0 V sense   | WH    |
|                    | 3   | Up +        | BNGN  |
|                    | 4   | Clock +     | VT    |
|                    | 5   | Clock -     | YE    |
|                    | 6   | 0 V GND     | WHGN  |
|                    | 7   | B + (Sin +) | BUBK  |
|                    | 8   | B - (Sin -) | RDBK  |
|                    | 9   | Data +      | GY    |
|                    | 10  | A + (Cos +) | GNBK  |
|                    | 11  | A - (Cos -) | YEBK  |
|                    | 12  | Data -      | PK    |
|                    | A   |             |       |
| B                  |     |             |       |
| C                  |     |             |       |


**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.17**

| Connection diagram | Pin | Connection  | Color |
|--------------------|-----|-------------|-------|
|                    | 1   | Up sense    | BU    |
|                    | 2   |             |       |
|                    | 3   |             |       |
|                    | 4   | 0 V sense   | WH    |
|                    | 5   |             |       |
|                    | 6   |             |       |
|                    | 7   | Up +        | BNGN  |
|                    | 8   | Clock +     | VT    |
|                    | 9   | Clock -     | YE    |
|                    | 10  | 0 V GND     | WHGN  |
|                    | 11  |             |       |
|                    | 12  | B + (Sin +) | BUBK  |
|                    | 13  | B - (Sin -) | RDBK  |
|                    | 14  | Data +      | GY    |
|                    | 15  | A + (Cos +) | GNBK  |
|                    | 16  | A - (Cos -) | YEBK  |
|                    | 17  | Data -      | PK    |

**Resolver, plug connector size con.15**

| Connection diagram | Pin | Connection | Color                  |
|--------------------|-----|------------|------------------------|
|                    | 1   | S3 Cos +   | BK                     |
|                    | 2   | S1 Cos -   | RD                     |
|                    | 3   | S4 Sin +   | BU                     |
|                    | 4   | S2 Sin -   | YE                     |
|                    | 5   |            |                        |
|                    | 6   |            |                        |
|                    | 7   | R2 Ref +   | YEWH/BKWH <sup>2</sup> |
|                    | 8   | R1 Ref -   | RDWH                   |
|                    | 9   |            |                        |
|                    | 10  |            |                        |
|                    | 11  |            |                        |
|                    | 12  |            |                        |

Resolver, plug connector size con.17

| Connection diagram  | Pin | Connection | Color                  |
|---|-----|------------|------------------------|
|  | 1   | S3 Cos +   | BK                     |
|   | 2   | S1 Cos -   | RD                     |
|   | 3   | S4 Sin +   | BU                     |
|   | 4   | S2 Sin -   | YE                     |
|   | 5   |            |                        |
|   | 6   |            |                        |
|   | 7   | R2 Ref +   | YEWB/BKWB <sup>3</sup> |
|   | 8   | R1 Ref -   | RDWB                   |
|   | 9   |            |                        |
|   | 10  |            |                        |
|   | 11  |            |                        |
|   | 12  |            |                        |

## 13.7 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

An explanation of the formula symbols can be found in Chapter Symbols in formulas.

The formula symbols for values actually present in the application are marked with \*.

### 13.7.1 Calculation of the operating point

In this chapter, you can find information needed to calculate the operating point.

Check the following conditions for operating points other than the nominal point  $M_N$  specified in the selection tables:

$$n_{m*} \leq n_N$$

$$M_{eff*} \leq M_{limK} \text{ and } M_{eff*} \leq M_{limF}$$

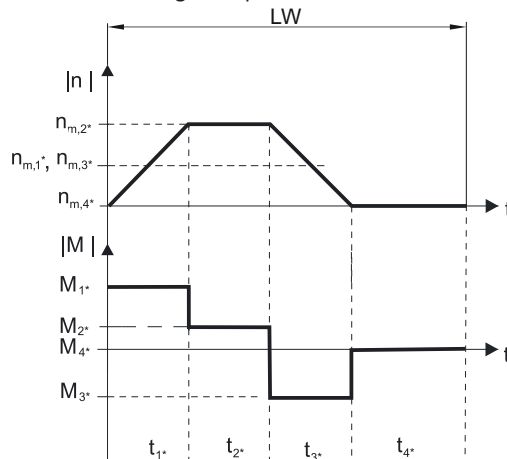
$$M_{max*} < M_{max}$$

The values for  $M_N$ ,  $n_N$ ,  $M_{max}$  can be found in the selection tables.

The values for  $M_{limK}$  and  $M_{limF}$  can be found in the torque/speed curves.

#### Example of cyclic operation

The following calculations refer to a representation of the power delivered at the motor shaft in accordance with the following example:



<sup>3</sup>(depending on the brand of the resolver)

**Calculation of the actual average input speed**

$$n_{m^*} = \frac{|n_{m,1^*}| \cdot t_{1^*} + \dots + |n_{m,n^*}| \cdot t_{n^*}}{t_{1^*} + \dots + t_{n^*}}$$

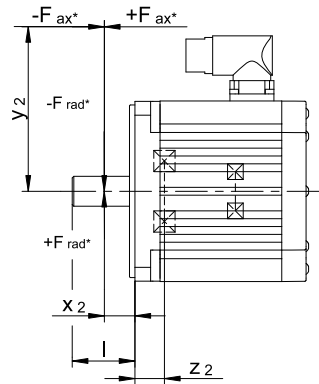
If  $t_{1^*} + \dots + t_{3^*} \geq 6$  min, determine  $n_{m^*}$  without the rest phase  $t_{4^*}$ .

**Calculation of the actual effective torque**

$$M_{\text{eff}^*} = \sqrt{\frac{t_{1^*} \cdot M_{1^*}^2 + \dots + t_{n^*} \cdot M_{n^*}^2}{t_{1^*} + \dots + t_{n^*}}}$$

### 13.7.2 Permitted shaft loads

This chapter contains information about the maximum permitted shaft loads of the output shaft of the motor.



| Type  | $z_2$<br>[mm] | $F_{ax100}$<br>[N] | $F_{rad100}$<br>[N] | $M_{k100}$<br>[Nm] |
|-------|---------------|--------------------|---------------------|--------------------|
| EZ202 | 12.0          | 250                | 750                 | 20                 |
| EZ203 | 12.0          | 250                | 750                 | 20                 |
| EZ301 | 24.0          | 350                | 1000                | 39                 |
| EZ302 | 24.0          | 350                | 1000                | 39                 |
| EZ303 | 24.0          | 350                | 1000                | 39                 |
| EZ401 | 19.5          | 550                | 1800                | 62                 |
| EZ402 | 19.5          | 550                | 1800                | 71                 |
| EZ404 | 19.5          | 550                | 1800                | 71                 |
| EZ501 | 19.5          | 750                | 2000                | 79                 |
| EZ502 | 19.5          | 750                | 2400                | 95                 |
| EZ503 | 19.5          | 750                | 2400                | 107                |
| EZ505 | 19.5          | 750                | 2400                | 107                |
| EZ701 | 24.5          | 1300               | 3500                | 173                |
| EZ702 | 24.5          | 1300               | 4200                | 208                |
| EZ703 | 24.5          | 1300               | 4200                | 208                |
| EZ705 | 24.5          | 1300               | 4200                | 225                |
| EZ802 | 28.5          | 1750               | 5600                | 384                |
| EZ803 | 28.5          | 1750               | 5600                | 384                |
| EZ805 | 28.5          | 1750               | 5600                | 384                |

The values for permitted shaft loads specified in the table apply:

- For shaft dimensions in accordance with the catalog
- A force applied at the center of the output shaft:  $x_2 = l / 2$  (shaft dimensions can be found in the chapter Dimensional drawings)
- Output speeds  $n_{m^*} \leq 100$  rpm ( $F_{ax} = F_{ax100}$ ;  $F_{rad} = F_{rad100}$ ;  $M_k = M_{k100}$ )

The following applies to output speeds  $n_{m^*} > 100$  rpm:



$$F_{ax} = \frac{F_{ax100}}{\sqrt[3]{\frac{n_{m^*}}{100 \text{ rpm}}}} \quad F_{rad} = \frac{F_{rad100}}{\sqrt[3]{\frac{n_{m^*}}{100 \text{ rpm}}}} \quad M_k = \frac{M_{k100}}{\sqrt[3]{\frac{n_{m^*}}{100 \text{ rpm}}}}$$

The following applies to other force application points:

$$M_{k^*} = \frac{2 \cdot F_{ax^*} \cdot y_2 + F_{rad^*} \cdot (x_2 + z_2)}{1000}$$

For applications with multiple axial and/or radial forces, you must add the forces as vectors.

Also note the calculation for equivalent values:

$$M_{k,eq^*} = \sqrt[3]{\frac{|n_{m,1^*}| \cdot t_{1^*} \cdot |M_{k,1^*}|^3 + \dots + |n_{m,n^*}| \cdot t_{n^*} \cdot |M_{k,n^*}|^3}{|n_{m,1^*}| \cdot t_{1^*} + \dots + |n_{m,n^*}| \cdot t_{n^*}}}$$

$$F_{rad,eq^*} = \sqrt[3]{\frac{|n_{m,1^*}| \cdot t_{1^*} \cdot |F_{rad,1^*}|^3 + \dots + |n_{m,n^*}| \cdot t_{n^*} \cdot |F_{rad,n^*}|^3}{|n_{m,1^*}| \cdot t_{1^*} + \dots + |n_{m,n^*}| \cdot t_{n^*}}}$$

### 13.7.3 Derating

If you use the motor under ambient conditions that differ from the standard ambient conditions, the nominal torque  $M_N$  of the motor is reduced. In this chapter, you can find information for calculating the reduced nominal torque.

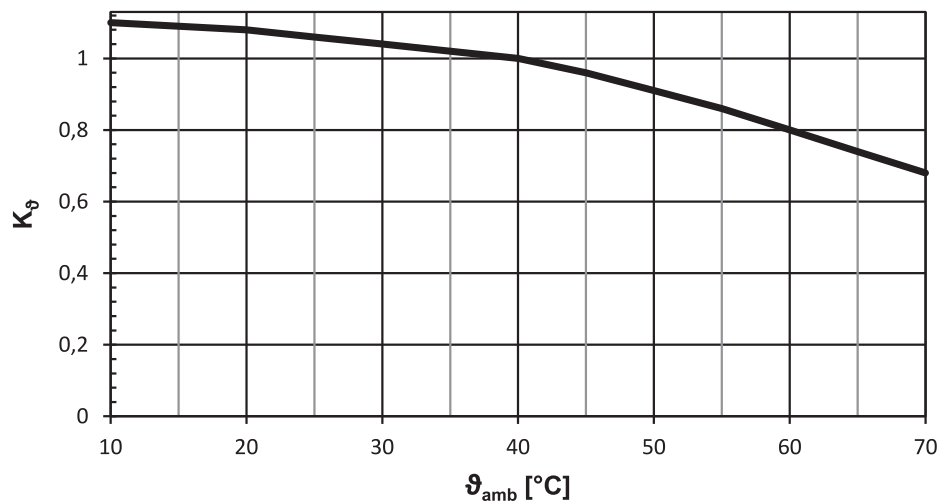


Fig. 5: Derating depending on the surrounding temperature

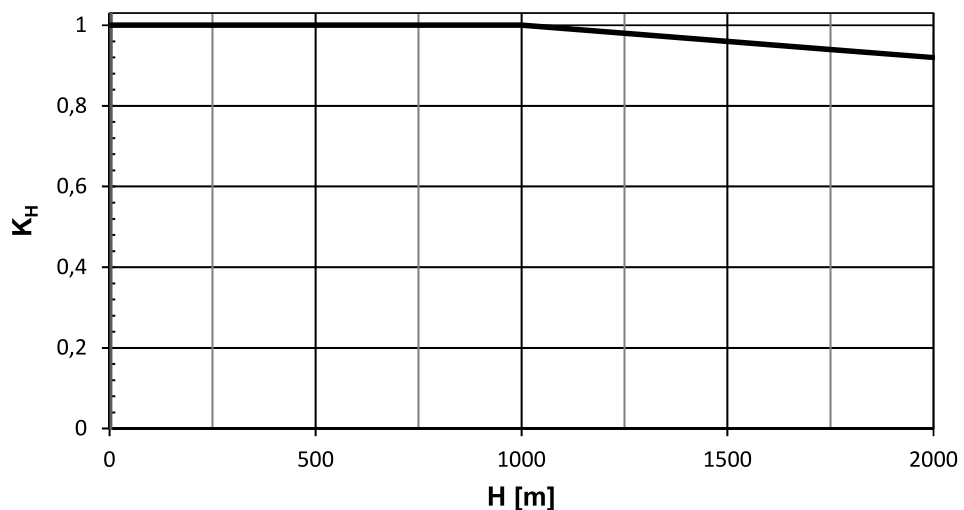


Fig. 6: Derating depending on the installation height

**Calculation**

If surrounding temperature  $\vartheta_{amb} > 40\text{ °C}$ :

$$M_{Nred} = M_N \cdot K_{\vartheta}$$

If installation altitude  $H > 1000\text{ m}$  above sea level:

$$M_{Nred} = M_N \cdot K_H$$

If the surrounding temperature  $\vartheta_{amb} > 40\text{ °C}$  and installation altitude  $H > 1000\text{ m}$  above sea level:

$$M_{Nred} = M_N \cdot K_H \cdot K_{\vartheta}$$

## 13.8 Further information

### 13.8.1 Directives and standards

STOBER synchronous servo motors meet the requirements of the following directives and standards:

- (Low Voltage) Directive 2014/35/EU
- EN 60034-1:2010 + Cor.:2010
- EN 60034-5:2001 + A1:2007
- EN 60034-6:1993

### 13.8.2 Identifiers and test symbols

STOBER synchronous servo motors have the following identifiers and test symbols:



CE mark: The product meets the requirements of EU directives.



UKCA mark: The product meets the requirements of UK directives.



cURus test symbol "Servo and Stepper Motors – Component"; registered under UL number E488992 with Underwriters Laboratories USA.

### 13.8.3 Additional documentation

Additional documentation related to the product can be found at

<http://www.stoeber.de/en/downloads/>

Enter the ID of the documentation in the Search term field.

| Documentation                                    | ID        |
|--|-----------|
| Operating manual for EZ synchronous servo motors | 443032_en |

# 14 Connecting to drive controllers of third-party manufacturers

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## 14.1 General notes

STOBER synchronous servo motors are designed for connection to STOBER drive controllers in the standard version. STOBER offers an extensive assortment of high-quality, trusted power and encoder connection cables for this purpose. However, STOBER synchronous servo motors can also be operated on drive controllers from third-party manufacturers. Notes and information for this purpose can be found in the following chapters. You can find all other information about STOBER synchronous servo motors in the corresponding chapters of this catalog.

### 14.1.1 Nominal data

Nominal data for synchronous servo motors specified in the selection tables of this catalog were calculated for connecting to STOBER drive controllers. Note that this nominal data may change when STOBER synchronous servo motors are connected to drive controllers of third-party manufacturers. The following drive controller plug connectors are determining factors here:

- $f_{2PU}$
- $f_{PWM,PU}$
- $U_{ZK}$
- Compensation of the field weakening range.

The maximum achievable speed of a synchronous servo motor depends on the number of pole pairs ( $p$ ) of the synchronous servo motor and, if applicable, on the restriction of  $f_{2PU}$  by Regulation (EC) No. 428/2009 (EC Dual Use Regulation). Details are shown in the figure below.

Some encoders feature integrated temperature monitoring, the warning and switch-off thresholds of which may overlap with the corresponding values set for the thermal winding protection in the drive controller. In some cases, this may result in an instance where an encoder with internal temperature monitoring forces the motor to shut down, even before the motor has reached its nominal data.

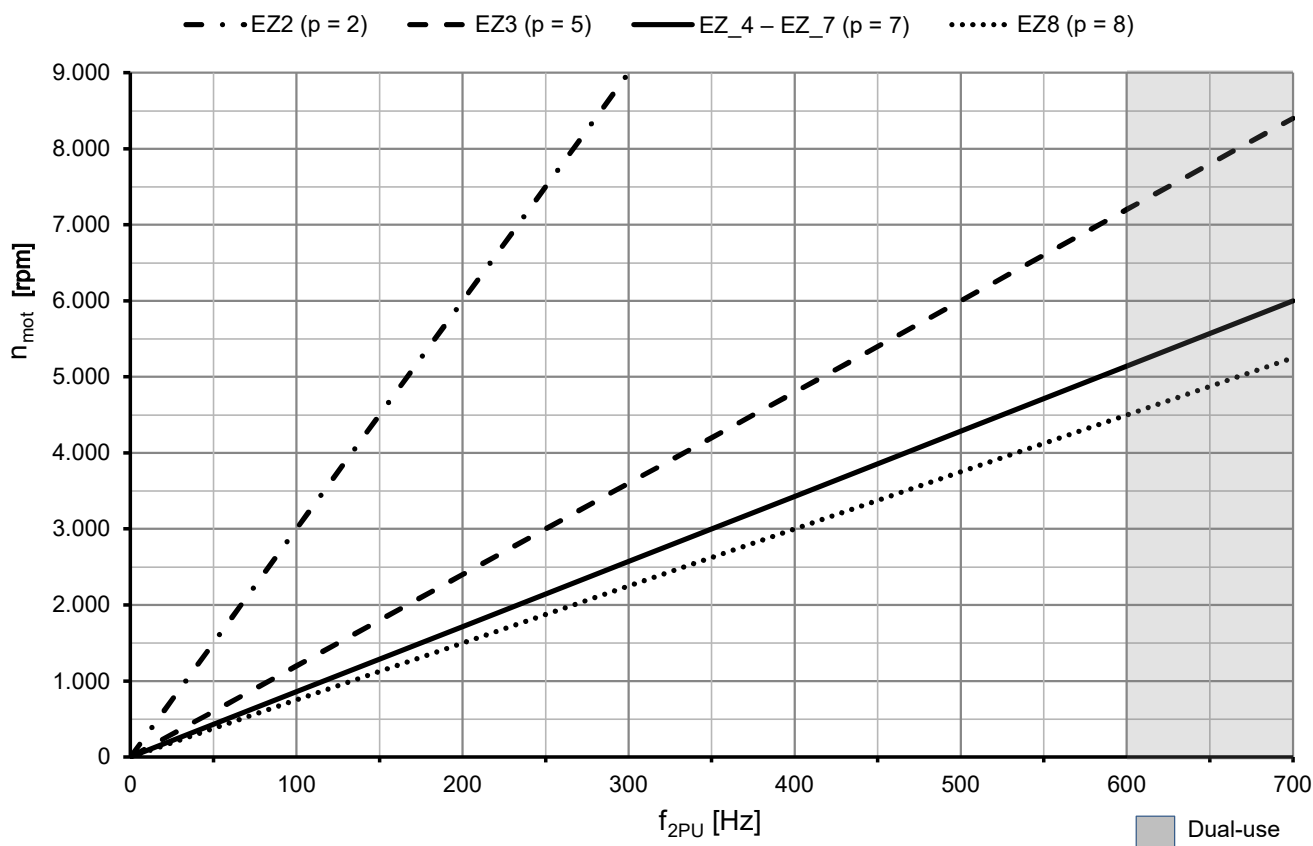


Fig. 1: Speed/frequency graph for EZ motors

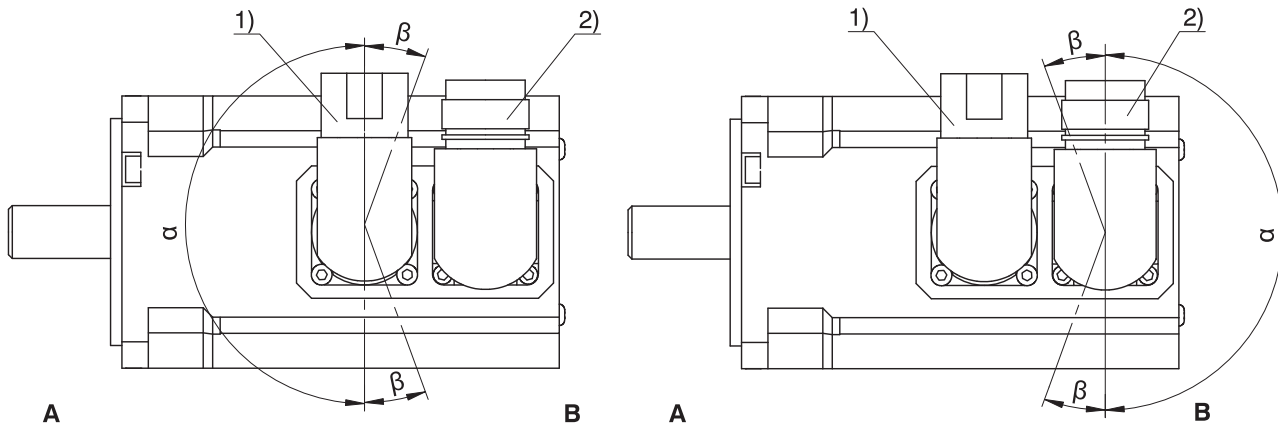
## 14.1.2 Plug connectors

STOBER synchronous servo motors are equipped with angled, round plug connectors (INTERCONTEC brand) for power and encoder connection in the standard version. You can find detailed technical information about the plug connectors at <http://www.intercontec.biz>.

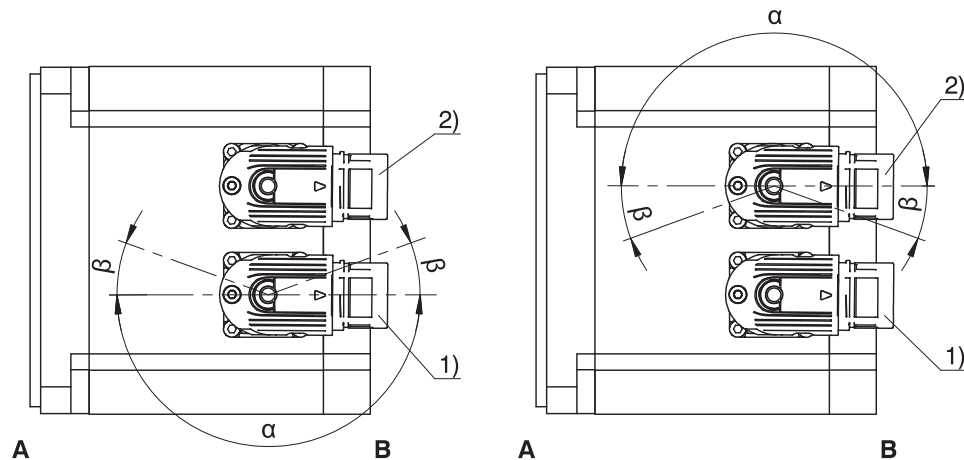
For motors with forced ventilation, avoid collisions between the motor connection cables and the plug connector of the forced ventilation unit. In the event of a collision, turn the motor plug connectors accordingly. Details regarding the position of the plug connector for the forced ventilation unit can be found in the "Dimensional drawings" chapter.

The figures represent the position of the plug connectors upon delivery.

### Turning ranges of plug connectors (E22 – E23 motors)



### Turning ranges of plug connectors (motors E24 – E28, EZHD, EZM, EZS)



- 1 Power plug connector
- A Attachment or output side of the motor

- 2 Encoder plug connector
- B Not output side

**Power plug connector features**

| Motor type                 | Size   | Connection | Turning range |         |
|----------------------------|--------|------------|---------------|---------|
|                            |        |            | $\alpha$      | $\beta$ |
| EZ2 – EZ5, EZ701, EZ703    | con.23 | Quick lock | 180°          | 40°     |
| EZ705, EZ802, EZ803, EZ805 | con.40 | Quick lock | 180°          | 40°     |

**Encoder plug connector features**

| Motor type                      | Size                | Connection | Turning range |         |
|---------------------------------|---------------------|------------|---------------|---------|
|                                 |                     |            | $\alpha$      | $\beta$ |
| EZ2 – EZ7, EZ802, EZ803, EZ805U | con.23 <sup>1</sup> | Quick lock | 180°          | 20°     |
| EZ805B                          | con.23 <sup>2</sup> | Quick lock | 180°          | 0°      |

**Notes**

- In turning range  $\beta$ , the power or encoder plug connectors can be turned only if doing so does not cause them to collide.
- The number after "con." indicates the approximate external thread diameter of the plug connector in mm (for example, con.23 designates a plug connector with an external thread diameter of about 23 mm).

## 14.1.3 Connection cables

The plug connectors and connection assignment of STOBBER synchronous servo motors are designed for connecting to drive controllers from third-party manufacturers in such a way that allows you to connect the original cable of the respective manufacturer. Keep the following information regarding cable quality and design in mind.

- Because the original cable from Bosch Rexroth cannot be used, STOBBER offers suitable cables for this purpose. More detailed information is available from your STOBBER customer consultant.
- Ensure that the cable quality and cable design is suitable for the ambient conditions at the installation location.

**Electromagnetic compatibility (EMC)**

Ensure compliance with statutory EMC requirements for the drive system at the installation location.

Connect the cable shields on both ends of the connection cable. Connect the grounding screw of the synchronous servo motor with the grounding at the installation location.

**Power cables**

Operation with unsuitable power cables may lead to inadmissibly high voltage peaks, which could damage the motor. For this reason, the capacitances and inductances must match the motor. Recommended values can be found in the table below.

The conductor cross-section of the power cable must be designed appropriately for the stall current of the motor. Details on this can be found in the table below.

| Conductor cross-section [mm <sup>2</sup> ]                                 | 1.0  | 1.5  | 2.5  | 4.0  | 6.0  | 10.0 | 16.0 | 25.0              |
|--|------|------|------|------|------|------|------|-------------------|
| Nominal current [A]  | 12.5 | 15.0 | 20.0 | 28.3 | 35.8 | 49.2 | 66.7 | 90.0              |
| Maximum capacitance in accordance with test type A (core/core) [nF/km]     | 45   | 55   | 65   | 60   | 70   | 75   | 75   | Values on request |
| Maximum capacitance in accordance with test type B (core/residual) [nF/km] | 250  | 300  | 325  | 260  | 300  | 350  | 360  | Values on request |
| Maximum inductance (core/core) [ $\mu$ H/km]                               | 800  | 700  | 700  | 600  | 650  | 600  | 570  | Values on request |

**Notes**

- The maximum capacitance is specified in accordance with DIN VDE 0472-504. Specifications in accordance with EN 50289-1-5 in preparation.

<sup>1</sup> con.15 for connection to B&R ACOPOSmulti with EnDat 2.2 Interface (drive controller type code GG and GY).

<sup>2</sup> con.15 for connection to B&R ACOPOSmulti with EnDat 2.2 Interface (drive controller type code GG and GY).

- The maximum inductance is specified in accordance with EN 50289-1-12.

#### Encoder cables

When operating with unsuitable encoder cables, encoder signals can no longer be transferred free of interference. Note the recommended values in the following table.

| Signal shape  | Digital                    |      | Sin-Cos                    |      |      | Resolver        |      |
|---|----------------------------|------|----------------------------|------|------|-----------------|------|
| Conductor cross-section [mm <sup>2</sup> ]                                  | 0.14                       | 0.25 | 0.14                       | 0.25 | 0.37 | 0.14            | 0.25 |
| Maximum capacitance in accordance with test type A (core/core) [nF/km]      | 30                         | 35   | 60                         | 110  | 130  | 40              | 50   |
| Maximum capacitance in accordance with test type B (core/remainder) [nF/km] | 110                        | 130  | 300                        | 300  | 325  | 300             | 300  |
| Maximum inductance (core/core) [ $\mu$ H/km]                                | 800                        | 800  | 650                        | 700  | 700  | 800             | 800  |
| Shielding type of cable   | Tin-plated copper braiding |      |                            |      |      |                 |      |
| Shielding type of core pairs  | –                          |      | Tin-plated copper braiding |      |      | Film + braiding |      |
| Cover   | $\geq 90\%$                |      | $\geq 80\%$                |      |      | $\geq 80\%$     |      |

#### Notes

- The maximum capacitance is specified in accordance with DIN VDE 0472-504. Specifications in accordance with EN 50289-1-5 in preparation.
- The maximum inductance is specified in accordance with EN 50289-1-12.

## 14.2 Connection to B&R drive controllers

This chapter contains the information for connecting STOBBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBBER drive controllers. You can find all other information about STOBBER synchronous servo motors in the respective chapter of this catalog.

STOBBER has taken the following measures to minimize the effort of commissioning STOBBER motors connected to B&R drive controllers and avoid errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- The electronic nameplate of the motor was designed to be compatible with the B&R controllers.

More information on commissioning EZ motors connected to B&R drive controllers can be found in the 443184\_en document in the download area on the STOBBER website.

### 14.2.1 Encoders

#### Encoders with EnDat 2.2 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                   |
|------------------------|------|------------------|------------------------|------------|--------------------------------|--------------|---------------------------|
| EnDat 2.2 EQI 1131 FMA | M4   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 EQI 1131     | Q6   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 EQN 1135 FMA | M3   | Optical          | 4096                   | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 EQN 1135     | Q5   | Optical          | 4096                   | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 ECN 1123 FMA | M1   | Optical          | –                      | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 ECN 1123     | C7   | Optical          | –                      | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$  |
| EnDat 2.2 ECI 1118-G2  | C5   | Inductive        | –                      | 18 bit     | 262144                         | > 76         | $\leq 1.5 \times 10^{-6}$ |

#### Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]                 |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|-------------------------|
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113 FMA | M0   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113     | C6   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- Encoders with EnDat 2.2 interface and in the FMA design are ready for operation as a one-encoder solution on a safety-related position measuring system with an EnDat 2.2 interface
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.



### 14.2.2 Possible combinations with drive controllers

The following table shows the possible combinations of STOBER synchronous servo motors with drive controllers from B&R depending on the encoder model.

| Drive controller          |              | ACOPOS | ACOPOSmulti<br>(EnDat 2.1) | ACOPOSmulti<br>(EnDat 2.2) | ACOPOS P3<br>(EnDat 2.2) | ACOPOS P3 OCS<br>(EnDat 2.2) | ACOPOSmulti<br>OCS<br>(EnDat 2.2) |
|---------------------------|--------------|--------|----------------------------|----------------------------|--------------------------|------------------------------|-----------------------------------|
| Drive controller code     |              | FG     | FV                         | GG                         | GY                       | GP                           | GV                                |
| Connection plan ID        |              | 442313 | 442444                     | 442677                     | 443095                   | 443022                       | 443092                            |
| Encoder                   | Encoder code |        |                            |                            |                          |                              |                                   |
| EnDat 2.2 EQI<br>1131 FMA | M4           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 EQI<br>1131     | Q6           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 EQN<br>1135 FMA | M3           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 EQN<br>1135     | Q5           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 ECN<br>1123 FMA | M1           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 ECN<br>1123     | C7           | –      | –                          | EZ                         | EZ                       | EZ                           | EZ                                |
| EnDat 2.2 ECI<br>1118-G2  | C5           | –      | –                          | EZ                         | EZ                       | –                            | –                                 |
| EnDat 2.1 EQN<br>1125 FMA | M2           | EZ     | EZ                         | –                          | –                        | –                            | –                                 |
| EnDat 2.1 EQN<br>1125     | Q4           | EZ     | EZ                         | –                          | –                        | –                            | –                                 |
| EnDat 2.1 ECN<br>1113 FMA | M0           | –      | EZ                         | –                          | –                        | –                            | –                                 |
| EnDat 2.1 ECN<br>1113     | C6           | –      | EZ                         | –                          | –                        | –                            | –                                 |
| Resolver                  | R0           | EZ     | EZ                         | –                          | –                        | –                            | –                                 |

The encoder and drive controller codes are a part of the type designation of the motor.

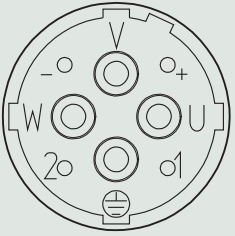

### 14.2.3 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

Plug connector size con.23

| Connection diagram | Pin                 | Connection           | Color |
|--------------------|---------------------|----------------------|-------|
|                    | 1                   | U phase              | BK    |
|                    | 3                   | W phase              | RD    |
|                    | 4                   | V phase              | BU    |
|                    | A                   | Temperature sensor + |       |
|                    | B                   | Temperature sensor - |       |
|                    | C                   | Brake +              | RD    |
|                    | D                   | Brake -              | BK    |
| ⊕                  | Grounding conductor | GNYE                 |       |

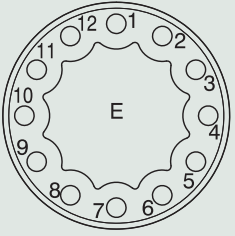
**Plug connector size con.40 (1.5)**

| Connection diagram  | Pin   | Connection           | Color |
|---|---|----------------------|-------|
|  | U   | U phase              | BK    |
|   | V   | V phase              | BU    |
|   | W   | W phase              | RD    |
|   | +   | Brake +              | RD    |
|   | -   | Brake -              | BK    |
|   | 1   | Temperature sensor + |       |
|   | 2   | Temperature sensor - |       |
|   |  | Grounding conductor  | GNYE  |

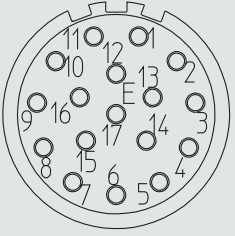
**14.2.4 Connection assignment of the encoder plug connector**

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

**EnDat 2.2 digital encoder, plug connector size con.15**

| Connection diagram   | Pin | Connection | Color |
|--|-----|------------|-------|
|  | 1   | Up +       | BNGN  |
|  | 2   | Data +     | GY    |
|  | 3   | Data -     | PK    |
|  | 4   | Clock +    | VT    |
|  | 5   | Clock -    | YE    |
|  | 6   |            |       |
|  | 7   | 0 V GND    | WHGN  |
|  | 8   |            |       |
|  | 9   |            |       |
|  | 10  |            |       |
|  | 11  |            |       |
|  | 12  |            |       |

**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.23**

| Connection diagram  | Pin | Connection  | Color |
|---|-----|-------------|-------|
|  | 1   | Up sense    | BU    |
|   | 2   |             |       |
|   | 3   |             |       |
|   | 4   | 0 V sense   | WH    |
|   | 5   |             |       |
|   | 6   |             |       |
|   | 7   | Up +        | BNGN  |
|   | 8   | Clock +     | VT    |
|   | 9   | Clock -     | YE    |
|   | 10  | 0 V GND     | WHGN  |
|   | 11  |             |       |
|   | 12  | B + (Sin +) | BUBK  |
|   | 13  | B - (Sin -) | RDBK  |
|   | 14  | Data +      | GY    |
|   | 15  | A + (Cos +) | GNBK  |
|   | 16  | A - (Cos -) | YEBK  |
|   | 17  | Data -      | PK    |

Resolver, plug connector size con.23

| Connection diagram | Pin | Connection | Color |
|--------------------|-----|------------|-------|
|                    | 1   |            |       |
|                    | 2   |            |       |
|                    | 3   | S4 Sin +   | BU    |
|                    | 4   | S1 Cos -   | RD    |
|                    | 5   | R2 Ref +   | YEW   |
|                    | 6   |            |       |
|                    | 7   | S2 Sin -   | YE    |
|                    | 8   | S3 Cos +   | BK    |
|                    | 9   | R1 Ref -   | RDWH  |
|                    | 10  |            |       |
|                    | 11  |            |       |
|                    | 12  |            |       |

### 14.2.5 Terminal assignment for plug connectors (One Cable Solution)

In the One Cable Solution design, the power and encoder lines are connected using a shared plug connector. The temperature sensor of the motor is connected to the encoder internally. The measured values from the temperature sensor are transmitted via the log of the encoder.

Plug connector size con.23

| Connection diagram | Pin                 | Connection | Color |
|--------------------|---------------------|------------|-------|
|                    | A                   | U phase    |       |
|                    | B                   | V phase    |       |
|                    | C                   | W phase    |       |
|                    | D                   |            |       |
|                    | 1                   | Up +       |       |
|                    | 2                   | 0 V GND    |       |
|                    | 3                   | Data +     |       |
|                    | 4                   | Data -     |       |
|                    | 5                   | Clock +    |       |
|                    | 6                   | Clock -    |       |
|                    | 7                   | Brake -    |       |
|                    | 8                   | Brake +    |       |
| ⊕                  | Grounding conductor |            |       |

a) Coaxial shield to which the shield of the encoder cores is connected

## 14.3 Connection to Siemens drive controllers

This chapter contains the information for connecting STOBBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBBER drive controllers. You can find all other information about STOBBER synchronous servo motors in the respective chapter of this catalog.

STOBBER has taken the following measures to minimize the effort of commissioning STOBBER motors connected to SINAMICS S120 drive controllers and avoid errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- Parameter lists are provided on request.

More information on commissioning EZ motors connected to SINAMICS S120 drive controllers can be found in the 443232\_en document in the download area on the STOBBER website.

### 14.3.1 EIB 3392S interface

The EIB 3392S interface made by Heidenhain enables the connection of EnDat 2.2 encoders to Siemens SINAMICS S120 drive controllers using the powerful DRIVE-CLiQ system interface. STOBBER offers the EIB 3392S interface with the ID 1250663-01. In this design, the connector and the terminal assignment on the EnDat 2.2 side are adapted to STOBBER synchronous servo motors so that the interface can be connected and commissioned without additional work.

#### Advantages

- Support for all DRIVE-CLiQ interface options
- Compact and robust industrial design
- Easy, fast commissioning
- No space or wiring necessary in the control cabinet
- Because the DRIVE-CLiQ electronics are located outside of the motor, it is not necessary to reduce the performance data of the motor based on the temperature.

#### Features

| Feature  | Description   |
|--|---|
| Surrounding temperature for operation            | 0 °C to 60 °C   |
| Protection class                                 | IP 65   |
| Bending radius of the interface connection cable | 75 mm, freely movable<br>20 mm, permanently installed |

The EIB 3392S interface is connected to the plug connector of the motor on the EnDat 2.2 side. On the DRIVE-CLiQ side, an original Siemens encoder cable with a length of up to 30 m can be connected.

The EIB 3392S interface may only be connected to motors with a Pt1000 temperature sensor. The temperature sensor is connected to the EnDat 2.2 encoder inside the motor. The EIB 3392S interface transmits the values from the temperature sensor over the DRIVE-CLiQ interface unchanged.

The housing of the EIB 3392S must be attached at the installation location. A cable clip can be used for this purpose (see dimensional drawing).

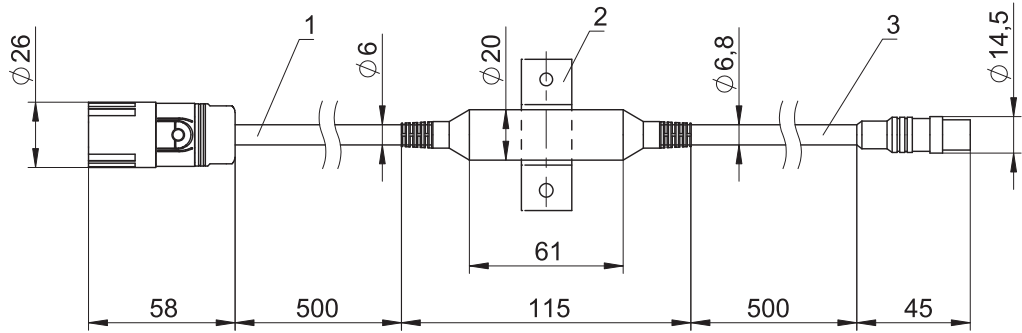
#### Functional safety

Depending on the connected encoder and the downstream electronics, the EIB 3392S can be used in safety-oriented applications up to Safety Integrity Level (SIL) 2 in accordance with EN 61508-1 / EN 61800-5-2 or up to Category 3, PL d in accordance with EN ISO 13849-1.

The probability of a failure per hour (PFH) is  $26 \times 10^{-9}$  for an installation altitude  $\leq 1000$  m above sea level.

The EIB 3392S interface does not have any effect on the safe position that can be implemented by the motor encoder and the downstream electronics.

### 14.3.1.1 Dimensional drawing



- 1 Black cable color (EnDat 2.2 side)
- 2 Cable clip (not included in the scope of delivery)
- 3 Green cable color (DRIVE-CLiQ side)

### 14.3.1.2 Terminal assignment

| EnDat 2.2 side, con.23 plug connector |     |            | DRIVE-CLiQ side, M12 plug connector |     |                    |
|---------------------------------------|-----|------------|-------------------------------------|-----|--------------------|
| Connection diagram                    | Pin | Connection | Connection                          | Pin | Connection diagram |
|                                       | 1   | Clock +    | Up +                                | 1   |                    |
|                                       | 2   |            |                                     | 2   |                    |
|                                       | 3   |            | RXP                                 | 3   |                    |
|                                       | 4   |            | RXN                                 | 4   |                    |
|                                       | 5   | Data -     | 0 V GND                             | 5   |                    |
|                                       | 6   | Data +     | TXN                                 | 6   |                    |
|                                       | 7   |            | TXP                                 | 7   |                    |
|                                       | 8   | Clock -    |                                     | 8   |                    |
|                                       | 9   |            |                                     |     |                    |
|                                       | 10  | 0 V GND    |                                     |     |                    |
|                                       | 11  |            |                                     |     |                    |
|                                       | 12  | Up +       |                                     |     |                    |

## 14.3.2 Encoders

#### Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]              |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|----------------------|
| EnDat 2.1 ECI 119      | C4   | Inductive        | –                      | 19 bit     | 524288                         | Sin/cos 32             | > 57         | $\leq 2 \times 10^6$ |
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^6$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^6$ |
| EnDat 2.1 ECN 1113 FMA | M0   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^6$ |
| EnDat 2.1 ECN 1113     | C6   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^6$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

### 14.3.3 Possible combinations with drive controllers

The following table shows the possible combinations of STOBER synchronous servo motors with drive controllers from Siemens depending on the encoder model.

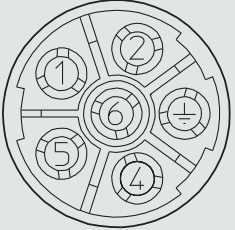

| Drive controller       |              | SINAMICS S120<br>(with EnDat 2.1 and resolver interface) |
|------------------------|--------------|--|
| Drive controller code  |              | FJ   |
| Connection plan ID     |              | 442315   |
| Encoder                | Encoder code |  |
| EnDat 2.1 EQN 1125 FMA | M2           | EZ   |
| EnDat 2.1 EQN 1125     | Q4           | EZ   |
| EnDat 2.1 ECN 1113 FMA | M0           | EZ   |
| EnDat 2.1 ECN 1113     | C6           | EZ   |
| Resolver               | R0           | EZ   |

The encoder and drive controller codes are a part of the type designation of the motor.

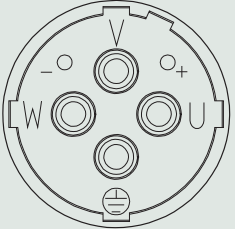

### 14.3.4 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

#### Plug connector size con.23

| Connection diagram  | Pin   | Connection          | Color |
|---|---|---------------------|-------|
|  | 1   | U phase             | BK    |
|   | 2   | V phase             | BU    |
|   | 4   | Brake +             | RD    |
|   | 5   | Brake -             | BK    |
|   | 6   | W phase             | RD    |
|   |  | Grounding conductor | GNYE  |

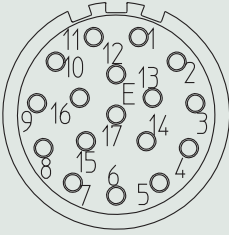
#### Plug connector size con.40 (1.5)

| Connection diagram  | Pin   | Connection          | Color |
|---|---|---------------------|-------|
|  | U   | U phase             | BK    |
|   | V   | V phase             | BU    |
|   | W   | W phase             | RD    |
|   | +   | Brake +             | RD    |
|   | -   | Brake -             | BK    |
|   |  | Grounding conductor | GNYE  |

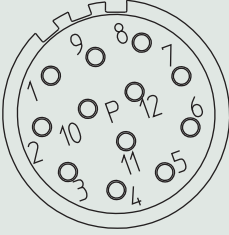
### 14.3.5 Connection assignment of the encoder plug connector

The size and terminal assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor.

**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.23**

| Connection diagram  | Pin | Connection           | Color |
|---|-----|----------------------|-------|
|  | 1   | A + (Cos +)          | GNBK  |
|   | 2   | A - (Cos -)          | YEBK  |
|   | 3   | Data +               | GY    |
|   | 4   |                      |       |
|   | 5   | Clock +              | VT    |
|   | 6   |                      |       |
|   | 7   | 0 V GND              | WHGN  |
|   | 8   | Temperature sensor + | BK/BN |
|   | 9   | Temperature sensor - | WH/WH |
|   | 10  | Up +                 | BNGN  |
|   | 11  | B + (Sin +)          | BUBK  |
|   | 12  | B - (Sin -)          | RDBK  |
|   | 13  | Data -               | PK    |
|   | 14  | Clock -              | YE    |
|   | 15  | 0 V sense            | WH    |
|   | 16  | Up sense             | BU    |
|   | 17  |                      |       |

**Resolver, plug connector size con.23**

| Connection diagram   | Pin | Connection           | Color |
|--|-----|----------------------|-------|
|  | 1   | S4 Sin +             | BU    |
|  | 2   | S2 Sin -             | YE    |
|  | 3   |                      |       |
|  | 4   |                      |       |
|  | 5   |                      |       |
|  | 6   |                      |       |
|  | 7   | R1 Ref -             | RDWH  |
|  | 8   | Temperature sensor + | BK/BN |
|  | 9   | Temperature sensor - | WH/WH |
|  | 10  | R2 Ref +             | YEWB  |
|  | 11  | S3 Cos +             | BK    |
|  | 12  | S1 Cos -             | RD    |



## 14.4 Connection to Kollmorgen drive controllers

This chapter contains the information for connecting STOBBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBBER drive controllers. You can find all other information about STOBBER synchronous servo motors in the respective chapter of this catalog.

STOBBER has taken the following measures to minimize the effort of commissioning STOBBER motors connected to Kollmorgen drive controllers and avoid errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- Parameter lists are provided on request.

More information on commissioning EZ motors connected to Kollmorgen drive controllers can be found in the 443236\_en document in the download area on the STOBBER website.

### 14.4.1 Encoders

#### Encoders with EnDat 2.2 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                  |
|------------------------|------|------------------|------------------------|------------|--------------------------------|--------------|--------------------------|
| EnDat 2.2 EQI 1131     | Q6   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$ |
| EnDat 2.2 EQI 1131 FMA | M4   | Inductive        | 4096                   | 19 bit     | 524288                         | > 100        | $\leq 15 \times 10^{-9}$ |

#### Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]                 |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|-------------------------|
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

### 14.4.2 Possible combinations with drive controllers

The following table shows the possible combinations of STOBBER synchronous servo motors with drive controllers from Kollmorgen depending on the encoder model.

| Drive controller       | Servostar S300/S400/S600/S700 |    |
|------------------------|-------------------------------|----|
| Drive controller code  | FE                            |    |
| Connection plan ID     | 442311                        |    |
| Encoder                | Encoder code                  |    |
| EnDat 2.2 EQI 1131     | Q6                            |    |
| EnDat 2.2 EQI 1131 FMA | M4                            |    |
| EnDat 2.1 EQN 1125 FMA | M2                            |    |
| EnDat 2.1 EQN 1125     | Q4                            |    |
| Resolver               | R0                            |    |
|                        |                               | EZ |

The encoder and drive controller codes are a part of the type designation of the motor.

### 14.4.3 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

Plug connector size con.23

| Connection diagram | Pin | Connection          | Color |
|--------------------|-----|---------------------|-------|
|                    | 1   | U phase             | BK    |
|                    | 3   | W phase             | RD    |
|                    | 4   | V phase             | BU    |
|                    | A   | Brake +             | RD    |
|                    | B   | Brake -             | BK    |
|                    | C   |                     |       |
|                    | D   |                     |       |
|                    | ⊕   | Grounding conductor | GNYE  |

Plug connector size con.40 (1.5)

| Connection diagram | Pin | Connection          | Color |
|--------------------|-----|---------------------|-------|
|                    | U   | U phase             | BK    |
|                    | V   | V phase             | BU    |
|                    | W   | W phase             | RD    |
|                    | +   | Brake +             | RD    |
|                    | -   | Brake -             | BK    |
|                    | 1   |                     |       |
|                    | 2   |                     |       |
|                    | ⊕   | Grounding conductor | GNYE  |

### 14.4.4 Connection assignment of the encoder plug connector

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor.

EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.23

| Connection diagram | Pin | Connection                  | Color |
|--------------------|-----|-----------------------------|-------|
|                    | 1   | B - (Sin -)                 | RDBK  |
|                    | 2   | 0 V GND                     | WHGN  |
|                    | 3   | A - (Cos -)                 | YEBK  |
|                    | 4   | Up +                        | BNGN  |
|                    | 5   | Data +                      | GY    |
|                    | 6   |                             |       |
|                    | 7   | 1TP1 (Temperature sensor +) | BK/RD |
|                    | 8   | Clock +                     | VT    |
|                    | 9   | B + (Sin +)                 | BUBK  |
|                    | 10  | 0 V sense                   | WH    |
|                    | 11  | A + (Cos +)                 | GNBK  |
|                    | 12  | Up sense                    | BU    |
|                    | 13  | Data -                      | PK    |
|                    | 14  | 1TP2 (Temperature sensor -) | WH/WH |
|                    | 15  | Clock -                     | YE    |
|                    | 16  |                             |       |
|                    | 17  |                             |       |

**Resolver, plug connector size con.23**

| Connection diagram | Pin | Connection                  | Color |
|--------------------|-----|-----------------------------|-------|
|                    | 1   |                             |       |
|                    | 2   | 1TP1 (Temperature sensor +) | BK/RD |
|                    | 3   | S4 Sin +                    | BU    |
|                    | 4   | S3 Cos +                    | BK    |
|                    | 5   | R2 Ref +                    | YEWB  |
|                    | 6   | 1TP2 (Temperature sensor -) | WH/WH |
|                    | 7   | S2 Sin -                    | YE    |
|                    | 8   | S1 Cos -                    | RD    |
|                    | 9   | R1 Ref -                    | RDWH  |
|                    | 10  |                             |       |
|                    | 11  |                             |       |
|                    | 12  |                             |       |

## 14.5 Connection to Bosch Rexroth drive controllers

This chapter contains the information for connecting STOBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBER drive controllers. You can find all other information about STOBER synchronous servo motors in the respective chapter of this catalog.

STOBER has taken the following measures to minimize the effort of commissioning STOBER motors connected to IndraDrive C/Cs drive controllers and avoid errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- Parameter lists are provided on request.

More information on commissioning EZ motors connected to IndraDrive C/Cs drive controllers can be found in the 443235\_en document in the download area on the STOBER website.

### 14.5.1 Encoders

#### Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]                 |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|-------------------------|
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113 FMA | M0   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113     | C6   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

### 14.5.2 Possible combinations with drive controllers

The following table shows the possible combinations of STOBER synchronous servo motors with drive controllers from Bosch Rexroth depending on the encoder model.

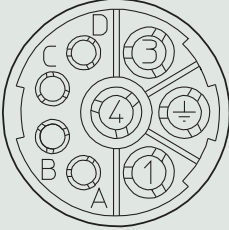

| Drive controller         | IndraDrive C/Cs |
|--------------------------|-----------------|
| Drive controller code    | FW              |
| DC link voltage $U_{zK}$ | 540 V           |
| Connection plan ID       | 442445          |
| Encoder                  | Encoder code    |
| EnDat 2.1 EQN 1125 FMA   | M2              |
| EnDat 2.1 EQN 1125       | Q4              |
| EnDat 2.1 ECN 1113 FMA   | M0              |
| EnDat 2.1 ECN 1113       | C6              |

The encoder and drive controller codes are a part of the type designation of the motor.

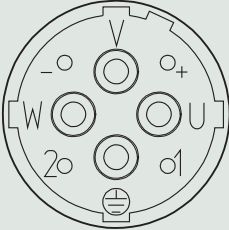

### 14.5.3 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

**Plug connector size con.23**

| Connection diagram  | Pin   | Connection           | Color |
|---|---|----------------------|-------|
|  | 1   | U phase              | BK    |
|   | 3   | V phase              | BU    |
|   | 4   | W phase              | RD    |
|   | A   | Brake +              | RD    |
|   | B   | Brake -              | BK    |
|   | C   | Temperature sensor + |       |
|   | D   | Temperature sensor - |       |
|   |  | Grounding conductor  | GNYE  |

**Plug connector size con.40 (1.5)**

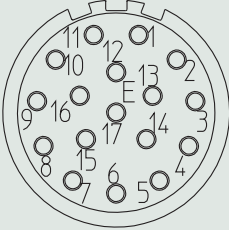
| Connection diagram  | Pin   | Connection           | Color |
|---|---|----------------------|-------|
|  | U   | U phase              | BK    |
|   | V   | V phase              | BU    |
|   | W   | W phase              | RD    |
|   | +   | Brake +              | RD    |
|   | -   | Brake -              | BK    |
|   | 1   | Temperature sensor + |       |
|   | 2   | Temperature sensor - |       |
|   |  | Grounding conductor  | GNYE  |

### 14.5.4 Connection assignment of the encoder plug connector

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.23**

This connection assignment only applies to the IndraDrive C/Cs drive controller.

| Connection diagram  | Pin | Connection  | Color |
|---|-----|-------------|-------|
|  | 1   | Up sense    | BU    |
|   | 2   |             |       |
|   | 3   |             |       |
|   | 4   | 0 V sense   | WH    |
|   | 5   |             |       |
|   | 6   |             |       |
|   | 7   | Up +        | BNGN  |
|   | 8   | Clock +     | VT    |
|   | 9   | Clock -     | YE    |
|   | 10  | 0 V GND     | WHGN  |
|   | 11  |             |       |
|   | 12  | B + (Sin +) | BUBK  |
|   | 13  | B - (Sin -) | RDBK  |
|   | 14  | Data +      | GY    |
|   | 15  | A + (Cos +) | GNBK  |
|   | 16  | A - (Cos -) | YEBK  |
|   | 17  | Data -      | PK    |

## 14.6 Connection to Beckhoff drive controllers

This chapter contains the information for connecting STOBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBER drive controllers. You can find all other information about STOBER synchronous servo motors in the respective chapter of this catalog.

STOBER has taken the following measures to minimize the effort of commissioning STOBER motors connected to AX5000 drive controllers and avoiding errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- Parameter files for all supported motor versions are provided.

More information on commissioning EZ motors connected to B&R drive controllers can be found in the 443185\_en document in the download area on the STOBER website.

### 14.6.1 Encoders

#### Encoders with EnDat 2.1 interface

| Encoder model          | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | Periods per revolution | MTTF [years] | PHF [h]                 |
|------------------------|------|------------------|------------------------|------------|--------------------------------|------------------------|--------------|-------------------------|
| EnDat 2.1 EQN 1125 FMA | M2   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQN 1125     | Q4   | Optical          | 4096                   | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113 FMA | M0   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 ECN 1113     | C6   | Optical          | –                      | 13 bit     | 8192                           | Sin/cos 512            | > 57         | $\leq 2 \times 10^{-6}$ |
| EnDat 2.1 EQI 1130     | Q2   | Inductive        | 4096                   | 12 bit     | 262144                         | Sin/cos 16             | > 100        | $\leq 6 \times 10^{-7}$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- FMA = Version with fault exclusion for mechanical coupling.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

### 14.6.2 Possible combinations with drive controllers

The following table shows the possible combinations of STOBER synchronous servo motors with drive controllers from Beckhoff depending on the encoder model.

| Drive controller       | AX5000       |  |
|------------------------|--------------|--|
| Drive controller code  | FM           |  |
| Connection plan ID     | 442318       |  |
| Encoder                | Encoder code |  |
| EnDat 2.1 EQN 1125 FMA | M2           |  |
| EnDat 2.1 EQN 1125     | Q4           |  |
| EnDat 2.1 ECN 1113 FMA | M0           |  |
| EnDat 2.1 ECN 1113     | C6           |  |
|                        | EZ           |  |

The encoder and drive controller codes are a part of the type designation of the motor.

### 14.6.3 Connection assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

**Plug connector size con.23**

| Connection diagram | Pin | Connection           | Color |
|--------------------|-----|----------------------|-------|
|                    | 1   | U phase              | BK    |
|                    | 3   | W phase              | RD    |
|                    | 4   | V phase              | BU    |
|                    | A   | Brake +              | RD    |
|                    | B   | Brake -              | BK    |
|                    | C   | Temperature sensor + |       |
|                    | D   | Temperature sensor - |       |
|                    | ⊕   | Grounding conductor  | GNYE  |

**Plug connector size con.40 (1.5)**

| Connection diagram | Pin | Connection           | Color |
|--------------------|-----|----------------------|-------|
|                    | U   | U phase              | BK    |
|                    | V   | V phase              | BU    |
|                    | W   | W phase              | RD    |
|                    | +   | Brake +              | RD    |
|                    | -   | Brake -              | BK    |
|                    | 1   | Temperature sensor + |       |
|                    | 2   | Temperature sensor - |       |
|                    | ⊕   | Grounding conductor  | GNYE  |

### 14.6.4 Connection assignment of the encoder plug connector

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor.

**EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.23**

| Connection diagram | Pin | Connection  | Color |
|--------------------|-----|-------------|-------|
|                    | 1   | B - (Sin -) | RDBK  |
|                    | 2   | 0 V GND     | WHGN  |
|                    | 3   | A - (Cos -) | YEBK  |
|                    | 4   | Up +        | BNGN  |
|                    | 5   | Data +      | GY    |
|                    | 6   |             |       |
|                    | 7   |             |       |
|                    | 8   | Clock +     | VT    |
|                    | 9   | B + (Sin +) | BUBK  |
|                    | 10  | 0 V sense   | WH    |
|                    | 11  | A + (Cos +) | GNBK  |
|                    | 12  | Up sense    | BN    |
|                    | 13  | Data -      | PK    |
|                    | 14  |             |       |
|                    | 15  | Clock -     | YE    |
|                    | 16  |             |       |
|                    | 17  |             |       |

## 14.7 Connection to Allen-Bradley drive controllers

This chapter contains the information for connecting STOBER synchronous servo motors to drive controllers of the above-named manufacturer which differs from connecting to STOBER drive controllers. You can find all other information about STOBER synchronous servo motors in the respective chapter of this catalog.

The STOBER EZ geared motors can be parameterized to Kinetix 5500/5700/6500 drive controllers fully automatically. EZ motors without an attached gear unit and other STOBER series are excluded.

STOBER has taken the following measures to minimize the effort of commissioning STOBER motors connected to Allen-Bradley drive controllers and avoid errors during parameterization:

- The commutation offset of the motor was set so that calibration by the customer is not necessary.
- The electronic nameplate of the motor was designed to be compatible with the Kinetix 5500/5700/6500.
- STOBER tests the motor connected to Allen-Bradley drive controllers before delivery to the customer.
- Configuration files for supported motor versions are available for download.

More information on commissioning EZ motors connected to Allen-Bradley drive controllers can be found in the 443244\_en document in the download area on the STOBER website.

### 14.7.1 Encoders

#### Encoders with EnDat 2.2 interface

| Encoder model      | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                  |
|--------------------|------|------------------|------------------------|------------|--------------------------------|--------------|--------------------------|
| EnDat 2.2 EQN 1135 | Q5   | Optical          | 4096                   | 23 bit     | 8388608                        | > 100        | $\leq 15 \times 10^{-9}$ |

#### Encoders with HIPERFACE interface

| Encoder model | Code | Measuring method | Recordable revolutions | Resolution | Position values per revolution | MTTF [years] | PHF [h]                  |
|---------------|------|------------------|------------------------|------------|--------------------------------|--------------|--------------------------|
| EDM35         | H6   | Optical          | 4096                   | 20 bit     | 1048576                        | > 100        | $\leq 31 \times 10^{-9}$ |

#### Notes

- The encoder code is a part of the type designation of the motor.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.

### 14.7.2 Possible combinations with drive controllers

The following table shows the possible combinations of STOBER motors and geared motors with drive controllers from Allen-Bradley depending on the encoder model.

| Drive controller      |              | KINETIX 5500<br>(with HIPERFACE DSL) | KINETIX 5700<br>(with HIPERFACE DSL) | KINETIX 5700<br>(with EnDat 2.2) | KINETIX 6500<br>(with EnDat 2.2) |
|-----------------------|--------------|--------------------------------------|--------------------------------------|----------------------------------|----------------------------------|
| Drive controller code |              | HB                                   | GD                                   | HA                               | GC                               |
| Connection plan ID    |              | 443169                               | 442449                               | 443096                           | 442448                           |
| Encoder               | Encoder code |                                      |                                      |                                  |                                  |
| EnDat 2.2 EQN 1135    | Q5           | –                                    | –                                    | EZ                               | EZ                               |
| EDM35                 | H6           | EZ                                   | EZ                                   | –                                | –                                |

The encoder and drive controller codes are a part of the type designation of the motor.



### 14.7.3 Terminal assignment of the power plug connector

The size and connection plan of the power plug connector depend on the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

**Plug connector size con.23**

| Connection diagram | Pin | Connection               | Color |
|--------------------|-----|--------------------------|-------|
|                    | A   | 1U1 (U phase)            | BK    |
|                    | B   | 1V1 (V phase)            | RD    |
|                    | C   | 1W1 (W phase)            | BU    |
|                    | F   | MBRK + (1BD1)            | RD    |
|                    | G   | MBRK - (1BD2)            | BK    |
|                    | E   |                          |       |
|                    | H   |                          |       |
|                    | L   |                          |       |
|                    |     | PE (grounding conductor) | GNYE  |

**Plug connector size con.40 (1.5)**

| Connection diagram | Pin | Connection               | Color |
|--------------------|-----|--------------------------|-------|
|                    | U   | 1U1 (U phase)            | BK    |
|                    | V   | 1V1 (V phase)            | BU    |
|                    | W   | 1W1 (W phase)            | RD    |
|                    | +   | MBRK + (1BD1)            | RD    |
|                    | -   | MBRK - (1BD2)            | BK    |
|                    | 1   |                          |       |
|                    | 2   |                          |       |
|                    |     | PE (grounding conductor) | GNYE  |

### 14.7.4 Terminal assignment of the encoder plug connector

**EnDat 2.2 digital encoder, plug connector size con.23**

| Connection diagram | Pin | Connection      | Color |
|--------------------|-----|-----------------|-------|
|                    | 1   |                 |       |
|                    | 2   |                 |       |
|                    | 3   |                 |       |
|                    | 4   |                 |       |
|                    | 5   | DATA +          | GY    |
|                    | 6   | DATA -          | PK    |
|                    | 7   | CLK + (Clock +) | VT    |
|                    | 8   | CLK - (Clock -) | YE    |
|                    | 9   | EPWR_5V (Up +)  | BNGN  |
|                    | 10  | ECOM (0 V)      | WHGN  |
|                    | 11  |                 |       |
|                    | 12  |                 |       |
|                    | 13  | TS + (1TP1)     | BK    |
|                    | 14  | TS - (1TP2)     | WH    |
|                    | 15  |                 |       |
|                    | 16  |                 |       |
|                    | 17  |                 |       |

### 14.7.5 Terminal assignment for plug connectors (One Cable Solution)

In the One Cable Solution design, the power and encoder lines are connected using a shared plug connector.

The size of the plug connector depends on the size of the motor.

The temperature sensor of the motor is connected to the encoder internally. The measured values from the temperature sensor are transmitted via the log of the encoder.

#### Plug connector size con.23

| Connection diagram | Pin | Connection               | Color |
|--------------------|-----|--------------------------|-------|
|                    | A   | 1U1 (U phase)            | BK    |
|                    | B   | 1V1 (V phase)            | BU    |
|                    | C   | 1W1 (W phase)            | RD    |
|                    | E   | DATA + (DSL +)           | GY    |
|                    | F   | MBRK + (1BD1)            | RD    |
|                    | G   | MBRK - (1BD2)            | BK    |
|                    | H   | DATA - (DSL -)           | GN    |
|                    | L   |                          |       |
|                    | ⊕   | PE (grounding conductor) | GNYE  |

#### Plug connector size con.40 (1.5)

| Connection diagram | Pin | Connection               | Color |
|--------------------|-----|--------------------------|-------|
|                    | U   | 1U1 (U phase)            | BK    |
|                    | V   | 1V1 (V phase)            | BU    |
|                    | W   | 1W1 (W phase)            | RD    |
|                    | N   |                          |       |
|                    | +   |                          |       |
|                    | -   |                          |       |
|                    | 1   | MBRK + (1BD1)            | RD    |
|                    | 2   | MBRK - (1BD2)            | BK    |
|                    | H   | DATA - (DSL -)           | GY    |
|                    | L   | DATA + (DSL +)           | GN    |
|                    | ⊕   | PE (grounding conductor) | GNYE  |

a) Coaxial shield to which the DSL shield is connected

# 15 Appendix

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## 15.1 Formula symbols

The formula symbols for values actually present in the application are marked with \*.

| Symbol                    | Unit            | Explanation   |
|---------------------------|-----------------|---|
| $a^*$                     | $m/s^2$         | Acceleration  |
| $a_{NOT}^*$               | $m/s^2$         | Emergency off acceleration  |
| $a_{th}$                  | –               | Parameter for calculating $K_{mot,th}$  |
| $a_{thEL}$                | –               | Parameters for calculating $K_{mot,th}$ (dependent on the mounting position)  |
| $B_{10}$                  | –               | Number of cycles after which 10% of components have failed  |
| $B_{10D}$                 | –               | Number of cycles until 10% of components have failed dangerously  |
| $C_{lin}$                 | $N/\mu m$       | Total linear spring rigidity  |
| $d_o$                     | mm              | Pitch circle diameter   |
| $\Delta J_B$              | $kgcm^2$        | Additive mass moment of inertia of a motor with brake   |
| $\Delta m_B$              | kg              | Additive weight of a motor with brake   |
| $\Delta s$                | mm              | Linear backlash resulting from the backlash of the gear unit  |
| $ED_{10}$                 | %               | Duty cycle based on 10 minutes  |
| $F_{ax}$                  | N               | Permitted axial force on the output   |
| $F_{ax}^*$                | N               | Actual axial force on the output  |
| $F_{ax100}$               | N               | Permitted axial force on the output for $n_m^* \leq 100$ rpm  |
| $fB_{op}$                 | –               | Operating mode operating factor   |
| $fB_t$                    | –               | Runtime operating factor  |
| $fB_T$                    | –               | Temperature operating factor  |
| $fB_{2B}$                 | –               | Operating factor for cyclic operation   |
| $ F_{f2} $                | kN              | Absolute value of feed force at output  |
| $F_{f2,0}$                | kN              | Standstill feed force at gear unit output at $n_1 = 500$ rpm  |
| $F_{f2,1}^* - F_{f2,4}^*$ | kN              | Existing feed force in the respective time segment (1 to 4)   |
| $F_{f2,n}^*$              | kN              | Existing feed force in the nth time segment   |
| $F_{f2acc}$               | kN              | Permitted acceleration feed force at the gear unit output   |
| $F_{f2acc}^*$             | N               | Actual acceleration feed force at the gear unit output  |
| $F_{f2accE}$              | kN              | Permitted acceleration feed force at the gear unit output, pinion position E  |
| $F_{f2eq}$                | kN              | Equivalent feed force at the gear unit output   |
| $F_{f2eq}^*$              | kN              | Actual equivalent feed force at the gear unit output  |
| $F_{f2N}$                 | kN              | Nominal feed force at the gear unit output for $n_1 = 500$ rpm  |
| $F_{f2NOT}$               | kN              | Emergency off feed force of the gear unit at the gear unit output for a maximum of 1000 load changes  |
|                           |                 | Without consideration of the maximum torque of the motor  |
| $F_{f2NOT}^*$             | kN              | Actual emergency off feed force at the gear unit output   |
| $F_{f2NOT,E}$             | kN              | Emergency off feed force of the gear unit at the gear unit output for a maximum of 1000 load changes, pinion position E                     |
| $F_L^*$                   | N               | Existing load force   |
| $F_{rad}$                 | N               | Permitted radial force on the output  |
| $F_{rad}^*$               | N               | Actual radial force on the output   |
| $F_{rad100}$              | N               | Permitted radial force on the output for $n_m^* \leq 100$ rpm   |
| $H$                       | m               | Installation altitude above sea level   |
| $i$                       | –               | Gear ratio  |
| $I_0$                     | A               | Stall current   |
| $I_{max}$                 | A               | Maximum current   |
| $I_N$                     | A               | Nominal current   |
| $I_{N,B}$                 | A               | Nominal current of the brake at 20 °C   |
| $I_{N,F}$                 | A               | Nominal current of the forced ventilation unit  |
| $J_{Bstop}$               | $kgcm^2$        | Reference mass moment of inertia when braking from full speed: $J_{Bstop} = J_{dyn} \times 2$   |
| $J_{dyn}$                 | $kgcm^2$        | Mass moment of inertia of a motor in dynamic operation  |
| $J_{tot}$                 | $kgm^2$         | Total mass moment of inertia (based on the motor shaft)   |
| $K_{EM}$                  | $V/1000$<br>rpm | Voltage constant: peak value of the induced voltage between the phases U, V, W of the motor at operating temperature at a speed of 1000 rpm |
| $K_H$                     | –               | Derating factor for installation altitude   |

| Symbol                | Unit              | Explanation   |
|-----------------------|-------------------|---|
| $K_{M0}$              | Nm/A              | Torque constant: ratio of the stall torque and frictional torque to the stall current; $K_{M0} = (M_0 + M_R) / I_0$ (tolerance $\pm 10\%$ )   |
| $K_{M,N}$             | Nm/A              | Torque constant: ratio of the nominal torque $M_N$ to the nominal current $I_N$ ; $K_{M,N} = M_N / I_N$ (tolerance $\pm 10\%$ )   |
| $K_{mot,th}$          | –                 | Factor for determining the thermal limit torque   |
| $K_\theta$            | –                 | Derating factor for surrounding temperature   |
| $l$                   | mm                | Length of the output shaft  |
| $L_{pA}$              | dB(A)             | Sound pressure level of the gear unit at $n_{1N} = 2000$ rpm  |
| $L_{U-V}$             | mH                | Winding inductance of a motor between two phases (determined in a resonant circuit)   |
| LW                    | -                 | Load change: A load change (LW) corresponds to an acceleration and a deceleration.  |
| $m^*$                 | kg                | Mass to be accelerated  |
| $M$                   | Nm                | Torque  |
| $M_0$                 | Nm                | Stall torque: The continuous torque the motor is able to deliver at a speed of 10 rpm (tolerance $\pm 5\%$ )  |
| $M_{1*} - M_{4*}$     | Nm                | Actual torque of the motor in the respective time segment (1 to 4)  |
| $M_{2.1*} - M_{2.4*}$ | Nm                | Actual torque in the respective time segment (1 to 4)   |
| $M_{2,n*}$            | Nm                | Actual torque in the n-th time segment  |
| $M_{2acc}$            | Nm                | Maximum permitted acceleration torque on the gear unit output   |
| $M_{2accE}$           | Nm                | Maximum permitted acceleration torque at the gear unit output, pinion position E  |
| $M_{2eff*}$           | Nm                | Actual effective torque on the gear unit output   |
| $M_{2th}$             | Nm                | Thermal limit torque on the gear unit output  |
| $M_{Bdyn}$            | Nm                | Dynamic braking torque at 100 °C  |
| $M_{Bstat}$           | Nm                | Static braking torque of the motor brake at 100 °C  |
| $m_{dyn}$             | kg                | Weight of a motor in dynamic operation  |
| $M_{eff*}$            | Nm                | Actual effective torque of the motor  |
| $m_F$                 | kg                | Weight of the forced ventilation unit   |
| $M_k$                 | Nm                | Permitted tilting torque on the output  |
| $M_{k*}$              | Nm                | Actual tilting torque on the output   |
| $M_{k100}$            | Nm                | Permitted tilting torque on the output for $n_m \leq 100$ rpm   |
| $M_L$                 | Nm                | Load torque   |
| $M_{lim}$             | Nm                | Torque limit without compensating for field weakening   |
| $M_{limF}$            | Nm                | Torque curve of the motor with forced ventilation in continuous operation   |
| $M_{limFW}$           | Nm                | Torque limit with compensation for field weakening (applies to operation on STOBBER drive controllers only)   |
| $M_{limK}$            | Nm                | Torque curve of the motor with convection cooling in continuous operation   |
| $M_{max}$             | Nm                | Maximum torque: the maximum permitted torque the motor is able to deliver over a short period (when accelerating or decelerating) (tolerance $\pm 10\%$ )   |
| $M_{max*}$            | Nm                | Actual maximum torque   |
| $m_n$                 | mm                | Module  |
| $M_{n*}$              | Nm                | Actual torque of the motor in the n-th time segment   |
| $M_N$                 | Nm                | Nominal torque: the maximum torque of a motor in S1 mode at nominal speed $n_N$ (tolerance $\pm 5\%$ )  |
| $M_{Nred}$            | Nm                | Reduced nominal torque of the motor   |
| $M_{op}$              | Nm                | Torque of motor at the operating point from the motor characteristic curve at $n_{1m*}$   |
| $M_R$                 | Nm                | Frictional torque (of the bearings and seals) of a motor at winding temperature $\Delta\theta = 100$ K  |
| $n$                   | rpm               | Speed   |
| $n_{1m*}$             | rpm               | Actual average input speed  |
| $n_{1max*}$           | rpm               | Actual maximum input speed  |
| $n_{1maxDB}$          | $\text{min}^{-1}$ | Maximum permitted input speed of the gear unit in continuous operation  |
| $n_{1maxZB}$          | $\text{min}^{-1}$ | Maximum permitted input speed of the gear unit in cyclic operation  |
| $N_{Bstop}$           | –                 | Permitted number of braking processes from full speed ( $n = 3000$ rpm) with $J_{Bstop}$ ( $M_L = 0$ ). The following applies if the values of $n$ and $J_{Bstop}$ differ: $N_{Bstop} = W_{B,Rlim} / W_{B,R/B}$ . |

| Symbol                      | Unit              | Explanation   |
|-----------------------------|-------------------|---|
| $n_{m^*}$                   | rpm               | Actual average motor speed  |
| $n_{m,1^*} - n_{m,4^*}$     | rpm               | Actual average speed of the motor in the respective time segment (1 to 4)   |
| $n_{m,n^*}$                 | rpm               | Actual average speed of the motor in the n-th time segment  |
| $n_N$                       | rpm               | Nominal speed: The speed for which the nominal torque $M_N$ is specified  |
| $P_N$                       | kW                | Nominal power: the power the motor is able to deliver long term in S1 mode at the nominal point (tolerance $\pm 5\%$ )  |
| $P_{N,F}$                   | W                 | Nominal output of the forced ventilation unit   |
| $q_{vF}$                    | m <sup>3</sup> /h | Delivery capacity of the forced ventilation unit in open air  |
| $R_{U-V}$                   | $\Omega$          | Winding resistance of a motor between two phases at a winding temperature of 20 °C  |
| S                           | –                 | Service factor: Quotient of the nominal torque from the gear unit and the motor without consideration for thermal limiting performance. Represents a value for the reserve of the geared motor. |
| t                           | s                 | Time  |
| $t_{1^*} - t_{4^*}$         | s                 | Duration of the respective time segment (1 to 4)  |
| $t_{1^*} - t_{n^*}$         | s                 | Duration of the respective time segment   |
| $t_{11B}$                   | ms                | Response delay: time from when the current is turned off until the torque increases   |
| $t_{1B}$                    | ms                | Linking time: time from when the current is turned off until the nominal braking torque is reached  |
| $t_{2B}$                    | ms                | Disengagement time: time from when the current is turned on until the torque begins to drop   |
| $t_{dec}$                   | ms                | Stop time   |
| $T_{el}$                    | ms                | Electrical time constant: ratio of the winding inductance to the winding resistance of a motor: $T_{el} = L_{U-V} / R_{U-V}$  |
| $\vartheta_{amb}$           | °C                | Surrounding temperature   |
| $t_{n^*}$                   | s                 | Duration of the n-th time segment   |
| U                           | V                 | Voltage   |
| $U_{N,B}$                   | V                 | Nominal voltage of brake  |
| $U_{N,F}$                   | V                 | Nominal voltage of the forced ventilation unit  |
| $ v_{f2} $                  | m/s               | Absolute value of feed velocity   |
| $v_{f2m^*}$                 | m/s               | Actual average feed velocity  |
| $v_{f2m,1^*} - v_{f2m,4^*}$ | m/s               | Actual average feed velocity in the respective time segment (1 to 4)  |
| $v_{f2m,n^*}$               | m/s               | Actual average feed velocity in the nth time segment  |
| $v_{f2N}$                   | m/s               | Nominal feed rate at gear unit output   |
| $v_{f2maxDB}$               | m/s               | Maximum feed velocity at the gear unit output at $n_{1maxDB}$   |
| $v_{f2maxZB}$               | m/s               | Maximum feed velocity at the gear unit output at $n_{1maxZB}$   |
| $W_{B,R/B}$                 | J                 | Work done by friction for braking   |
| $W_{B,Rlim}$                | J                 | Work done by friction until wear limit is reached   |
| $W_{B,Rmax/h}$              | J/h               | Maximum permitted work done by friction per hour with individual braking  |
| x                           | mm                | Profile offset factor   |
| $x_2$                       | mm                | Distance of the shaft shoulder to the force application point   |
| $x_{B,N}$                   | mm                | Nominal air gap of brake  |
| $y_2$                       | mm                | Distance of the shaft axis to the axial force application point   |
| z                           | –                 | Number of teeth   |
| $z_2$                       | mm                | Distance of the shaft shoulder to the middle of the output bearing  |

## 15.2 Trademarks

The following names used in connection with the device, its optional equipment and its accessories are trademarks or registered trademarks of other companies:

|                        |  |
|------------------------|--|
| ACOPOS®                | ACOPOS is a registered trademark of ABB Asea Brown Boveri Ltd., Zurich, Switzerland.   |
| DRIVE-CLiQ®,<br>EnDat® | DRIVE-CLiQ® is a registered trademark of Siemens AG, Munich, Germany.<br>EnDat® and the EnDat® logo are registered trademarks of Dr. Johannes Heidenhain GmbH, Traunreut, Germany. |
| HIPERFACE®             | HIPERFACE® and the HIPERFACE DSL® logo are registered trademarks of SICK STEGMANN GmbH, Donaueschingen, Germany.   |
| IndraDrive®            | IndraDrive® is a registered trademark of Bosch Rexroth AG, Lohr, Germany.  |
| INTERCONTEC®           | INTERCONTEC® is a registered trademark of TE Connectivity Industrial GmbH, Niederwinkling, Germany.  |
| RINGFEDER®             | RINGFEDER® is a registered trademark of VBG GROUP TRUCK EQUIPMENT GmbH, Krefeld, Germany.  |
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All other trademarks not listed here are the property of their respective owners.

Products that are registered as trademarks are not specially indicated in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

## 15.3 Sales terms and delivery conditions

You can find our current sales terms and delivery conditions at <http://www.stoeber.de/en/gtc>.

## 15.4 Legal notice

Catalog Rack and pinion drives with synchronous servo motors ID 443286\_en.

You can find current versions of PDF files online at <http://www.stoeber.de/en/downloads/>.

### **ATLANTA gear racks**

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

<http://atlantagmbh.de/>



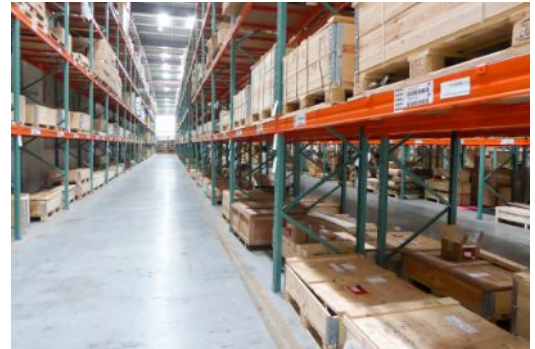


## 15.5 ATLANTA product catalog pages

The following pages include an excerpt from the product catalog of ATLANTA Antriebssysteme.



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The values given in the load table are based upon uniform, smooth operation,  $K_{H\beta}=1,0$  and reliable grease lubrication. Since, in practice, the applications are very diverse, it is important to consider the given conditions by using appropriate factors  $S_B$ ,  $K_A$ ,  $L_{K\beta}$  and  $f_n$  (see below).

### Formulas for determining the tangential force

$$a = \frac{v}{t_b} \quad [\text{m/s}^2]$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad (\text{for lifting axle}) \quad [\text{kN}]$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000} \quad (\text{for driving axle}) \quad [\text{kN}]$$

$$F_{u \text{ perm.}} = \frac{F_{u \text{ tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{K\beta}} \quad [\text{kN}]$$

Formula dimensions see page ZD-3

**The condition  $F_u < F_{u \text{ perm.}}$  must be fulfilled.**

### Load factor $K_A$

| Drive         | Type of load from the machines to be driven |               |              |
|---------------|---|---------------|--------------|
|               | uniform                                     | medium shocks | heavy shocks |
| uniform       | 1,00  | 1,25          | 1,75         |
| light shocks  | 1,25  | 1,50          | 2,00         |
| medium shocks | 1,50  | 1,75          | 2,25         |

### Safety coefficient $S_B$

The safety coefficient should be allowed for according to experience ( $S_B = 1.25 \div 1.50$ ). This is valid for rack drives with one drive / rack line. For multiple drives on one rack line, as well as for preloaded drives, this safety coefficient have to be increased. In case of doubts please contact our technical service.

### Life-time factor $f_n$

considering of the peripheral speed of the pinion and lubrication.

| Lubrication                 |       | contin. | daily | monthly |
|-----------------------------|-------|---------|-------|---------|
| Peripheral speed of gearing |       |         |       |         |
| m/sec                       | m/min |         |       |         |
| 0,5                         | 30    | 0,85    | 0,95  |         |
| 1,0                         | 60    | 0,95    | 1,10  | from    |
| 1,5                         | 90    | 1,00    | 1,20  | 3       |
| 2,0                         | 120   | 1,05    | 1,30  | to      |
| 3,0                         | 180   | 1,10    | 1,50  | 10      |
| 5,0                         | 300   | 1,25    | 1,90  |         |

### Linear load distribution factor $L_{K\beta}$

The linear load distribution factor considers the contact stress, while it describes unintegrated load distribution over the tooth width ( $L_{K\beta} = \sqrt{K_{H\beta}}$ ).

- $L_{K\beta} = 1,1$  for counter bearing, e.g. Torque Supporter
- $= 1,2$  for preloaded bearings on the output shaft e.g. Atlanta Ht-, HP- and E-servo worm gear unit, BG-bevel gear unit
- $= 1,5$  for unpreloaded bearings on the output shaft e.g. Atlanta B-servo worm gear unit



## Calculation example

### Values given

⊗ travelling operation

|                                 |   |
|---------------------------------|---|
| mass to be moved                | m = 820 kg                                |
| speed                           | v = 2 m/s                                 |
| acceleration time               | t <sub>b</sub> = 1 s                      |
| acceleration due to gravity     | g = 9,81 m/s <sup>2</sup>                 |
| coefficient of friction         | μ = 0,1                                   |
| load factor                     | K <sub>A</sub> = 1,5                      |
| life-time factor                | f <sub>n</sub> = 1,05 (cont. lubrication) |
| safety coefficient              | S <sub>B</sub> = 1,4                      |
| linear load distribution factor | L <sub>KHβ</sub> = 1,5                    |

### Calculation process

$$a = \frac{v}{t_b} \quad a = \frac{2}{1} = 2 \text{ m/s}^2$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000}$$

$$F_u = \frac{820 \cdot 9,81 \cdot 0,1 + 820 \cdot 2}{1000} = 2,44 \text{ kN}$$

permissible feed force F<sub>uTab</sub>:  
rack C45, ind. hardened, Q10, straight tooth, module 3,  
pinion 16MnCr5, case hardened, 20 teeth  
page ZB-40 with F<sub>uTab</sub> = 11,5 kN

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}}$$

$$F_{u \text{ per.}} = \frac{11,5 \text{ kN}}{1,5 \cdot 1,4 \cdot 1,05 \cdot 1,5} = 3,47 \text{ kN}$$

### Condition

$$F_{u \text{ per.}} > F_u ; 3,47 \text{ kN} > 2,44 \text{ kN} \quad \Rightarrow \text{fulfilled}$$

Result: Rack 27 30 101 Page ZB-13

Pinion 24 35 220 Page ZB-23  
case hardened

## Your calculation

### Values given

⊗ travelling operation

|                                 |                                  |
|---------------------------------|----------------------------------|
| mass to be moved                | m = _____ kg                     |
| speed                           | v = _____ m/s                    |
| acceleration time               | t <sub>b</sub> = _____ s         |
| acceleration due to gravity     | g = <u>9,81</u> m/s <sup>2</sup> |
| coefficient of friction         | μ = _____                        |
| load factor                     | K <sub>A</sub> = _____           |
| life-time factor                | f <sub>n</sub> = _____           |
| safety coefficient              | S <sub>B</sub> = _____           |
| linear load distribution factor | L <sub>KHβ</sub> = _____         |

### Calculation process

$$a = \frac{v}{t_b} \quad a = \text{_____} = \text{_____} \text{ m/s}^2$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000} ; F_u = \frac{\text{_____}}{1000} = \text{_____} \text{ kN}$$

permissible feed force F<sub>uTab</sub>

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}}$$

$$F_{u \text{ per.}} = \text{_____} = \text{_____} \text{ kN}$$

### Condition

$$F_{u \text{ per.}} > F_u ; \text{_____ kN} > \text{_____ kN} \quad \Rightarrow \text{fulfilled}$$



**Calculation example**
**Values given**

⊗ travelling operation

|                                 |   |
|---------------------------------|---|
| mass to be moved                | $m = 300 \text{ kg}$                    |
| speed                           | $v = 1,08 \text{ m/s}$                  |
| acceleration time               | $t_b = 0,27 \text{ s}$                  |
| acceleration due to gravity     | $g = 9,81 \text{ m/s}^2$                |
| load factor                     | $K_A = 1,2$                             |
| life-time factor                | $f_n = 1,1 \text{ (cont. lubrication)}$ |
| safety coefficient              | $S_B = 1,4$                             |
| linear load distribution factor | $L_{KH\beta} = 1,2$                     |

**Calculation process**

$$a = \frac{v}{t_b} \quad a = \frac{1,08}{0,27} = 4 \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_u = \frac{300 \cdot 9,81 + 300 \cdot 4}{1000} = 4,1 \text{ kN}$$

permissible feed force  $F_{u \text{ Tab}}$  :  
 rack C45, ind. hardened, Q6, helical tooth, module 2,  
 pinion 16MnCr5, case hardened, 20 teeth  
 page ZA-31 with  $F_{u \text{ Tab}} = 11,5 \text{ kN}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ; F_{u \text{ per.}} = \frac{11,5 \text{ kN}}{1,2 \cdot 1,4 \cdot 1,1 \cdot 1,2} = 5,18 \text{ kN}$$

**Condition**

$$F_{u \text{ per.}} > F_u ; 5,18 \text{ kN} > 4,1 \text{ kN} \quad \Rightarrow \text{ fulfilled}$$

Result: Rack 29 20 105 Page ZA-7  
 Pinion 24 29 520 Page ZA-24

**Your calculation**
**Values given**

⊗ travelling operation

|                                 |  |
|---------------------------------|--|
| mass to be moved                | $m = \underline{\hspace{2cm}} \text{ kg}$  |
| speed                           | $v = \underline{\hspace{2cm}} \text{ m/s}$ |
| acceleration time               | $t_b = \underline{\hspace{2cm}} \text{ s}$ |
| acceleration due to gravity     | $g = \underline{9,81} \text{ m/s}^2$       |
| load factor                     | $K_A = \underline{\hspace{2cm}}$           |
| life-time factor                | $f_n = \underline{\hspace{2cm}}$           |
| safety coefficient              | $S_B = \underline{\hspace{2cm}}$           |
| linear load distribution factor | $L_{KH\beta} = \underline{\hspace{2cm}}$   |

**Calculation process**

$$a = \frac{v}{t_b} \quad a = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_{u \text{ req.}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

permissible feed force  $F_{u \text{ Tab}}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ; F_{u \text{ per.}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

**Condition**

$$F_{u \text{ per.}} > F_u ; \underline{\hspace{2cm}} \text{ kN} > \underline{\hspace{2cm}} \text{ kN} \quad \Rightarrow \text{ fulfilled}$$



Module 1,0



Module 1,25



Module 1,5



Module 2,0



Module 2,5



Module 3,0



Module 4,0



Module 5,0



Module 6,0



Module 8,0



Module 10,0



Module 12,0



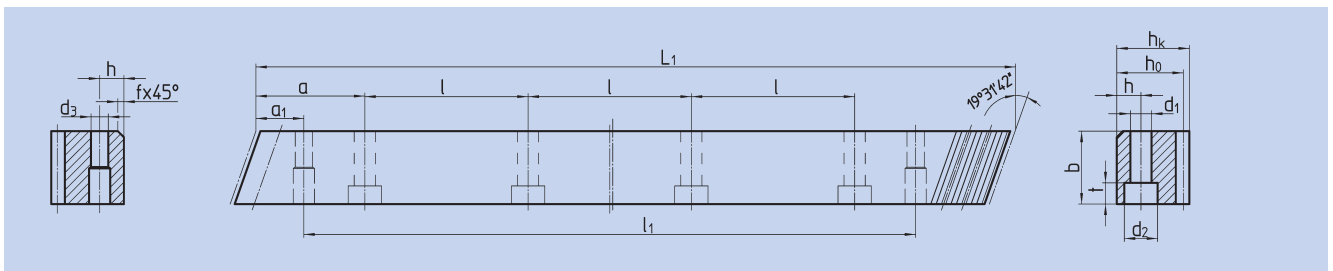
| Class                                 | ATLANTA Quality | Module | Total pitch error <sup>1)</sup><br>(±µm/m) | Tooth thickness tolerance<br>(µm) | max. length<br>(mm) | Max. feed force per pinion contact <sup>2)</sup><br>kN | Applications (examples)   |
|---------------------------------------|-----------------|--------|--|-----------------------------------|---------------------|--|---|
| <b>HPR</b><br><br>High Precision Rack | 6               | 2      | 34   | -20                               | 1000                | 19,5   | <b>Wood, plastic, composite, aluminium working machines</b>   |
|                                       |                 | 3      | 34   | -20                               | 1000                | 31,0   |   |
|                                       |                 | 4      | 34   | -20                               | 1000                | 60,0   |   |
|                                       | 6               | 1,5    | 34   | -20                               | 1000                | 9,0  | <b>Machine tools, integratable racks, water cutting machines, tube bending systems, plasma cutting machines</b> |
|                                       |                 | 2      | 34   | -20                               | 2000                | 15,5   |   |
|                                       |                 | 3      | 34   | -20                               | 2000                | 28,5   |   |
|                                       |                 | 4      | 34   | -20                               | 2000                | 51,5   |   |
|                                       |                 | 5      | 34   | -20                               | 2000                | 76,0   |   |
|                                       |                 | 6      | 34   | -20                               | 2000                | 109,0  |   |
|                                       |                 | 8      | 34   | -20                               | 1920                | 191,0  |   |
|                                       | 10              | 34     | -20  | 1500                              | 287,0               |  |   |
|                                       |                 | 12     | 34   | -20                               | 1000                | 409,0  |   |
|                                       | 7               | 2      | 52   | -36                               | 2000                | 15,5   | <b>Wood working machines, linear axes with high requirement for a smooth running</b>                            |
|                                       |                 | 3      | 52   | -36                               | 2000                | 28,5   |   |
|                                       |                 | 4      | 52   | -36                               | 2000                | 51,5   |   |
|                                       |                 | 5      | 52   | -36                               | 2000                | 76,0   |   |
|                                       |                 | 6      | 52   | -36                               | 2000                | 109,0  |   |
|                                       |                 | 8      | 52   | -36                               | 1920                | 191,0  |   |
|                                       |                 | 10     | 52   | -36                               | 1500                | 287,0  |   |
|                                       |                 |        |  |                                   |                     |  |   |
| <b>PR</b><br><br>Precision Rack       | 8               | 2      | 60   | -59                               | 2000                | 13,5   | <b>Portals, handling linear axes</b>  |
|                                       |                 | 3      | 60   | -59                               | 2000                | 24,5   |   |
|                                       |                 | 4      | 60   | -59                               | 2000                | 44,0   |   |
|                                       |                 | 5      | 60   | -59                               | 2000                | 64,5   |   |
|                                       |                 | 6      | 60   | -59                               | 2000                | 90,5   |   |
|                                       | 8               | 2      | 100  | -110                              | 2000                | 8,0  | <b>Linear axes</b>  |
|                                       |                 | 3      | 100  | -110                              | 2000                | 14,0   |   |
|                                       |                 | 4      | 100  | -110                              | 2000                | 27,0   |   |

1) Values available for 1000 mm. Other total pitch errors for other length, see detailed description (ATLANTA Servo Drive catalogue).

2) Values are only valid for special steel according ATLANTA-Standard.

**When using the maximum capacity of the teeth, or multiple pinions in contact, the mounting screw loads must be checked separately! Please ask ATLANTA for advice!**

ATLANTA-Quality 6



| Order code | Module | L <sub>1</sub> | N° of teeth | b  | h <sub>k</sub> | h <sub>0</sub> | f | a    | l   | N° of holes | h  | d <sub>1</sub> | d <sub>2</sub> | t  | a <sub>1</sub> | l <sub>1</sub> | d <sub>3</sub> | kg    |
|------------|--------|----------------|-------------|----|----------------|----------------|---|------|-----|-------------|----|----------------|----------------|----|----------------|----------------|----------------|-------|
| 29 20 100  | 2      | 1000,00        | 150         | 24 | 24             | 22             | 2 | 62,5 | 125 | 8           | 8  | 7              | 11             | 7  | 31,7           | 936,6          | 5,7            | 4,10  |
| 29 30 100  | 3      | 1000,00        | 100         | 29 | 29             | 26             | 2 | 62,5 | 125 | 8           | 9  | 10             | 15             | 9  | 35,0           | 930,0          | 7,7            | 5,90  |
| 29 42 100  | 4      | 1000,00        | 75          | 39 | 39             | 35             | 2 | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 33,3           | 933,4          | 11,7           | 10,70 |

**Total pitch error**     $GT_f/1000 \leq 0,034 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,041 \text{ mm} (\Delta 0,027 \text{ mm}/1000)$ ,  
 $GT_f/2000 \leq 0,044 \text{ mm} (\Delta 0,022 \text{ mm}/1000)$ .

- Teeth hardened with the ATLANTA high performance hardening process and ground
- case hardening steel acc. ATLANTA-Standard
- ground on all sides after hardening

**Mounting racks, see Atlanta Servo Drive catalogue.**

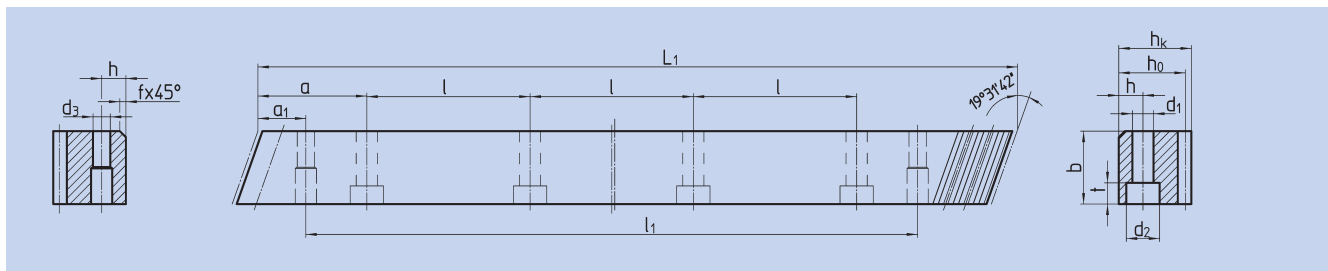
**To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.**


**For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.**

**For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.**

**Screws for rack mounting, see Atlanta Servo Drive catalogue.**

ATLANTA-Quality 6



| Order code              | Module | L <sub>1</sub> | N° of teeth | b   | h <sub>k</sub> | h <sub>0</sub> | f   | a    | l   | N° of holes | h  | d <sub>1</sub> | d <sub>2</sub> | t  | a <sub>1</sub> | l <sub>1</sub> | d <sub>3</sub> |  |
|-------------------------|--------|----------------|-------------|-----|----------------|----------------|-----|------|-----|-------------|----|----------------|----------------|----|----------------|----------------|----------------|---|
| 29 15 105               | 1,5    | 1000,00        | 200         | 19  | 19             | 17,5           | 2,0 | 62,5 | 125 | 8           | 8  | 7              | 11             | 7  | 31,7           | 936,6          | 5,7            | 2,60  |
| 29 20 105               | 2      | 1000,00        | 150         | 24  | 24             | 22             | 2,0 | 62,5 | 125 | 8           | 8  | 7              | 11             | 7  | 31,7           | 936,6          | 5,7            | 4,10  |
| 29 20 155               | 2      | 1500,00        | 225         | 24  | 24             | 22             | 2,0 | 62,5 | 125 | 16          | 8  | 7              | 11             | 7  | 31,7           | 1436,6         | 5,7            | 6,15  |
| 29 20 205               | 2      | 2000,00        | 300         | 24  | 24             | 22             | 2,0 | 62,5 | 125 | 16          | 8  | 7              | 11             | 7  | 31,7           | 1936,6         | 5,7            | 8,20  |
| 29 30 105               | 3      | 1000,00        | 100         | 29  | 29             | 26             | 2,0 | 62,5 | 125 | 8           | 9  | 10             | 15             | 9  | 35,0           | 930,0          | 7,7            | 5,90  |
| 29 30 155               | 3      | 1500,00        | 150         | 29  | 29             | 26             | 2,0 | 62,5 | 125 | 12          | 9  | 10             | 15             | 9  | 35,0           | 1430,0         | 7,7            | 8,85  |
| 29 30 205               | 3      | 2000,00        | 200         | 29  | 29             | 26             | 2,0 | 62,5 | 125 | 16          | 9  | 10             | 15             | 9  | 35,0           | 1930,0         | 7,7            | 11,80   |
| 29 40 105 <sup>2)</sup> | 4      | 1000,00        | 75          | 39  | 39             | 35             | 2,0 | 62,5 | 125 | 8           | 12 | 10             | 15             | 9  | 33,3           | 933,4          | 7,7            | 10,70   |
| 29 42 105               | 4      | 1000,00        | 75          | 39  | 39             | 35             | 2,0 | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 33,3           | 933,4          | 11,7           | 10,70   |
| 29 42 155 <sup>1)</sup> | 4      | 1506,67        | 113         | 39  | 39             | 35             | 2,0 | 62,5 | 125 | 12          | 12 | 14             | 20             | 13 | 33,3           | 1433,4         | 11,7           | 16,05   |
| 29 40 205               | 4      | 2000,00        | 150         | 39  | 39             | 35             | 2,0 | 62,5 | 125 | 16          | 12 | 10             | 15             | 9  | 33,3           | 1933,4         | 7,7            | 21,40   |
| 29 42 205               | 4      | 2000,00        | 150         | 39  | 39             | 35             | 2,0 | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 33,3           | 1933,4         | 11,7           | 21,40   |
| 29 50 105               | 5      | 1000,00        | 60          | 49  | 49             | 34             | 2,5 | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 37,5           | 925,0          | 11,7           | 13,00   |
| 29 50 155               | 5      | 1500,00        | 90          | 49  | 49             | 34             | 2,5 | 62,5 | 125 | 12          | 12 | 14             | 20             | 13 | 37,5           | 1425,0         | 11,7           | 19,50   |
| 29 50 205               | 5      | 2000,00        | 120         | 49  | 49             | 34             | 2,5 | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 37,5           | 1925,0         | 11,7           | 26,00   |
| 29 60 105               | 6      | 1000,00        | 50          | 59  | 59             | 43             | 2,5 | 62,5 | 125 | 8           | 16 | 18             | 26             | 17 | 37,5           | 925,0          | 15,7           | 18,10   |
| 29 60 155               | 6      | 1500,00        | 75          | 59  | 59             | 43             | 2,5 | 62,5 | 125 | 12          | 16 | 18             | 26             | 17 | 37,5           | 1425,0         | 15,7           | 27,10   |
| 29 60 205               | 6      | 2000,00        | 100         | 59  | 59             | 43             | 2,5 | 62,5 | 125 | 16          | 16 | 18             | 26             | 17 | 37,5           | 1925,0         | 15,7           | 36,20   |
| 29 80 105               | 8      | 960,00         | 36          | 79  | 79             | 71             | 2,5 | 60,0 | 120 | 8           | 25 | 22             | 33             | 21 | 120,0          | 720,0          | 19,7           | 42,50   |
| 29 80 155               | 8      | 1440,00        | 54          | 79  | 79             | 71             | 2,5 | 60,0 | 120 | 12          | 25 | 22             | 33             | 21 | 120,0          | 1200,0         | 19,7           | 63,80   |
| 29 80 205               | 8      | 1920,00        | 72          | 79  | 79             | 71             | 2,5 | 60,0 | 120 | 16          | 25 | 22             | 33             | 21 | 120,0          | 1680,0         | 19,7           | 85,00   |
| 29 10 105               | 10     | 1000,00        | 30          | 99  | 99             | 89             | 2,5 | 62,5 | 125 | 8           | 32 | 33             | 48             | 32 | 125,0          | 750,0          | 19,7           | 68,72   |
| 29 10 155               | 10     | 1500,00        | 45          | 99  | 99             | 89             | 2,5 | 62,5 | 125 | 12          | 32 | 33             | 48             | 32 | 125,0          | 1250,0         | 19,7           | 103,00  |
| 29 12 105               | 12     | 1000,00        | 25          | 120 | 120            | 108            | 2,5 | 40,0 | 125 | 8           | 40 | 39             | 58             | 38 | 125,0          | 750,0          | 19,7           | 111,00  |

- 1) This racks could be used for continuous linking only with the left side (see sketch).
- 2) The screw joint limits the feed force.

**Total pitch error**     $GT_f/1000 \leq 0,034 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,041 \text{ mm} (\Delta 0,027 \text{ mm}/1000)$ ,  
 $GT_f/2000 \leq 0,044 \text{ mm} (\Delta 0,022 \text{ mm}/1000)$ .

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard, carburized
- ground on all sides after hardening

**Mounting racks, see Atlanta Servo Drive catalogue.**

**To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.**

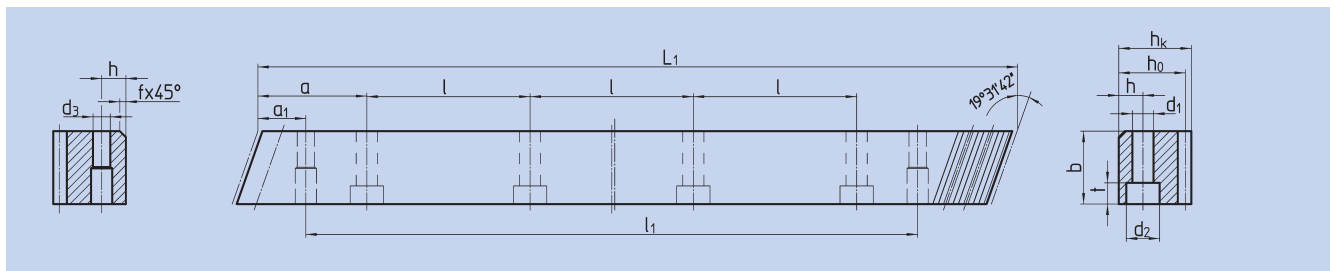
**For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.**

**For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.**

**Screws for rack mounting, see Atlanta Servo Drive catalogue.**



## ATLANTA-Quality 7



| Order code              | Module | L <sub>1</sub> | N° of teeth | b <sup>+0,4</sup> | h <sub>k</sub> | h <sub>0</sub> | f   | a    | l   | N° of holes | h  | d <sub>1</sub> | d <sub>2</sub> | t  | a <sub>1</sub> | l <sub>1</sub> | d <sub>3</sub> | kg     |
|-------------------------|--------|----------------|-------------|-------------------|----------------|----------------|-----|------|-----|-------------|----|----------------|----------------|----|----------------|----------------|----------------|--------|
| 29 20 107               | 2      | 1000,00        | 150         | 24                | 24             | 22             | 2   | 62,5 | 125 | 8           | 8  | 7              | 11             | 7  | 31,7           | 936,6          | 5,7            | 4,10   |
| 29 20 157               | 2      | 1500,00        | 225         | 24                | 24             | 22             | 2   | 62,5 | 125 | 12          | 8  | 7              | 11             | 7  | 31,7           | 1436,6         | 5,7            | 6,15   |
| 29 20 207               | 2      | 2000,00        | 300         | 24                | 24             | 22             | 2   | 62,5 | 125 | 16          | 8  | 7              | 11             | 7  | 31,7           | 1936,6         | 5,7            | 8,20   |
| 29 30 107               | 3      | 1000,00        | 100         | 29                | 29             | 26             | 2   | 62,5 | 125 | 8           | 9  | 10             | 15             | 9  | 35,0           | 930,0          | 7,7            | 5,90   |
| 29 30 157               | 3      | 1500,00        | 150         | 29                | 29             | 26             | 2   | 62,5 | 125 | 12          | 9  | 10             | 15             | 9  | 35,0           | 1430,0         | 7,7            | 8,85   |
| 29 30 207               | 3      | 2000,00        | 200         | 29                | 29             | 26             | 2   | 62,5 | 125 | 16          | 9  | 10             | 15             | 9  | 35,0           | 1930,0         | 7,7            | 11,80  |
| 29 40 107               | 4      | 1000,00        | 75          | 39                | 39             | 35             | 2   | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 33,3           | 933,4          | 11,7           | 10,70  |
| 29 40 157 <sup>1)</sup> | 4      | 1506,67        | 113         | 39                | 39             | 35             | 2   | 62,5 | 125 | 12          | 12 | 14             | 20             | 13 | 33,3           | 1433,0         | 11,7           | 16,00  |
| 29 40 207               | 4      | 2000,00        | 150         | 39                | 39             | 35             | 2   | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 33,3           | 1933,4         | 11,7           | 21,40  |
| 29 50 107               | 5      | 1000,00        | 60          | 49                | 39             | 34             | 2,5 | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 37,5           | 925,0          | 11,7           | 13,00  |
| 29 50 157               | 5      | 1500,00        | 90          | 49                | 39             | 34             | 2,5 | 62,5 | 125 | 12          | 12 | 14             | 20             | 13 | 37,5           | 1425,0         | 11,7           | 19,50  |
| 29 50 207               | 5      | 2000,00        | 120         | 49                | 39             | 34             | 2,5 | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 37,5           | 1925,0         | 11,7           | 26,00  |
| 29 60 107               | 6      | 1000,00        | 50          | 59                | 49             | 43             | 2,5 | 62,5 | 125 | 8           | 16 | 18             | 26             | 17 | 37,5           | 925,0          | 15,7           | 18,10  |
| 29 60 157               | 6      | 1500,00        | 75          | 59                | 49             | 43             | 2,5 | 62,5 | 125 | 12          | 16 | 18             | 26             | 17 | 37,5           | 1425,0         | 15,7           | 27,10  |
| 29 60 207               | 6      | 2000,00        | 100         | 59                | 49             | 43             | 2,5 | 62,5 | 125 | 16          | 16 | 18             | 26             | 17 | 37,5           | 1925,0         | 15,7           | 36,20  |
| 29 80 107               | 8      | 960,00         | 36          | 79                | 79             | 71             | 2,5 | 60,0 | 120 | 8           | 25 | 22             | 33             | 21 | 120,0          | 720,0          | 19,7           | 42,50  |
| 29 80 157               | 8      | 1440,00        | 54          | 79                | 79             | 71             | 2,5 | 60,0 | 120 | 12          | 25 | 22             | 33             | 21 | 120,0          | 1200,0         | 19,7           | 65,00  |
| 29 80 207               | 8      | 1920,00        | 72          | 79                | 79             | 71             | 2,5 | 60,0 | 120 | 16          | 25 | 22             | 33             | 21 | 120,0          | 1680,0         | 19,7           | 85,00  |
| 29 10 107               | 10     | 1000,00        | 30          | 99                | 99             | 89             | 2,5 | 62,5 | 125 | 8           | 32 | 33             | 48             | 32 | 125,0          | 750,0          | 19,7           | 68,72  |
| 29 10 157               | 10     | 1500,00        | 45          | 99                | 99             | 89             | 2,5 | 62,5 | 125 | 12          | 32 | 33             | 48             | 32 | 125,0          | 1250,0         | 19,7           | 104,00 |

1) This racks could be used for continuous linking only with the left side (see sketch).

**Total pitch error**     $GT_f/1000 \leq 0,052 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,062 \text{ mm}$  ( $\Delta 0,042 \text{ mm}/1000$ ),  
 $GT_f/2000 \leq 0,068 \text{ mm}$  ( $\Delta 0,034 \text{ mm}/1000$ ).

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard
- ground on all sides after hardening

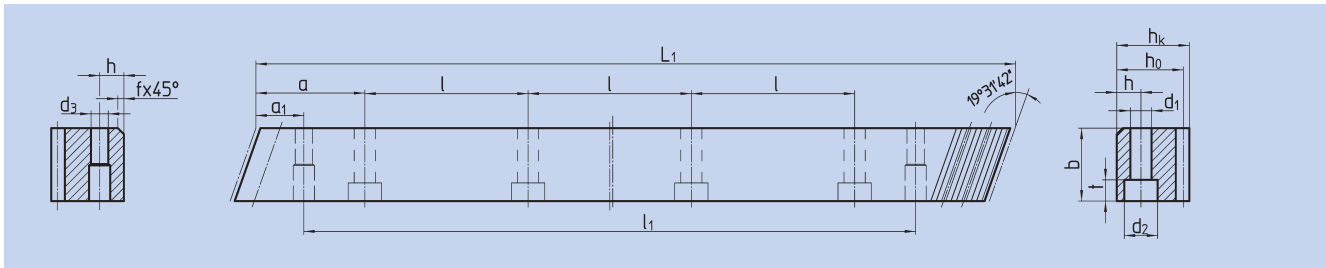
**Mounting racks, see Atlanta Servo Drive catalogue.**


**To achieve precision rack joints, we recommend our patented rack assembly kit, see Atlanta Servo Drive catalogue.**

**For lubrication of racks & pinions, we recommend our automatic lubrication systems, Atlanta Servo Drive catalogue.**

**For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.**

**Screws for rack mounting, see Atlanta Servo Drive catalogue.**

**ATLANTA-Quality 8**


| Order code              | Module | L <sub>1</sub> | N° of teeth | b <sup>+0,4</sup> | h <sub>k</sub> | h <sub>0</sub> | f   | a    | l   | N° of holes | h  | d <sub>1</sub> | d <sub>2</sub> | t  | a <sub>1</sub> | l <sub>1</sub> | d <sub>3</sub> |  |
|-------------------------|--------|----------------|-------------|-------------------|----------------|----------------|-----|------|-----|-------------|----|----------------|----------------|----|----------------|----------------|----------------|---|
| 29 20 108               | 2      | 1000,00        | 150         | 24                | 24             | 22             | 2   | 62,5 | 125 | 8           | 8  | 7              | 11             | 7  | 31,7           | 936,6          | 5,7            | 4,12  |
| 29 20 158               | 2      | 1500,00        | 225         | 24                | 24             | 22             | 2   | 62,5 | 125 | 12          | 8  | 7              | 11             | 7  | 31,7           | 1486,6         | 5,7            | 6,15  |
| 29 20 208               | 2      | 2000,00        | 300         | 24                | 24             | 22             | 2   | 62,5 | 125 | 16          | 8  | 7              | 11             | 7  | 31,7           | 1936,6         | 5,7            | 8,00  |
| 29 30 108               | 3      | 1000,00        | 100         | 29                | 29             | 26             | 2   | 62,5 | 125 | 8           | 9  | 10             | 15             | 9  | 35,0           | 930,0          | 7,7            | 5,70  |
| 29 30 158               | 3      | 1500,00        | 150         | 29                | 29             | 26             | 2   | 62,5 | 125 | 12          | 9  | 10             | 15             | 9  | 35,0           | 1430,0         | 7,7            | 8,90  |
| 29 30 208               | 3      | 2000,00        | 200         | 29                | 29             | 26             | 2   | 62,5 | 125 | 16          | 9  | 10             | 15             | 9  | 35,0           | 1930,0         | 7,7            | 11,20   |
| 29 40 108               | 4      | 1000,00        | 75          | 39                | 39             | 35             | 2   | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 33,3           | 933,4          | 11,7           | 10,10   |
| 29 40 158 <sup>1)</sup> | 4      | 1506,67        | 113         | 39                | 39             | 35             | 2   | 62,5 | 125 | 12          | 12 | 14             | 20             | 13 | 33,3           | 1433,4         | 11,7           | 16,00   |
| 29 40 208               | 4      | 2000,00        | 150         | 39                | 39             | 35             | 2   | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 33,3           | 1933,4         | 11,7           | 20,16   |
| 29 50 108               | 5      | 1000,00        | 60          | 49                | 39             | 34             | 2,5 | 62,5 | 125 | 8           | 12 | 14             | 20             | 13 | 37,5           | 925,0          | 11,7           | 13,00   |
| 29 50 208               | 5      | 2000,00        | 120         | 49                | 39             | 34             | 2,5 | 62,5 | 125 | 16          | 12 | 14             | 20             | 13 | 37,5           | 1925,0         | 11,7           | 24,52   |
| 29 60 108               | 6      | 1000,00        | 50          | 59                | 49             | 43             | 2,5 | 62,5 | 125 | 8           | 16 | 18             | 26             | 17 | 37,5           | 925,0          | 15,7           | 18,25   |
| 29 60 208               | 6      | 2000,00        | 100         | 59                | 49             | 43             | 2,5 | 62,5 | 125 | 16          | 16 | 18             | 26             | 17 | 37,5           | 1925,0         | 15,7           | 36,20   |

1) This racks could be used for continuous linking only with the left side (see sketch).

**Total pitch error**  $GT_f/1000 \leq 0,060 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,072 \text{ mm}$  ( $\Delta \pm 0,048 \text{ mm}/1000$ )  
 $GT_f/2000 \leq 0,078 \text{ mm}$  ( $\Delta \pm 0,039 \text{ mm}/1000$ ).

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard
- ground on all sides after hardening

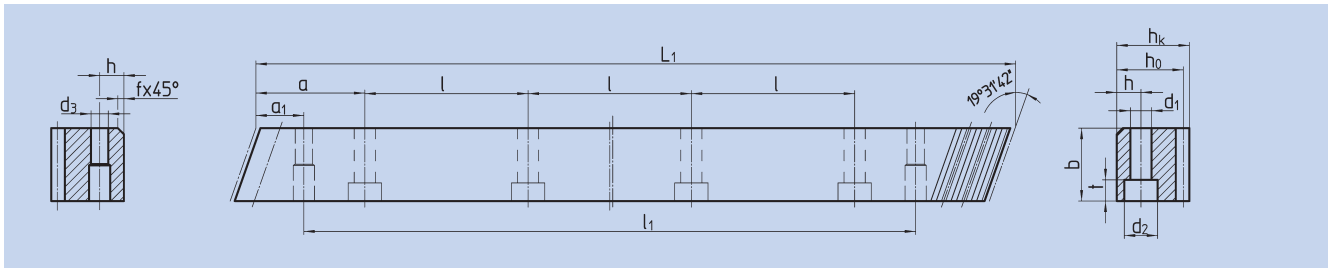
**Mounting racks, see Atlanta Servo Drive catalogue.**

**To achieve precision rack joints, we recommend our patented rack assembly kit, see Atlanta Servo Drive catalogue.**

**For lubrication of racks & pinions, we recommend our automatic lubrication systems, see Atlanta Servo Drive catalogue.**

**For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.**

**Screws for rack mounting, see Atlanta Servo Drive catalogue.**

**ATLANTA-Quality 8**


| Order code       | Module | L <sub>1</sub> | N° of teeth | b <sub>0,5</sub> | h <sub>k</sub> | h <sub>0</sub> | f | a                      | l   | N° of holes | h  | d <sub>1</sub> | d <sub>2</sub> | t | a <sub>1</sub> | l <sub>1</sub> | d <sub>3</sub> | kg    |       |
|------------------|--------|----------------|-------------|------------------|----------------|----------------|---|------------------------|-----|-------------|----|----------------|----------------|---|----------------|----------------|----------------|-------|-------|
| <b>38 21 100</b> | 2      | 1000,00        | 150         | 25               | 24             | 22             | 2 | 62,5                   | 125 | 8           | 8  | 7              | 11             | 7 | 31,7           | 936,6          | 5,7            | 4,30  |       |
| <b>38 20 100</b> | 2      | 1000,00        | 150         | 25               | 24             | 22             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 4,30  |
| <b>38 21 200</b> | 2      | 2000,00        | 300         | 25               | 24             | 22             | 2 | 62,5                   | 125 | 16          | 8  | 7              | 11             | 7 | 31,7           | 1936,6         | 5,7            | 8,60  |       |
| <b>38 20 200</b> | 2      | 2000,00        | 300         | 25               | 24             | 22             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 8,60  |
| <b>38 31 100</b> | 3      | 1000,00        | 100         | 30               | 29             | 26             | 2 | 62,5                   | 125 | 8           | 9  | 10             | 15             | 9 | 35,0           | 930,0          | 7,7            | 6,10  |       |
| <b>38 30 100</b> | 3      | 1000,00        | 100         | 30               | 29             | 26             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 6,10  |
| <b>38 31 200</b> | 3      | 2000,00        | 200         | 30               | 29             | 26             | 2 | 62,5                   | 125 | 16          | 9  | 10             | 15             | 9 | 35,0           | 1930,0         | 7,7            | 12,20 |       |
| <b>38 30 200</b> | 3      | 2000,00        | 200         | 30               | 29             | 26             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 12,20 |
| <b>38 41 100</b> | 4      | 1000,00        | 75          | 40               | 39             | 35             | 2 | 62,5                   | 125 | 8           | 12 | 10             | 15             | 9 | 33,3           | 933,4          | 7,7            | 10,90 |       |
| <b>38 40 100</b> | 4      | 1000,00        | 75          | 40               | 39             | 35             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 10,90 |
| <b>38 41 200</b> | 4      | 2000,00        | 150         | 40               | 39             | 35             | 2 | 62,5                   | 125 | 16          | 12 | 10             | 15             | 9 | 33,3           | 1933,4         | 7,7            | 21,80 |       |
| <b>38 40 200</b> | 4      | 2000,00        | 150         | 40               | 39             | 35             | 2 | without mounting holes |     |             |    |                |                |   |                |                |                |       | 21,80 |

**Total pitch error**     $GT_f/1000 \leq 0,100$  mm,  
 $GT_f/2000 \leq 0,200$  mm.

- Milled teeth, quenched and tempered
- heat-treatable steel according ATLANTA-Standard
- bright steel, backside machined

**Mounting racks, see Atlanta Servo Drive catalogue.**

**To achieve precision rack joints, we recommend our patented rack assembly kit, Atlanta Servo Drive catalogue.**

**For lubrication of racks & pinions, we recommend our automatic lubrication systems, see Atlanta Servo Drive catalogue.**

**For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.**

**Screws for rack mounting, see Atlanta Servo Drive catalogue.**





# Rack and pinion drive – calculation and selection – module 3 – helical tooth system

| Rack                              | HPR   |  | PR                                 |               | BR            |               |                                    |        |         |         |
|-----------------------------------|---|--|------------------------------------|---------------|---------------|---------------|------------------------------------|--------|---------|---------|
|                                   | 6   | 7  | 8                                  | 9             | 10            |               |                                    |        |         |         |
| ATLANTA-Quality                   | heat-treatable steel according ATLANTA-standard |  |                                    |               |               |               |                                    |        |         |         |
| Rack                              | material  | case hardened steel <sup>2)</sup>  | high performance hardening process |               |               |               | high performance hardening process |        |         |         |
|                                   | heat treatment                                  | 16MnCr5  | 16MnCr5                            | 16MnCr5       | 16MnCr5       | 16MnCr5       | 16MnCr5                            |        |         |         |
| Pinion                            | material  | case hardened  | case hardened                      | case hardened | case hardened | case hardened | case hardened                      |        |         |         |
|                                   | heat treatment                                  | 16MnCr5  | 16MnCr5                            | 16MnCr5       | 16MnCr5       | 16MnCr5       | 16MnCr5                            |        |         |         |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia.                               | maximum feed force (values are only valid for material according ATLANTA-standard) |                                    |               |               |               |                                    |        |         |         |
|                                   |   | 13,0 kN  | 9,5 kN                             | 8,0 kN        | 3,0 kN        | 2,5 kN        | 1,5 kN                             | 1,0 kN | 5,5 kN  | 5,0 kN  |
| 12                                | 38,20 mm  | 13,0 kN  | 9,5 kN                             | 8,0 kN        | 3,0 kN        | 2,5 kN        | 1,5 kN                             | 1,0 kN | 5,5 kN  | 5,0 kN  |
| 13                                | 41,38 mm  | 15,0 kN  | 11,0 kN                            | 9,0 kN        | 3,5 kN        | 3,0 kN        | 1,5 kN                             | 1,5 kN | 6,5 kN  | 6,0 kN  |
| 14                                | 44,56 mm  | 18,0 kN  | 13,0 kN                            | 11,0 kN       | 4,5 kN        | 3,5 kN        | 2,0 kN                             | 1,5 kN | 8,0 kN  | 7,5 kN  |
| 15                                | 47,75 mm  | 19,5 kN  | 14,5 kN                            | 12,0 kN       | 5,0 kN        | 4,0 kN        | 2,5 kN                             | 2,0 kN | 9,0 kN  | 8,0 kN  |
| 16                                | 50,93 mm  | 21,0 kN  | 15,5 kN                            | 13,0 kN       | 5,0 kN        | 4,5 kN        | 2,5 kN                             | 2,0 kN | 9,5 kN  | 8,5 kN  |
| 17                                | 54,11 mm  | 22,5 kN  | 16,5 kN                            | 14,0 kN       | 5,5 kN        | 4,5 kN        | 2,5 kN                             | 2,0 kN | 10,0 kN | 9,0 kN  |
| 18                                | 57,30 mm  | 24,0 kN  | 17,5 kN                            | 14,5 kN       | 6,0 kN        | 5,0 kN        | 3,0 kN                             | 2,0 kN | 11,0 kN | 10,0 kN |
| 19                                | 60,48 mm  | 25,5 kN  | 19,0 kN                            | 15,5 kN       | 6,0 kN        | 5,5 kN        | 3,0 kN                             | 2,5 kN | 11,5 kN | 10,5 kN |
| 20                                | 63,66 mm  | 27,0 kN  | 20,0 kN                            | 16,5 kN       | 6,5 kN        | 5,5 kN        | 3,0 kN                             | 2,5 kN | 12,0 kN | 11,0 kN |
| 21                                | 66,85 mm  | 28,5 kN  | 21,0 kN                            | 17,5 kN       | 7,0 kN        | 6,0 kN        | 3,5 kN                             | 2,5 kN | 13,0 kN | 11,5 kN |
| 22                                | 70,03 mm  | 29,5 kN  | 22,0 kN                            | 18,5 kN       | 7,5 kN        | 6,5 kN        | 3,5 kN                             | 2,5 kN | 13,5 kN | 12,0 kN |
| 23                                | 73,21 mm  | 29,5 kN  | 23,0 kN                            | 19,0 kN       | 7,5 kN        | 6,5 kN        | 4,0 kN                             | 3,0 kN | 14,0 kN | 13,0 kN |
| 24                                | 76,39 mm  | 29,5 kN  | 24,0 kN                            | 20,0 kN       | 8,0 kN        | 7,0 kN        | 4,0 kN                             | 3,0 kN | 15,0 kN | 13,0 kN |
| 25                                | 79,58 mm  | 30,0 kN  | 25,0 kN                            | 21,0 kN       | 8,5 kN        | 7,5 kN        | 4,0 kN                             | 3,0 kN | 15,5 kN | 13,0 kN |
| 26                                | 82,76 mm  | 30,0 kN  | 26,5 kN                            | 22,0 kN       | 8,5 kN        | 7,5 kN        | 4,5 kN                             | 3,5 kN | 16,0 kN | 13,0 kN |
| 27                                | 85,94 mm  | 30,0 kN  | 27,5 kN                            | 22,5 kN       | 9,0 kN        | 8,0 kN        | 4,5 kN                             | 3,5 kN | 17,0 kN | 13,5 kN |
| 28                                | 89,13 mm  | 30,5 kN  | 27,5 kN                            | 23,5 kN       | 9,5 kN        | 8,0 kN        | 4,5 kN                             | 3,5 kN | 17,0 kN | 13,5 kN |
| 29                                | 92,31 mm  | 30,5 kN  | 27,5 kN                            | 23,5 kN       | 10,0 kN       | 8,5 kN        | 5,0 kN                             | 4,0 kN | 17,0 kN | 13,5 kN |
| 30                                | 95,49 mm  | 30,5 kN  | 27,5 kN                            | 24,0 kN       | 10,0 kN       | 9,0 kN        | 5,0 kN                             | 4,0 kN | 17,5 kN | 13,5 kN |
| 31                                | 98,68 mm  | 30,5 kN  | 28,0 kN                            | 24,0 kN       | 10,5 kN       | 9,0 kN        | 5,5 kN                             | 4,0 kN | 17,5 kN | 13,5 kN |
| 32                                | 101,86 mm                                       | 30,5 kN  | 28,0 kN                            | 24,0 kN       | 11,0 kN       | 9,5 kN        | 5,5 kN                             | 4,0 kN | 17,5 kN | 13,5 kN |
| 33                                | 105,04 mm                                       | 31,0 kN  | 28,0 kN                            | 24,0 kN       | 11,5 kN       | 10,0 kN       | 5,5 kN                             | 4,5 kN | 17,5 kN | 13,5 kN |
| 34                                | 108,23 mm                                       | 31,0 kN  | 28,0 kN                            | 24,0 kN       | 11,5 kN       | 10,0 kN       | 6,0 kN                             | 4,5 kN | 17,5 kN | 13,5 kN |
| 35                                | 111,41 mm                                       | 31,0 kN  | 28,0 kN                            | 24,0 kN       | 12,0 kN       | 10,5 kN       | 6,0 kN                             | 4,5 kN | 17,5 kN | 13,5 kN |
| 36                                | 114,59 mm                                       | 31,0 kN  | 28,5 kN                            | 24,5 kN       | 12,5 kN       | 11,0 kN       | 6,0 kN                             | 5,0 kN | 17,5 kN | 13,5 kN |
| 37                                | 117,77 mm                                       | 31,0 kN  | 28,5 kN                            | 24,5 kN       | 13,0 kN       | 11,0 kN       | 6,5 kN                             | 5,0 kN | 17,5 kN | 13,5 kN |
| 38                                | 120,96 mm                                       | 31,0 kN  | 28,5 kN                            | 24,5 kN       | 13,0 kN       | 11,5 kN       | 6,5 kN                             | 5,0 kN | 17,5 kN | 13,5 kN |
| 39                                | 124,14 mm                                       | 31,0 kN  | 28,5 kN                            | 24,5 kN       | 13,5 kN       | 11,5 kN       | 7,0 kN                             | 5,0 kN | 17,5 kN | 13,5 kN |
| 40                                | 127,32 mm                                       | 31,0 kN  | 28,5 kN                            | 24,5 kN       | 14,0 kN       | 12,0 kN       | 7,0 kN                             | 5,5 kN | 17,5 kN | 13,5 kN |

1) check availability (chapter ZA)  
 2) according ATLANTA-standard

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 4 – helical tooth system

| Rack                              | HPR   |  |                                    | PR            |               |               | BR            |               |               |         |                                    |               |
|-----------------------------------|---|--|------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------|------------------------------------|---------------|
|                                   | 6   | 7  | 8                                  | 9             | 10            |               |               |               |               |         |                                    |               |
| ATLANTA-Quality                   | heat-treatable steel according ATLANTA-standard |  |                                    |               |               |               |               |               |               |         |                                    |               |
| Rack                              | material  | case hardening steel <sup>2)</sup>   | high performance hardening process |               |               |               |               |               | soft          |         | high performance hardening process |               |
|                                   | heat treatment                                  | 16MnCr5  | 16MnCr5                            | 16MnCr5       | 16MnCr5       | 16MnCr5       | 16MnCr5       | C45           | C45           | 16MnCr5 | C45                                |               |
| Pinion                            | material  | case hardened  | case hardened                      | case hardened | case hardened | case hardened | case hardened | ind. hardened | case hardened | soft    | case hardened                      | ind. hardened |
|                                   | heattreatment                                   | case hardened  | case hardened                      | case hardened | case hardened | case hardened | case hardened | ind. hardened | case hardened | soft    | case hardened                      | ind. hardened |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia.                               | maximum feed force (values are only valid for material according ATLANTA-standard) |                                    |               |               |               |               |               |               |         |                                    |               |
|                                   |   | 24,0 kN  | 18,0 kN                            | 17,5 kN       | 15,0 kN       | 6,0 kN        | 5,0 kN        | 3,0 kN        | 2,0 kN        | 11,0 kN | 9,5 kN                             |               |
| 12                                | 50,93 mm  | 28,0 kN  | 20,5 kN                            | 20,5 kN       | 17,5 kN       | 7,0 kN        | 5,5 kN        | 3,5 kN        | 2,5 kN        | 13,0 kN | 11,0 kN                            |               |
| 13                                | 55,17 mm  | 32,5 kN  | 24,0 kN                            | 24,0 kN       | 20,5 kN       | 8,0 kN        | 6,5 kN        | 4,0 kN        | 3,0 kN        | 15,0 kN | 12,5 kN                            |               |
| 14                                | 59,42 mm  | 37,0 kN  | 27,5 kN                            | 27,5 kN       | 23,5 kN       | 9,5 kN        | 7,5 kN        | 5,0 kN        | 3,5 kN        | 17,0 kN | 14,5 kN                            |               |
| 15                                | 63,66 mm  | 39,5 kN  | 29,5 kN                            | 29,5 kN       | 25,0 kN       | 10,0 kN       | 8,0 kN        | 5,0 kN        | 3,5 kN        | 18,5 kN | 15,5 kN                            |               |
| 16                                | 67,91 mm  | 42,0 kN  | 31,5 kN                            | 31,0 kN       | 26,5 kN       | 10,5 kN       | 8,5 kN        | 5,5 kN        | 4,0 kN        | 19,5 kN | 16,5 kN                            |               |
| 17                                | 72,15 mm  | 45,0 kN  | 33,5 kN                            | 33,0 kN       | 28,5 kN       | 11,5 kN       | 9,0 kN        | 5,5 kN        | 4,0 kN        | 21,0 kN | 17,5 kN                            |               |
| 18                                | 76,39 mm  | 47,5 kN  | 35,5 kN                            | 35,0 kN       | 30,0 kN       | 12,0 kN       | 10,0 kN       | 6,0 kN        | 4,5 kN        | 22,5 kN | 19,0 kN                            |               |
| 19                                | 80,64 mm  | 50,0 kN  | 37,0 kN                            | 37,0 kN       | 31,5 kN       | 13,0 kN       | 10,5 kN       | 6,5 kN        | 4,5 kN        | 23,5 kN | 20,0 kN                            |               |
| 20                                | 84,88 mm  | 53,0 kN  | 39,0 kN                            | 39,0 kN       | 33,5 kN       | 13,5 kN       | 11,0 kN       | 7,0 kN        | 5,0 kN        | 25,0 kN | 21,0 kN                            |               |
| 21                                | 89,13 mm  | 55,5 kN  | 41,0 kN                            | 41,0 kN       | 35,0 kN       | 14,0 kN       | 11,5 kN       | 7,0 kN        | 5,0 kN        | 26,0 kN | 22,0 kN                            |               |
| 22                                | 93,37 mm  | 56,5 kN  | 43,0 kN                            | 43,0 kN       | 37,0 kN       | 15,0 kN       | 12,0 kN       | 7,5 kN        | 5,5 kN        | 27,5 kN | 23,0 kN                            |               |
| 23                                | 97,62 mm  | 57,0 kN  | 45,0 kN                            | 45,0 kN       | 38,5 kN       | 15,5 kN       | 12,5 kN       | 8,0 kN        | 5,5 kN        | 28,5 kN | 23,5 kN                            |               |
| 24                                | 101,86 mm                                       | 57,5 kN  | 47,0 kN                            | 47,0 kN       | 40,0 kN       | 16,0 kN       | 13,0 kN       | 8,0 kN        | 6,0 kN        | 30,0 kN | 23,5 kN                            |               |
| 25                                | 106,10 mm                                       | 57,5 kN  | 49,0 kN                            | 49,0 kN       | 42,0 kN       | 17,0 kN       | 13,5 kN       | 8,5 kN        | 6,0 kN        | 30,5 kN | 24,0 kN                            |               |
| 26                                | 110,35 mm                                       | 58,0 kN  | 49,5 kN                            | 49,5 kN       | 42,0 kN       | 17,5 kN       | 14,5 kN       | 9,0 kN        | 6,5 kN        | 31,0 kN | 24,0 kN                            |               |
| 27                                | 114,59 mm                                       | 58,5 kN  | 49,5 kN                            | 49,5 kN       | 42,0 kN       | 18,5 kN       | 15,0 kN       | 9,5 kN        | 6,5 kN        | 31,0 kN | 24,0 kN                            |               |
| 28                                | 118,84 mm                                       | 58,5 kN  | 50,0 kN                            | 50,0 kN       | 42,5 kN       | 19,0 kN       | 15,5 kN       | 9,5 kN        | 7,0 kN        | 31,0 kN | 24,0 kN                            |               |
| 29                                | 123,08 mm                                       | 58,5 kN  | 50,0 kN                            | 50,0 kN       | 42,5 kN       | 19,5 kN       | 16,0 kN       | 10,0 kN       | 7,0 kN        | 31,0 kN | 24,0 kN                            |               |
| 30                                | 127,32 mm                                       | 59,0 kN  | 50,0 kN                            | 50,0 kN       | 42,5 kN       | 20,5 kN       | 16,5 kN       | 10,5 kN       | 7,5 kN        | 31,0 kN | 24,5 kN                            |               |
| 31                                | 131,57 mm                                       | 59,0 kN  | 50,5 kN                            | 50,5 kN       | 43,0 kN       | 21,0 kN       | 17,0 kN       | 11,0 kN       | 7,5 kN        | 31,5 kN | 24,5 kN                            |               |
| 32                                | 135,81 mm                                       | 59,0 kN  | 50,5 kN                            | 50,5 kN       | 43,0 kN       | 22,0 kN       | 17,5 kN       | 11,0 kN       | 8,0 kN        | 31,5 kN | 24,5 kN                            |               |
| 33                                | 140,06 mm                                       | 59,5 kN  | 50,5 kN                            | 50,5 kN       | 43,0 kN       | 22,5 kN       | 18,0 kN       | 11,5 kN       | 8,0 kN        | 31,5 kN | 24,5 kN                            |               |
| 34                                | 144,30 mm                                       | 59,5 kN  | 51,0 kN                            | 51,0 kN       | 43,5 kN       | 23,0 kN       | 19,0 kN       | 12,0 kN       | 8,5 kN        | 31,5 kN | 24,5 kN                            |               |
| 35                                | 148,54 mm                                       | 59,5 kN  | 51,0 kN                            | 51,0 kN       | 43,5 kN       | 24,0 kN       | 19,5 kN       | 12,0 kN       | 8,5 kN        | 31,5 kN | 24,5 kN                            |               |
| 36                                | 152,79 mm                                       | 59,5 kN  | 51,0 kN                            | 51,0 kN       | 43,5 kN       | 24,5 kN       | 20,0 kN       | 12,5 kN       | 9,0 kN        | 31,5 kN | 24,5 kN                            |               |
| 37                                | 157,03 mm                                       | 59,5 kN  | 51,5 kN                            | 51,5 kN       | 43,5 kN       | 25,5 kN       | 20,5 kN       | 13,0 kN       | 9,0 kN        | 32,0 kN | 24,5 kN                            |               |
| 38                                | 161,28 mm                                       | 59,5 kN  | 51,5 kN                            | 51,5 kN       | 43,5 kN       | 26,0 kN       | 21,0 kN       | 13,5 kN       | 9,5 kN        | 32,0 kN | 24,5 kN                            |               |
| 39                                | 165,52 mm                                       | 60,0 kN  | 51,5 kN                            | 51,5 kN       | 44,0 kN       | 27,0 kN       | 21,5 kN       | 13,5 kN       | 10,0 kN       | 32,0 kN | 24,5 kN                            |               |
| 40                                | 169,77 mm                                       | 60,0 kN  | 51,5 kN                            | 51,5 kN       | 44,0 kN       | 27,0 kN       | 21,5 kN       | 13,5 kN       | 10,0 kN       | 32,0 kN | 24,5 kN                            |               |

1) check availability (chapter ZA)  
 2) according ATLANTA-standard

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 5 – helical tooth system

| Rack                              | HPR               |  | PR            | BR                                 |               |         |         |         |
|-----------------------------------|-------------------|--|---------------|------------------------------------|---------------|---------|---------|---------|
| ATLANTA-Quality                   | 6                 | 7  | 8             | 9                                  | 10            |         |         |         |
| Rack                              | material          | heat-treatable steel according ATLANTA-standard                                    |               |                                    |               |         |         |         |
|                                   | heat treatment    | high performance hardening process   |               | high performance hardening process |               |         |         |         |
| Pinion                            | material          | 16MnCr5  | 16MnCr5       | 16MnCr5                            | C45           |         |         |         |
|                                   | heat treatment    | case hardened  | case hardened | case hardened                      | ind. hardened |         |         |         |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia. | maximum feed force (values are only valid for material according ATLANTA-standard) |               |                                    |               |         |         |         |
|                                   |                   | 28,0 kN  | 28,0 kN       | 23,5 kN                            | 5,0 kN        | 3,5 kN  | 17,5 kN | 15,0 kN |
| 12                                | 63,66 mm          | 28,0 kN  | 28,0 kN       | 23,5 kN                            | 5,0 kN        | 3,5 kN  | 17,5 kN | 15,0 kN |
| 13                                | 68,97 mm          | 32,5 kN  | 32,5 kN       | 27,5 kN                            | 5,5 kN        | 4,0 kN  | 20,5 kN | 17,5 kN |
| 14                                | 74,27 mm          | 37,5 kN  | 37,5 kN       | 32,0 kN                            | 6,5 kN        | 4,5 kN  | 23,5 kN | 20,0 kN |
| 15                                | 79,58 mm          | 43,0 kN  | 43,0 kN       | 36,5 kN                            | 7,5 kN        | 5,5 kN  | 27,0 kN | 23,0 kN |
| 16                                | 84,88 mm          | 46,0 kN  | 46,0 kN       | 39,0 kN                            | 8,0 kN        | 5,5 kN  | 29,0 kN | 24,5 kN |
| 17                                | 90,19 mm          | 49,5 kN  | 49,5 kN       | 42,0 kN                            | 8,5 kN        | 6,0 kN  | 31,0 kN | 26,0 kN |
| 18                                | 95,49 mm          | 52,5 kN  | 52,5 kN       | 44,5 kN                            | 9,0 kN        | 6,5 kN  | 33,0 kN | 28,0 kN |
| 19                                | 100,80 mm         | 55,5 kN  | 55,5 kN       | 47,0 kN                            | 9,5 kN        | 7,0 kN  | 35,0 kN | 29,5 kN |
| 20                                | 106,10 mm         | 58,5 kN  | 58,5 kN       | 49,5 kN                            | 10,5 kN       | 7,5 kN  | 37,0 kN | 31,0 kN |
| 21                                | 111,41 mm         | 61,5 kN  | 61,5 kN       | 52,5 kN                            | 11,0 kN       | 7,5 kN  | 39,0 kN | 33,0 kN |
| 22                                | 116,71 mm         | 65,0 kN  | 65,0 kN       | 55,0 kN                            | 11,5 kN       | 8,0 kN  | 41,0 kN | 34,5 kN |
| 23                                | 122,02 mm         | 68,0 kN  | 68,0 kN       | 57,5 kN                            | 12,0 kN       | 8,5 kN  | 43,0 kN | 36,5 kN |
| 24                                | 127,32 mm         | 71,0 kN  | 71,0 kN       | 60,5 kN                            | 12,5 kN       | 9,0 kN  | 45,0 kN | 37,0 kN |
| 25                                | 132,63 mm         | 74,5 kN  | 74,5 kN       | 63,0 kN                            | 13,0 kN       | 9,5 kN  | 47,0 kN | 37,0 kN |
| 26                                | 137,93 mm         | 75,0 kN  | 75,0 kN       | 63,5 kN                            | 13,5 kN       | 10,0 kN | 48,0 kN | 37,5 kN |
| 27                                | 143,24 mm         | 75,5 kN  | 75,5 kN       | 64,0 kN                            | 14,0 kN       | 10,0 kN | 48,0 kN | 37,5 kN |
| 28                                | 148,54 mm         | 75,5 kN  | 75,5 kN       | 64,0 kN                            | 15,0 kN       | 10,5 kN | 48,5 kN | 38,0 kN |
| 29                                | 153,85 mm         | 76,0 kN  | 76,0 kN       | 64,5 kN                            | 15,5 kN       | 11,0 kN | 48,5 kN | 38,0 kN |
| 30                                | 159,16 mm         | 76,0 kN  | 76,0 kN       | 64,5 kN                            | 16,0 kN       | 11,5 kN | 49,0 kN | 38,0 kN |

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 6 – helical tooth system

| Rack                              | HPR               |  |               | PR            |               |         | BR            |                                    |               |               |
|-----------------------------------|-------------------|--|---------------|---------------|---------------|---------|---------------|------------------------------------|---------------|---------------|
|                                   | 6                 | 7  | 8             | 9             | 10            |         |               |                                    |               |               |
| ATLANTA-Quality                   |                   |  |               |               |               |         |               |                                    |               |               |
| Rack                              | material          | heat-treatable steel according ATLANTA-standard                                    |               |               |               |         |               |                                    |               |               |
|                                   | heat treatment    | high performance hardening process   |               |               | soft          |         |               | high performance hardening process |               |               |
| Pinion                            | material          | 16MnCr5  | 16MnCr5       | 16MnCr5       | 16MnCr5       | C45     | 16MnCr5       | C45                                | 16MnCr5       | C45           |
|                                   | heat treatment    | case hardened  | case hardened | case hardened | case hardened | soft    | case hardened | soft                               | case hardened | ind. hardened |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia. | maximum feed force (values are only valid for material according ATLANTA-standard) |               |               |               |         |               |                                    |               |               |
|                                   |                   | 40,5 kN  | 40,5 kN       | 33,5 kN       | 7,0 kN        | 5,0 kN  | 25,5 kN       | 21,5 kN                            | 25,5 kN       | 25,0 kN       |
| 12                                | 76,39 mm          | 47,0 kN  | 47,0 kN       | 39,0 kN       | 8,0 kN        | 6,0 kN  | 29,5 kN       | 29,5 kN                            | 29,0 kN       |               |
| 13                                | 82,76 mm          | 54,5 kN  | 54,5 kN       | 45,5 kN       | 9,5 kN        | 7,0 kN  | 34,5 kN       | 34,5 kN                            | 29,0 kN       |               |
| 14                                | 89,13 mm          | 62,5 kN  | 62,5 kN       | 52,0 kN       | 11,0 kN       | 8,0 kN  | 39,0 kN       | 39,0 kN                            | 33,0 kN       |               |
| 15                                | 95,49 mm          | 67,0 kN  | 67,0 kN       | 55,5 kN       | 11,5 kN       | 8,5 kN  | 42,0 kN       | 42,0 kN                            | 35,5 kN       |               |
| 16                                | 101,86 mm         | 71,5 kN  | 71,5 kN       | 59,5 kN       | 12,5 kN       | 9,0 kN  | 45,0 kN       | 45,0 kN                            | 38,0 kN       |               |
| 17                                | 108,23 mm         | 76,0 kN  | 76,0 kN       | 63,0 kN       | 13,5 kN       | 9,5 kN  | 47,5 kN       | 47,5 kN                            | 40,5 kN       |               |
| 18                                | 114,59 mm         | 80,5 kN  | 80,5 kN       | 67,0 kN       | 14,0 kN       | 10,0 kN | 50,5 kN       | 50,5 kN                            | 43,0 kN       |               |
| 19                                | 120,96 mm         | 85,0 kN  | 85,0 kN       | 70,5 kN       | 15,0 kN       | 10,5 kN | 53,5 kN       | 53,5 kN                            | 45,0 kN       |               |
| 20                                | 127,32 mm         | 89,5 kN  | 89,5 kN       | 74,5 kN       | 15,5 kN       | 11,5 kN | 56,5 kN       | 56,5 kN                            | 47,5 kN       |               |
| 21                                | 133,69 mm         | 94,0 kN  | 94,0 kN       | 78,0 kN       | 16,5 kN       | 12,0 kN | 59,0 kN       | 59,0 kN                            | 50,0 kN       |               |
| 22                                | 140,06 mm         | 98,5 kN  | 98,5 kN       | 82,0 kN       | 17,5 kN       | 12,5 kN | 62,0 kN       | 62,0 kN                            | 52,5 kN       |               |
| 23                                | 146,42 mm         | 103,0 kN   | 103,0 kN      | 85,5 kN       | 18,0 kN       | 13,0 kN | 65,0 kN       | 65,0 kN                            | 53,0 kN       |               |
| 24                                | 152,79 mm         | 107,0 kN   | 107,0 kN      | 89,0 kN       | 19,0 kN       | 13,5 kN | 66,5 kN       | 66,5 kN                            | 53,5 kN       |               |
| 25                                | 159,16 mm         | 107,5 kN   | 107,5 kN      | 89,5 kN       | 20,0 kN       | 14,0 kN | 67,0 kN       | 67,0 kN                            | 54,0 kN       |               |
| 26                                | 165,52 mm         | 108,0 kN   | 108,0 kN      | 90,0 kN       | 21,5 kN       | 15,5 kN | 67,0 kN       | 67,0 kN                            | 54,0 kN       |               |
| 27                                | 171,89 mm         | 108,5 kN   | 108,5 kN      | 90,5 kN       | 22,0 kN       | 16,0 kN | 67,5 kN       | 67,5 kN                            | 54,5 kN       |               |
| 28                                | 178,25 mm         | 109,0 kN   | 109,0 kN      | 90,5 kN       | 23,0 kN       | 16,5 kN | 67,5 kN       | 67,5 kN                            | 54,5 kN       |               |
| 29                                | 184,62 mm         |  |               |               |               |         |               |                                    |               |               |
| 30                                | 190,99 mm         |  |               |               |               |         |               |                                    |               |               |

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue





# Rack and pinion drive – calculation and selection – module 8 – helical tooth system

| Rack                              | HPR   |  |               | BR            |               |          |                                    |
|-----------------------------------|---|--|---------------|---------------|---------------|----------|------------------------------------|
|                                   | 6   | 7  | 9             | 10            | 10            | 10       |                                    |
| ATLANTA-Quality                   | heat-treatable steel according ATLANTA-standard |  |               |               |               |          |                                    |
| Rack                              | material  | high performance hardening process   |               |               | soft          |          | high performance hardening process |
|                                   | heat treatment                                  | 16MnCr5  | 16MnCr5       | 16MnCr5       | C45           | C45      | C45                                |
| Pinion                            | material  | case hardened  |               |               | case hardened | soft     | ind. hardened                      |
|                                   | heat treatment                                  | case hardened  | case hardened | case hardened | soft          | soft     | ind. hardened                      |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia.                               | maximum feed force (values are only valid for material according ATLANTA-standard) |               |               |               |          |                                    |
|                                   |   | 101,86 mm  | 72,5 kN       | 72,5 kN       | 12,5 kN       | 9,0 kN   | 45,5 kN                            |
| 12                                | 110,35 mm                                       | 84,5 kN  | 84,5 kN       | 15,0 kN       | 10,5 kN       | 53,0 kN  | 44,5 kN                            |
| 13                                | 118,84 mm                                       | 97,5 kN  | 97,5 kN       | 17,0 kN       | 12,5 kN       | 61,5 kN  | 52,0 kN                            |
| 14                                | 127,32 mm                                       | 111,5 kN   | 111,5 kN      | 19,5 kN       | 14,0 kN       | 70,0 kN  | 59,5 kN                            |
| 15                                | 135,81 mm                                       | 119,5 kN   | 119,5 kN      | 21,0 kN       | 15,0 kN       | 75,0 kN  | 63,5 kN                            |
| 16                                | 144,30 mm                                       | 127,5 kN   | 127,5 kN      | 22,5 kN       | 16,0 kN       | 80,0 kN  | 67,5 kN                            |
| 17                                | 152,79 mm                                       | 135,5 kN   | 135,5 kN      | 24,0 kN       | 17,0 kN       | 85,0 kN  | 72,0 kN                            |
| 18                                | 161,28 mm                                       | 143,5 kN   | 143,5 kN      | 25,5 kN       | 18,0 kN       | 90,0 kN  | 76,5 kN                            |
| 19                                | 169,77 mm                                       | 151,5 kN   | 151,5 kN      | 27,0 kN       | 19,5 kN       | 95,5 kN  | 80,5 kN                            |
| 20                                | 178,25 mm                                       | 160,0 kN   | 160,0 kN      | 28,5 kN       | 20,5 kN       | 100,5 kN | 85,0 kN                            |
| 21                                | 186,74 mm                                       | 168,0 kN   | 168,0 kN      | 29,5 kN       | 21,5 kN       | 105,5 kN | 89,0 kN                            |
| 22                                | 195,23 mm                                       | 176,0 kN   | 176,0 kN      | 31,0 kN       | 22,5 kN       | 110,5 kN | 92,5 kN                            |
| 23                                | 203,72 mm                                       | 184,0 kN   | 184,0 kN      | 32,5 kN       | 23,5 kN       | 115,5 kN | 93,0 kN                            |
| 24                                | 212,21 mm                                       | 187,0 kN   | 187,0 kN      | 34,0 kN       | 24,5 kN       | 116,5 kN | 93,5 kN                            |
| 25                                | 220,70 mm                                       | 188,0 kN   | 188,0 kN      | 35,5 kN       | 25,5 kN       | 117,0 kN | 94,0 kN                            |
| 26                                | 229,18 mm                                       | 189,0 kN   | 188,5 kN      | 37,0 kN       | 26,5 kN       | 117,5 kN | 94,5 kN                            |
| 27                                | 237,67 mm                                       | 189,5 kN   | 189,5 kN      | 38,5 kN       | 27,5 kN       | 117,5 kN | 95,0 kN                            |
| 28                                | 246,16 mm                                       | 190,5 kN   | 190,5 kN      | 40,0 kN       | 28,5 kN       | 118,0 kN | 95,0 kN                            |
| 29                                | 254,65 mm                                       | 191,0 kN   | 191,0 kN      | 41,5 kN       | 29,5 kN       | 118,5 kN | 95,5 kN                            |
| 30                                |   |  |               |               |               |          |                                    |

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 10 – helical tooth system

| Rack                              | HPR   |  |               | BR                                 |          |               |
|-----------------------------------|---|--|---------------|------------------------------------|----------|---------------|
|                                   | 6   | 7  | 9             | 10                                 | 10       | 10            |
| ATLANTA-Quality                   | heat-treatable steel according ATLANTA-standard |  |               |                                    |          |               |
| Rack                              | material  | high performance hardening process   | soft          | high performance hardening process |          |               |
| Pinion                            | heat treatment                                  | 16MnCr5  | 16MnCr5       | 16MnCr5                            | C45      | C45           |
|                                   | heat treatment                                  | case hardened  | case hardened | case hardened                      | soft     | ind. hardened |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia.                               | maximum feed force (values are only valid for material according ATLANTA-standard) |               |                                    |          |               |
| 12                                | 127,32 mm                                       | 114,0 kN   | 20,0 kN       | 14,5 kN                            | 71,5 kN  | 60,5 kN       |
| 13                                | 137,93 mm                                       | 132,5 kN   | 23,5 kN       | 16,5 kN                            | 83,0 kN  | 70,0 kN       |
| 14                                | 148,54 mm                                       | 153,5 kN   | 27,0 kN       | 19,5 kN                            | 96,0 kN  | 81,5 kN       |
| 15                                | 159,16 mm                                       | 175,0 kN   | 31,0 kN       | 22,0 kN                            | 109,5 kN | 93,0 kN       |
| 16                                | 169,77 mm                                       | 187,5 kN   | 33,0 kN       | 24,0 kN                            | 117,5 kN | 99,5 kN       |
| 17                                | 180,38 mm                                       | 200,0 kN   | 35,5 kN       | 25,5 kN                            | 125,5 kN | 106,0 kN      |
| 18                                | 190,99 mm                                       | 212,5 kN   | 37,5 kN       | 27,0 kN                            | 133,5 kN | 113,0 kN      |
| 19                                | 201,60 mm                                       | 225,5 kN   | 40,0 kN       | 28,5 kN                            | 141,5 kN | 119,5 kN      |
| 20                                | 212,21 mm                                       | 238,0 kN   | 42,0 kN       | 30,5 kN                            | 149,5 kN | 126,0 kN      |
| 21                                | 222,82 mm                                       | 250,5 kN   | 44,5 kN       | 32,0 kN                            | 157,0 kN | 133,0 kN      |
| 22                                | 233,43 mm                                       | 263,0 kN   | 46,5 kN       | 33,5 kN                            | 165,0 kN | 140,0 kN      |
| 23                                | 244,04 mm                                       | 276,0 kN   | 49,0 kN       | 35,0 kN                            | 173,0 kN | 142,0 kN      |
| 24                                | 254,65 mm                                       | 285,5 kN   | 51,0 kN       | 37,0 kN                            | 178,0 kN | 143,0 kN      |
| 25                                | 265,26 mm                                       | 287,0 kN   | 53,5 kN       | 38,5 kN                            | 178,5 kN | 143,5 kN      |

<sup>1)</sup> check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



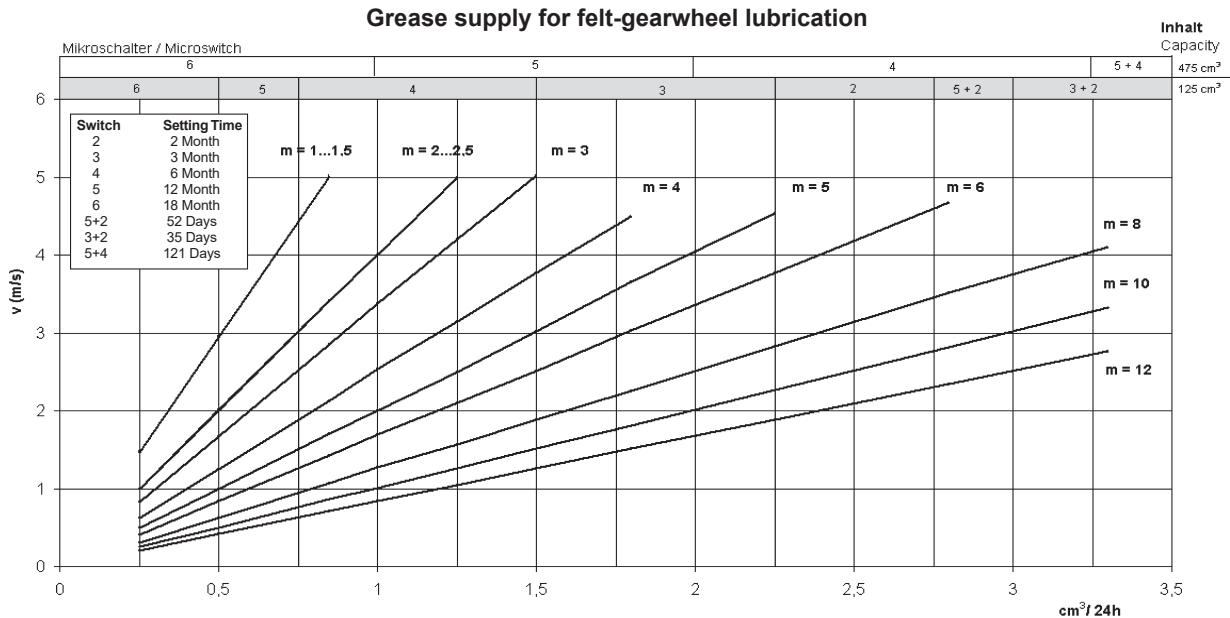
| Rack                              |                   | HPR   | BR                          |
|-----------------------------------|-------------------|---|-----------------------------|
| ATLANTA-Quality                   |                   | 6   | 10                          |
| Rack                              | material          | heat-treatable steel according ATLANTA-standard                                       |                             |
|                                   | heat treatment    | high performance hardening process  |                             |
| Pinion                            | material          | 16MnCr5   | C45                         |
|                                   | heat treatment    | case hardened   | case hardened ind. hardened |
| No. of pinion teeth <sup>1)</sup> | pitch circle dia. | maximum feed force<br>(values are only valid for material according ATLANTA-standard) |                             |
|                                   |                   |   |                             |
| 12                                | 152,79 mm         | 163,0 kN  | 101,0 kN                    |
| 13                                | 165,52 mm         | 189,5 kN  | 117,5 kN                    |
| 14                                | 178,25 mm         | 219,0 kN  | 136,0 kN                    |
| 15                                | 190,99 mm         | 249,5 kN  | 155,0 kN                    |
| 16                                | 203,72 mm         | 267,0 kN  | 166,0 kN                    |
| 17                                | 216,45 mm         | 285,5 kN  | 177,0 kN                    |
| 18                                | 229,18 mm         | 303,0 kN  | 188,5 kN                    |
| 19                                | 241,92 mm         | 321,0 kN  | 199,5 kN                    |
| 20                                | 254,65 mm         | 339,0 kN  | 210,5 kN                    |
| 21                                | 267,38 mm         | 357,0 kN  | 222,0 kN                    |
| 22                                | 280,11 mm         | 375,0 kN  | 233,0 kN                    |
| 23                                | 292,85 mm         | 393,5 kN  | 244,5 kN                    |
| 24                                | 305,58 mm         | 407,5 kN  | 251,0 kN                    |
| 25                                | 318,31 mm         | 409,0 kN  | 252,5 kN                    |

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue

## Lubrication of rack and pinion drives

When lubricating rack and pinion drives by means of a felt gearwheel and electronically controlled lubricator the optimal grease supply can be seen from the diagram below. For lubrication with sliding brush use the next higher switch position. If, for example, micro-switch position 4 is chosen for felt-gearwheel lubrication, choose 3 for sliding-brush lubrication at the same speed and with the same module.



## Pressure build-up

Set all micro-switches to „ON“. Pressure build-up time 6–8 hours. Then set the desired time. The micro-switch 7 must be always on. Before starting up the lubricator the connecting hose between felt wheel and lubricator should be filled and the felt wheel soaked with grease.

## Battery exchange

The guaranteed service life of the battery is 1 year. Then the battery should be replaced. Although the control lamp may still flash it is possible that the battery capacity has already decreased. The lubricator can also be operated by means of external power supply via an intermediate relay.

## Recommended lubricants for rack drives:

Felt-gear lubrication: Klüber Microlube GB 0  
**Order code 65 90 002 (1 kg)**  
 Klüber Structovis AHD  
**Order code 65 90 003 (1 kg)**

Sliding brush lubrication: Klüber Microlube GB 0  
**Order code 65 90 002 (1 kg)**

## Furthermore the following lubricants have been tested with good results.

Oest Langzeitfett LT 200  
 BP Energ grease LS EP 00  
 DEA Glissando 6833 EP 00  
 Fuchs Lubritech Gearmaster ZSA  
 Molykote G-Rapid plus 3694





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