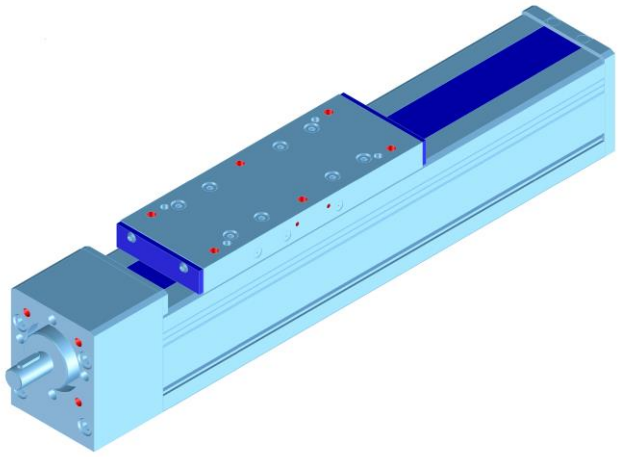

# Original Assembly and Maintenance Manual

## Linear Unit

HSB-beta®

## Types

Beta 60-SGV-SSS
Beta 70-C-SRS-SSS
Beta 80-SRS-SSS
Beta 80-SGV
Beta 100-D-SSS
Beta 110-SRS-SSS
Beta 110-C-SGV
Beta 120-C-SSS
Beta 140-SRS-SSS
Beta 140-C-SSS
Beta 165-SSS
Beta 165-SGV
Beta 165-C-SGV
Beta 180-SSS
Beta 180-C-SSS

Types
Beta 40-SGS-SSS
Beta 50-C-SRS
See page 39

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# Contents

# About this manual

**Applicability**

This manual applies to the following linear units with spindle drive:

- Beta 60-SGV-SSS
- Beta 70-C-SRS-SSS
- Beta 80-SRS-SSS
- Beta 80-SGV
- Beta 100-D-SSS
- Beta 110-SRS-SSS
- Beta 110-C-SGV
- Beta 120-C-SSS
- Beta 140-SRS-SSS
- Beta 140-C-SSS
- Beta 165 - SSS
- Beta 165-SGV
- Beta 180 - SSS
- Beta 180-C-SSS

The drawings show the Beta 60-SSS type and serve as examples for all other types, though some of the details may differ.

# 1 Safety

The Assembly and Maintenance Manual is a component element of the product package, and must always be kept to hand as a reference source.
The Manual must be passed on if the unit is sold on or given away.

If there is anything in this manual which you do not fully understand, please be sure to contact the manufacturers.

## 1.1 Symbols used

This manual employs the following symbols to indicate hazards as well as other types of symbol:

| | |
|---|---|
| DANGER  | Indicates immediate danger.<br>Failure to observe this notice entails risk of death or very serious injury. |
| WARNING  | Indicates moderate risk.<br>Failure to observe this notice may result in death or serious injury. |
| CAUTION  | Indicates a danger carrying a medium to high risk.<br>Failure to observe this notice may result in light to moderate injury or damage to property. |

☛ Note
Indicates tips on use of the machine and optimising its efficiency.

## 1.2 Regulation use

The mechanical linear unit is intended for installation in machines, and is used solely for manipulating, positioning, transporting, palletising , loading, unloading, clamping, clocking, tensioning, testing, measuring, handling and pushing workpieces or tools.

Pay attention to the basic applications of the linear unit set out in sections 4 and 3.

In order to comply with the EU Directive governing Electromagnetic Compatibility (EMC), the mechanical linear unit may only be used in industrial environments.

Any other use, or use for purposes beyond those stipulated, will be classed as illegitimate. The manufacturers accept no liability for any loss thereby incurred. The risk is borne solely by the operators.

## 1.3 General safety

**Preconditions for operation**

The linear unit must not be put into operation until the machine or line into which it is installed conforms to the following:

- Relevant accident prevention regulations
- Generally accepted safety standards
- EU directives
- Standards governing the electromagnetic compatibility of machinery
- Other applicable standards
- Applicable national legislation.

**Safe operation**

To ensure safe operation, refer to the following documents:

- This operating manual for the linear unit, particularly the technical data
- The operating manual for the line into which it is installed

## 1.4 Use in clean rooms (ISO 14644)

Linear units that are used in clean rooms are fitted with vent holes on the basic profile.

The following specifications must be adhered to:

- The linear unit must be connected to a suitable extractor.
- The linear unit must be lubricated with grease approved for clean room use (initial lubrication with Klüberplex BE11-462).

## 1.5 Use in explosive environments

If the linear units are used in potentially explosive environments, operators must take steps to prevent explosions in accordance with ATEX Directives 94/9/EC and 1999/92/EC and ensure explosion-proofing is installed.

The following ATEX rules must be observed:

- Operators must check the linear unit at least once a week, and ideally every day. The checks should cover: smooth running, functionality of all seals, and adequate lubrication.
- After being in continuous service for approximately 5000 hours, the functionality of the linear unit must be checked by a qualified expert assigned by the manufacturer.
- The operator/manufacturer of the end-product must ensure that the linear unit is integrated into the potential equalisation system of the

overall plant at the ports provided for the purpose. Where the unit is used in a dust-explosion hazard zone, the compressed air supply must additionally be connected to the linear unit.

- The limit switches must be supplied via an isolating amplifier. For the EX isolation an intrinsically safe input circuit is required. The isolating amplifier is not supplied by HSB.
- When selecting and installing the drive motor, the requirements of EN 60079-14 must be met.
- The linear unit may only be used under the operating conditions approved by the manufacturer. This includes:
  - Ambient temperature
  - Ambient conditions
  - Speed < 1 m/s;
    Speeds > 1 m/s only in combination with monitored central lubrication; operation in areas with potentially explosive dust possible with additional monitored compressed air loading
  - Maximum acceleration
  - Duty cycle
  - Load etc.

## 1.6 Technical condition of the linear unit

**State of the art**

The unit conforms to the current state of the art and applicable rules and regulations. The unit conforms to the EU Machinery Directive, harmonised European standards or corresponding national standards:

- Machinery Directive 2006/42/EC
- DIN EN ISO 12 100:2011-03 Safety of Machinery, General Design Guidelines, Risk Assessment and Reduction
- DIN EN ISO 13850:2008-09: Safety of machinery; emergency-stop devices
- DIN EN 60 204-1:2006: Electrical equipment for industrial machines
- 2004/108/EC: EMC Directive
- EMVG: German law relating to the electromagnetic compatibility of equipment dated 26.02.2008 (Federal Gazette I p. 220)

## 1.7 Modifications to the linear unit

**Modifications**

The linear unit must not be modified, either in its basic design or in its safety components, without our written consent. Any such unauthorised modification will void our liability in respect of the unit.

The operating company may only carry out the maintenance and repair

work detailed in this operating manual. Any other measures, such as to replace wearing parts and components, may be carried out only in consultation with our service engineers, by the service engineers themselves, or by us directly.

Installed safety devices must never be dismantled or disabled.

When fitting special attachments to the unit, follow the fitting instructions provided by the manufacturers!

## 1.8 Requirements for personnel

The linear unit has been designed and built in accordance with the state of the art and accepted safety standards. Hazards may nevertheless be posed when operating it. Consequently, the unit may only be installed and operated by trained, competent personnel.

All personnel assigned to install, operate, maintain, repair or dismantle a linear unit must have read and understood this operating manual, and in particular section 1, “Safety”.

Work on parts carrying live electrical current may be carried out only by trained electricians. Such work includes:

- Installing safety limit switches
- Mounting a drive unit
- Checking the direction of rotation of the drive

## 1.9 Obligations of the operating company

**Instruction of personnel**

In accordance with EU Health and Safety Directive 89/655/EEC articles 6(1) and 7 and with the Framework Directive 89/391/EEC articles 1(1) and 6(1), the company operating the linear unit must provide personnel assigned to install, operate, maintain, repair or dismantle the unit with appropriate instruction, in particular with regard to safety.
We recommend that companies require their personnel to provide written confirmation of having received such instruction.

**Checking the unit**

In accordance with EU Health and Safety Directive 89/655/EEC article 4a, the operating company must subject to the unit to thorough checking prior to putting it into operation, after carrying out repairs, and after malfunctions have occurred.

**Legibility and maintenance of affixed notices and labels**

The operating company must ensure that all notices and labels attached to the unit are fully legible (in particular details of the serial number) and must ensure compliance with all instructions contained on them. Damaged or illegible notices and labels must be replaced.

# 2 Warranty

The warranty conditions are laid down in the terms and conditions of delivery and payment issued at time of order. Warranty cover will be voided if:

- the unit is not operated in accordance with the stipulated regulation use;
- the instructions set out in this operating manual are not followed;
- the unit is modified without the consent of the manufacturers;
- screws sealed by locking varnish are unlocked.

The manufacturer’s warranty in respect of maintenance and repair work applies only if original replacement parts are used.

# 3 Technical data – Standard model

| **Technical data - Linear unit**<br>**Beta type with spindle drive** | **Sizes** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Beta 60** | | | | **Beta 70-C** | | | | |
| | **SSS** | | **SGV** | | **SRS** | | **SSS** | | |
| Drive element | BSD[2)] | TSC[3)] | BSD | TSD | BSD[2)] | TSD[3)] | BSD | TSD | |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | |
| Spindle diameter [mm] | 20 | | | | 16 | | | | |
| Spindle pitch [mm] | 5<br>10<br>20<br>50 | 4<br>8<br>16 | 5<br>10<br>20<br>50 | 4<br>8<br>16 | 5<br>10<br>20 | 4<br>8 | 5<br>10<br>20 | 4<br>8 | |
| Moment of inertia [kgm²/m] | $8.50 \times 10^{-5}$ | | | | $3.25 \times 10^{-5}$ | | | | |
| Max. velocity[1)] [m/s] | 2,50 | | | | 1,00 | | | | |
| Max. acceleration [m/s²] | 20 | | | | 20 | | | | |
| No-load torque [Nm] | 0,70 | | | | 0,35 | | 0,40 | | |
| Maximum travel (standard) [mm] | 5120 | | | | 2730 | | | | |
| Repeat accuracy [mm] | ±0,03 | - | ±0,03 | - | ±0,03 | - | ±0,03 | - | |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | | | 0 ... 80 | | | | |
| Geometrical moment of inertia $I_Y$ [mm⁴] | 473055 | | | | 585283 | | 563059 | | |
| Geometrical moment of inertia $I_Z$ [mm⁴] | 577258 | | | | 854713 | | 852507 | | |
| Length of standard carriage [mm] | 180 | | 180 | | 190 | | | | |
| Length of long carriage [mm] | 230 | | - | | 240 | | | | |
| Weight (without travel) [kg] | 4,30 | | 3,65 | | 3,65 | | 3,50 | | |
| Weight (per 100 mm travel) [kg] | 0,80 | | 0,65 | | 0,45 | | 0,60 | | |
| Weight of standard carriage [kg] | 1,50 | | 1,15 | | 1,60 | | 1,25 | | |
| Weight of long carriage [kg] | 1,80 | | - | | 2,02 | | 1,60 | | |
| Noise emission max. [dB A] [4)] | 85 | | | | 80 | | 80 | | |

[1)] *Dependent on spindle pitch at max. speed*
[2)] *Ball Screw Drive*
[3)] *Trapezoidal Screw Drive*
[4)] *The figure will vary based on assembly with other system components*

| **Technical data - Linear unit Beta type with spindle drive** | **Sizes** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Beta 80** | | | | | | **Beta 100-D** | | |
| | **SRS** | | **SSS** | | **SGV** | | **SSS** | | |
| Drive element | BSD[2] | TSD[3] | BSD | TSD | BSD | TSD | BSD | TSD | |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | |
| Spindle diameter [mm] | 20 | | | | 25 | 24 | 20 | | |
| Spindle pitch [mm] | 5<br>10<br>20<br>50 | 4<br>8<br>16 | 5<br>10<br>20<br>50 | 4<br>8<br>16 | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>20<br>50 | 4<br>8 | |
| Moment of inertia [kgm²/m] | $8.50 \times 10^{-5}$ | | | | $2.25 \times 10^{-4}$ | | $8.50 \times 10^{-5}$ | | |
| Max. velocity[1] [m/s] | 2,50 | | | | | | 2,50 | | |
| Max. acceleration [m/s²] | 20 | | | | | | 20 | | |
| No-load torque [Nm] | 0,60 | | 0,80 | | 1,00 | | 1,30 | | |
| Maximum travel (standard) [mm] | 5020 | | | | | | 5060 | | |
| Repeat accuracy [mm] | ±0,03 | | ±0,03 | | ±0,03 | | ±0,03 | | |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | 0 ... 80 | | 0 ... 80 | | 0 ... 80 | | |
| Geometrical moment of inertia $I_Y$ [mm⁴] | 1294343 | | 1372019 | | | | 917779 | | |
| Geometrical moment of inertia $I_Z$ [mm⁴] | 1732340 | | 1677956 | | | | 2328911 | | |
| Length of standard carriage [mm] | 210 | | | | | | 210 | | |
| Length of long carriage [mm] | 270 | | | | - | | 270 | | |
| Weight (without travel) [kg] | 5,40 | | 6,20 | | 12,50 | | 6,20 | | |
| Weight (per 100 mm travel) [kg] | 0,70 | | 1,10 | | 1,40 | | 0,75 | | |
| Weight of standard carriage [kg] | 2,20 | | | | 5,80 | | 3,40 | | |
| Weight of long carriage [kg] | 2,80 | | 2,40 | | - | | 4,00 | | |
| Noise emission max. [dB A] [4] | 80 | | 80 | | 80 | | 80 | | |

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*

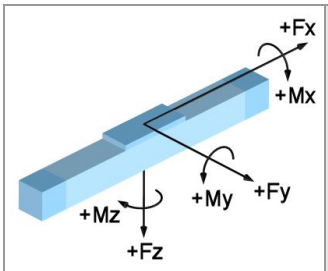
| **Technical data - Linear unit Beta type with spindle drive** | **Sizes** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Beta 110** | | | | **Beta 110-C** | | **Beta 120-C** | |
| | **SRS** | | **SGV** | | **SGV** | | **SSS** | |
| Drive element | BSD[2] | TSD[3] | BSD | TSD | BSD | TSD | BSD | TSD |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 |
| Spindle diameter [mm] | 25 | 24 | 25 | 24 | 40 | | 32 | |
| Spindle pitch [mm] | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>20<br>40 | 7 | 5<br>10<br>20<br>40 | 6 |
| Moment of inertia [kgm²/m] | $2{,}25 \times 10^{-4}$ | | | | $1{,}65 \times 10^{-3}$ | | $6{,}45 \times 10^{-4}$ | |
| Max. velocity[1] [m/s] | 2,50 | | | | 2,00 | | 2,00 | |
| Max. acceleration [m/s²] | 20 | | | | 20 | | 20 | |
| No-load torque [Nm] | 1,00 | | 1,50 | | 1,50 | | 2,00 | |
| Maximum travel (standard) [mm] | 4920 | | | | 4920 | | 5120 | |
| Repeat accuracy [mm] | ±0,03 | - | ±0,03 | - | ±0,03 | - | ±0,03 | - |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | | | 0 ... 80 | | 0 ... 80 | |
| Geometrical moment of inertia $I_Y$ [mm⁴] | 5114812 | | 4974348 | | 4974348 | | 7217779 | |
| Geometrical moment of inertia $I_Z$ [mm⁴] | 6177042 | | 5898662 | | 5898662 | | 8754150 | |
| Length of standard carriage [mm] | 320 | | | | 320 | | 320 | |
| Length of long carriage [mm] | 500 | | | | - | | 500 | |
| Weight (without travel) [kg] | 12,50 | | 13,50 | | 15,40 | | 22,00 | |
| Weight (per 100 mm travel) [kg] | 1,40 | | 1,70 | | 2,25 | | 2,70 | |
| Weight of standard carriage [kg] | 5,80 | | 5,30 | | 6,00 | | 8,00 | |
| Weight of long carriage [kg] | 9,10 | | 8,30 | | - | | 12,00 | |
| Noise emission max. [dB A] [4] | 80 | | 80 | | 80 | | 80 | |

| Technical data - Linear unit<br>Beta type with spindle drive | Sizes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Beta 140 | | | | Beta 165 | | | | |
| | SRS | | SSS | | SSS | | SGV | | |
| Drive element | BSD[2] | TSD[3] | BSD | TSD | BSD | TSD | BSD | TSD | |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 | |
| Spindle diameter [mm] | 25 | 24 | 25 | 24 | 40 | | | | |
| Spindle pitch [mm] | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>20<br>40 | 7 | 5<br>10<br>20<br>40 | 7 | |
| Moment of inertia [kgm²/m] | $2.25 \times 10^{-4}$ | | | | $1.65 \times 10^{-3}$ | | | | |
| Max. velocity[1] [m/s] | 2,50 | | | | 2,00 | | | | |
| Max. acceleration [m/s²] | 20 | | | | 20 | | | | |
| No-load torque [Nm] | 1,00 | | 1,50 | | 3,00 | | | | |
| Maximum travel (standard) [mm] | 4920 | | | | 4910 | | | | |
| Repeat accuracy [mm] | ±0,03 | - | ±0,03 | - | ±0,03 | | ±0,03 | | |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | | | 0 ... 80 | | | | |
| Geometrical moment of inertia $I_Y$ [mm⁴] | 3159202 | | | | 25391136 | | | | |
| Geometrical moment of inertia $I_Z$ [mm⁴] | 9975915 | | | | 31673479 | | | | |
| Length of standard carriage [mm] | 320 | | | | 400 | | | | |
| Length of long carriage [mm] | 500 | | | | 600 | | | | |
| Weight (without travel) [kg] | 14,00 | | 15,00 | | 37,90 | | 35,00 | | |
| Weight (per 100 mm travel) [kg] | 1,40 | | 1,90 | | 4,20 | | 3,80 | | |
| Weight of standard carriage [kg] | 6,20 | | 7,00 | | 11,50 | | 10,50 | | |
| Weight of long carriage [kg] | 9,70 | | 10,90 | | 17,25 | | 16,25 | | |
| Noise emission max. [dB A] [4] | 80 | | 80 | | 80 | | 80 | | |

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*

| **Technical data - Linear unit Beta type with spindle drive** | **Sizes** | | | | | |
|---|---|---|---|---|---|---|
| | **Beta 140-C** | | **Beta 180-C** | | **Beta 180** | |
| | **SSS** | | **SSS** | | **SSS** | |
| Drive element | BSD[2] | TSD[3] | BSD | TSD | BSD | TSD |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 |
| Spindle diameter [mm] | 25 | 24 | 32 | | 32 | |
| Spindle pitch [mm] | 5<br>10<br>25<br>50 | 5<br>10 | 5<br>10<br>20<br>40 | 6 | 5<br>10<br>20<br>40 | 6 |
| Moment of inertia [kgm²/m] | 2,25 x $10^{-4}$ | | 6,45 x $10^{-4}$ | | 6,45 x $10^{-4}$ | |
| Max. velocity[1] [m/s] | 2,50 | | 2,00 | | 2,00 | |
| Max. acceleration [m/s$^2$] | 20 | | 20 | | 20 | |
| No-load torque [Nm] | 1,50 | | 2,50 | | 2,50 | |
| Maximum travel (standard) [mm] | 4920 | | 4930 | | 4930 | |
| Repeat accuracy [mm] | ±0,03 | - | ±0,03 | - | ±0,03 | - |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | 0 ... 80 | | 0 ... 80 | |
| Geometrical moment of inertia $I_Y$ [mm$^4$] | 3127894 | | 9236448 | | 9236448 | |
| Geometrical moment of inertia $I_Z$ [mm$^4$] | 9071334 | | 23586987 | | 23586987 | |
| Length of standard carriage [mm] | 320 | | 380 | | 380 | |
| Length of long carriage [mm] | 500 | | 600 | | 600 | |
| Weight (without travel) [kg] | 15,00 | | 37,00 | | 33,50 | |
| Weight (per 100 mm travel) [kg] | 1,90 | | 3,00 | | 2,80 | |
| Weight of standard carriage [kg] | 7,00 | | 14,30 | | 10,80 | |
| Weight of long carriage [kg] | 10,90 | | 15,40 | | 15,50 | |
| Noise emission max. [dB A] [4] | 80 | | 80 | | 80 | |

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*




**Forces and moments - Beta linear unit with spindle drive**

| Type designation | Dynamic forces [Nm] | | | | Dynamic moments [Nm] | | | |
|---|---|---|---|---|---|---|---|---|
| | $F_X$ | $F_Y$ | $F_Z$ | $-F_Z$ | $M_X$ | $M_Y$ | $M_Z$ | $M_{no\text{-}load}$ |
| Beta 60-SSS | 4000 | 600 | 1800 | 1200 | 60 | 180 | 120 | 0,7 |
| Beta 60-SGV | 4000 | - | - | - | - | - | - | 0,7 |
| Beta 70-C-SRS | 2000 | 300 | 1000 | 400 | 35 | 120 | 60 | 0,3 |
| Beta 70-C-SSS | 2000 | 600 | 1800 | 1200 | 60 | 180 | 120 | 0,4 |
| Beta 80-SRS | 4000 | 500 | 1500 | 800 | 50 | 180 | 100 | 0,6 |
| Beta 80-SSS | 4000 | 800 | 3000 | 2000 | 100 | 250 | 250 | 0,8 |
| Beta 80-SGV | 6000 | - | - | - | - | - | - | 1,5 |
| Beta 100-D-SSS | 4000 | 1800 | 4000 | 3000 | 350 | 750 | 750 | 1,5 |
| Beta 110-C-SGV | 16000 | - | - | - | - | - | - | 1,5 |
| Beta 110-SRS | 6000 | 3000 | 5000 | 2500 | 400 | 800 | 600 | 1,5 |
| Beta 110-SSS | 6000 | 2000 | 8000 | 4000 | 300 | 600 | 450 | 1 |
| Beta 120-C-SSS | 12000 | 4000 | 12000 | 6000 | 600 | 1500 | 1000 | 2,0 |
| Beta 140-SRS | 6000 | 2500 | 5000 | 3000 | 350 | 700 | 700 | 1,5 |
| Beta 140-SSS | 6000 | 2500 | 6000 | 4000 | 500 | 1000 | 1000 | 1,8 |
| Beta 140-C-SSS | 6000 | 3200 | 7500 | 5000 | 600 | 1200 | 1200 | 1,8 |
| Beta 165-SGV | 18000 | - | - | - | - | - | - | 3 |
| Beta 165-C-SGV | 25000 | - | - | - | - | - | - | 3,2 |
| Beta 165-SSS | 18000 | 5000 | 15000 | 8000 | 700 | 1400 | 1100 | 3 |
| Beta 180-SSS | 12000 | 6000 | 12000 | 6000 | 1500 | 3000 | 1500 | 2,5 |
| Beta 180-C-SSS | 6000 | 6000 | 15000 | 8000 | 1800 | 3600 | 1800 | 2,5 |

*Figures in ( ) relate to the long carriage.*
*$M_{no\text{-}load}$ = No-load torque ±30%*
*The forces and moments quoted are maximum values for the single load. In the event of combined loading or simultaneous occurrence of multiple moments or forces, the individual values must be reduced. In case of doubt consult Technical Support.*

## Dynamic load ratings of ball screw drives - Beta linear unit

| Model and size | Nominal Ø in [mm] | Pitch in [mm] | $C_{dyn}$ [N] |
|---|---|---|---|
| Beta 70<br>Beta 70-C | 16 | 5 | 9300 |
| | | 10 | 14300 |
| | | 20 | 7450 |
| Beta 60<br>Beta 80<br>Beta 100-D | 20 | 5 | 10500 |
| | | 10 | 13500 |
| | | 20 | 11500 |
| | | 50 | 12300 |
| Beta 110<br>Beta 140<br>Beta 140-C | 25 | 5 | 12300 |
| | | 10 | 13200 |
| | | 25 | 15800 |
| | | 50 | 14500 |
| Beta 120-C<br>Beta 180<br>Beta 180-C | 32 | 5 | 21500 |
| | | 10 | 33100 |
| | | 20 | 29700 |
| | | 40 | 14900 |
| Beta 165<br>Beta 110-C-SGV | 40 | 5 | 23800 |
| | | 10 | 38000 |
| | | 20 | 33300 |
| | | 40 | 35000 |
| Beta 165-C-SGV | 50 | 10 | 68700 |
| | | 20 | 60000 |

*Dynamic load rating of ball screw nut to DIN 69051, 1989*

## Dynamic load ratings of rail guides - Beta linear unit

| Model | Size | Number of rails | Number of carriages | Load rating per carriage $C_{dyn}$ [N] THK / Rex* | Preten-sion $F_V$ THK / Rex* | $M_t$ [Nm] THK / Rex* | Guide spacing in direction x (lx1) [mm] | Guide spacing in direction y (ly) [mm] |
|---|---|---|---|---|---|---|---|---|
| Beta 60 | 15 | 1 | 2 | 11271 / 7800 | 5% / 8% | 60 / 74 | 106 (156) | |
| Beta 70 | 15 | 1 | 2 | 11271 / 7800 | 5% / 8% | 60 / 74 | 124 (174) | - |
| Beta 80 | 20 | 1 | 2 | 17700 / 18800 | 5% / 8% | 210 / 240 | 128 (188) | - |
| Beta 100 | 20 | 1 | 2 | 17700 / 18800 | 5% / 8% | 210 | 152 (272) | - |
| Beta 100-D-SSS | 15 | 2 | 4 | 11271 / 7800 | 5% / 8% | - | 150 (210) | 56 |
| Beta 110 | 25 | 1 | 2 | 25160 / 22800 | 5% / 8% | 340 | 203 (383) | - |
| Beta 120-C | 30 | 1 | 2 | 35558 / 31700 | 5% / 8% | 580 | 184 (364) | - |
| Beta 140 | 15 | 2 | 4 | 11667 / 7800 | 5% / 8% | - | 180 (330) | 72 |
| Beta 140-C-SSS | 20 | 2 | 4 | 17700 / 18800 | 5% / 8% | - | 210 (360) | 76 |
| Beta 165-SSS | 35 | 1 | 2 | 49448 / 41900 | 5% / 8% | 985 / 890 | 219 (329) | - |
| Beta 180-SSS | 20 | 2 | 4 | 17700 / 18800 | 5% / 8% | - | 247 (467) | 84 |
| Beta 180-C-SSS | 25 | 2 | 4 | 25160 / 22800 | 5% / 8% | - | 233 (453) | 84 |

*Figures in ( ) relate to the long carriage*
*The load rating and pre-tension figures relate to the standard linear guidance system with recirculating linear ball bearings*
** Rex = Rexroth*

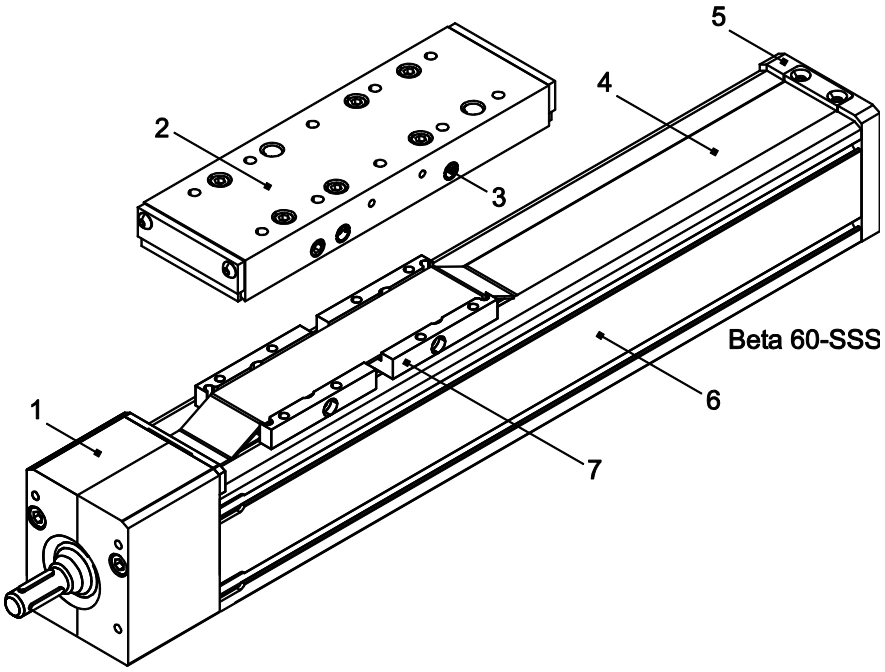
| Tightening torques [Nm] for fixing screws | | | | | | |
|---|---|---|---|---|---|---|
| **Fixing screws** | **M4** | **M5** | **M6** | **M8** | **M10** | The figures given are intended as guides. For shorter insertion depths, the figures must be adjusted accordingly. |
| DIN912/ISO4762-8.8 | 2,7 | 5,4 | 9,0 | 22,0 | 43,0 | |
| DIN912/ISO4762-10.9 | 3,0 | 5,7 | 9,0 | 22,0 | 43,0 | |
| DIN912/ISO4762-12.9 | 3,0 | 5,7 | 9,0 | 22,0 | 3438,0 | |

| Tightening torques [Nm] for clutch with clamping hub | | | | | |
|---|---|---|---|---|---|
| **Size** | **14** | **19** | **24** | **28** | **38** |
| Clutch diameter [mm] | 30 | 40 | 55 | 65 | 80 |
| Screw size | M3 | M6 | M6 | M8 | M8 |
| Tightening torque [Nm] | 1,34 | 10,50 | 10,50 | 25,00 | 25,00 |

| Tightening torques [Nm] for clutch with clamping ring hub | | | | | |
|---|---|---|---|---|---|
| **Size** | **14** | **19** | **24** | **28** | **38** |
| Clutch diameter [mm] | 30 | 40 | 55 | 65 | 80 |
| Screw size | M3 | M4 | M5 | M5 | M6 |
| Tightening torque [Nm] | 1,34 | 2,90 | 6,00 | 6,00 | 10,00 |

# 4 Product description

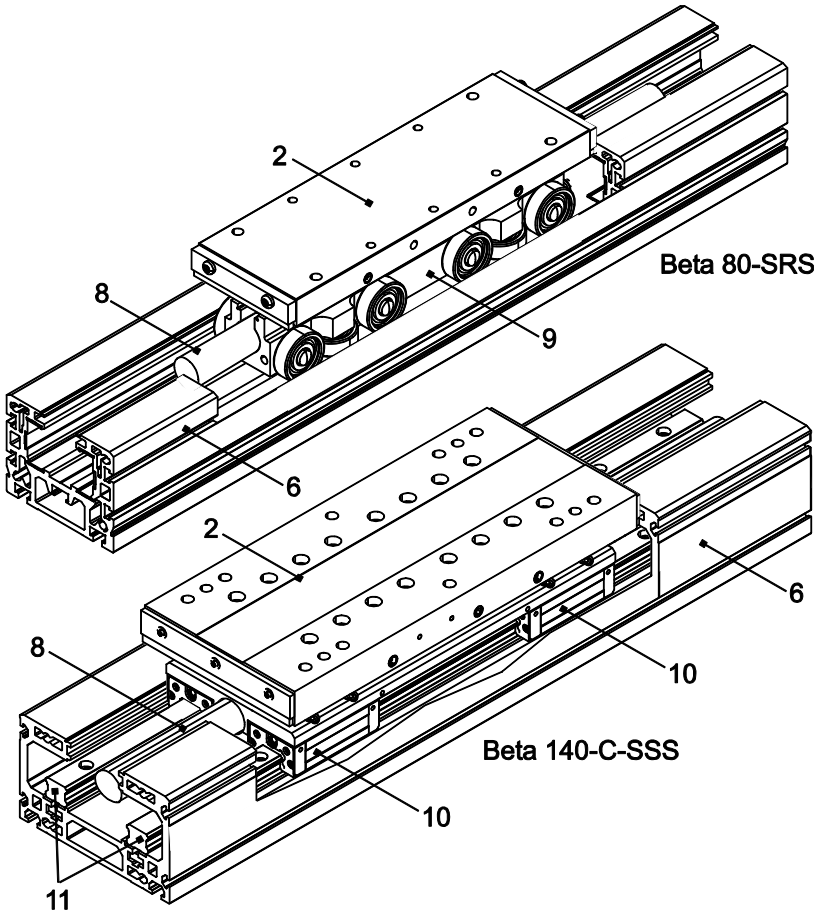
**Linear unit with spindle drive**




| | | | | |
|---|---|---|---|---|
| Key | 1 | Fixed bearing | 5 | Movable bearing |
| | 2 | Carriage | 6 | Base profile |
| | 3 | Lubricating nipple | 7 | Driver |
| | 4 | Cover band | | |

*Figure 1: Component assemblies of the Beta 60 linear unit with spindle drive*

**Roller bearing and linear guidance system**




| Key | | | | |
|---|---|---|---|---|
| | 2 | Carriage | 9 | Roller bearing guidance system |
| | 6 | Base profile | 10 | Recirculating ball bearing |
| | 8 | Thread drive | 11 | Guide rails |

*Figure 2: Guide elements*

A mechanical linear unit converts rotational motion into linear motion and is used to move loads quickly, safely and precisely from one position to another. It consists of an aluminium base profile, a moving carriage supported by a guide element (recirculating ball bearing or roller bearing guidance system) and a drive element (screw or timing belt drive).

Depending on its design, the carriage is able to absorb forces and moments in all directions, and is positively connected to the guidance and drive elements by way of the so-called drivers.

The base profile is self-supporting up to a certain length, and is equipped with grooves for mounting.

As an option, the linear unit can be equipped with accessories such as a cover, screw supports, inductive or mechanical limit switches and other fittings (see section **6.3**).

The effective range can be flexibly configured. Multiple linear units of the Alpha, Beta or Delta type can be arranged two-dimensionally (2 axes) or three-dimensionally (3 axes).
Driven linear units can be connected to non-driven units of the same type by a plate, to be able to take large-area loads for example.

# 5 Transportation and storage

The mechanical linear unit is a precision item. Its mechanism may be damaged by heavy jolting, resulting in impairment of its functions.


Risk of damage by heavy jolting or bending!
Transport the assembled linear unit only with the transit protection fitted.

To prevent damage during transportation and storage, protect the linear unit against shaking and sliding as follows:

- Stow it in a box of sufficient size.
- Use packing.

Section 3 lists the unit weights.

Protect the unit against:

- dirt;
- corrosion;
- water;
- and aggressive atmospheres.

# 6 Installation and adjustment

The linear unit can be attached by the following methods:

- On mounting rails
- By screws inserted into the sliding blocks
- By screws inserted into the factory-fitted tapped hole rails

☛ Install the linear unit on a flat surface. Unit parallelism < 0.2 mm/1,000 mm.

☛ Mounting by the rails with tapped holes in them is the preferable solution:
for highly dynamic applications;
where the linear unit has only two attachment points.

## 6.1 Installing the linear unit by mounting rails

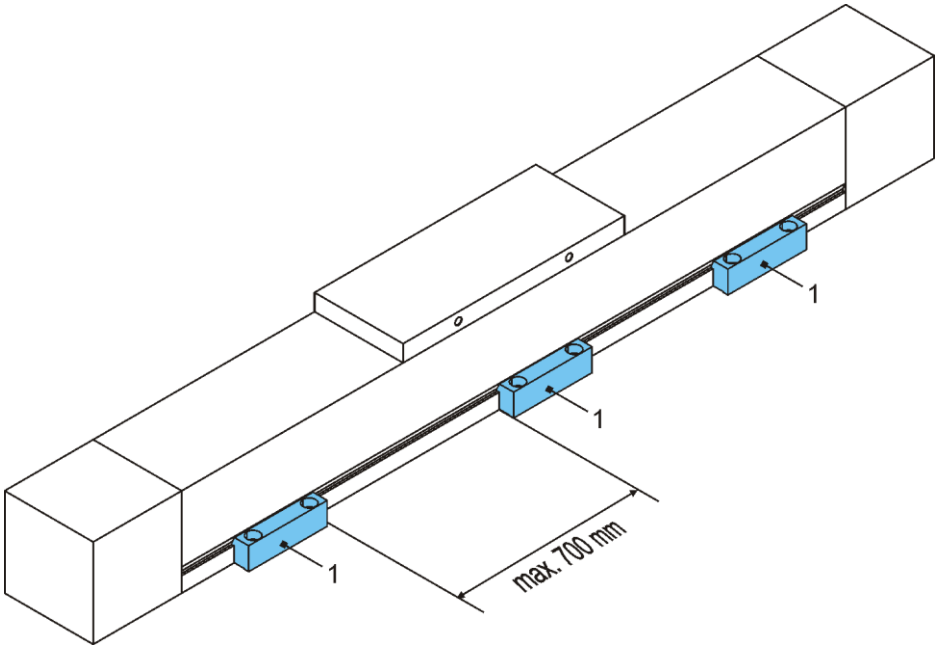



*Figure 3: Mounting rails (1)*

☛ The recommended maximum spacing between the mounting rails is 700 mm.

**Procedure**

1. Attach the mounting rails (1) loosely in position (figure 2).
2. Align the linear unit axially.
3. Tighten the mounting rails (1)
(for tightening torques see section 3).

## 6.2 Screwing the linear unit into place from below

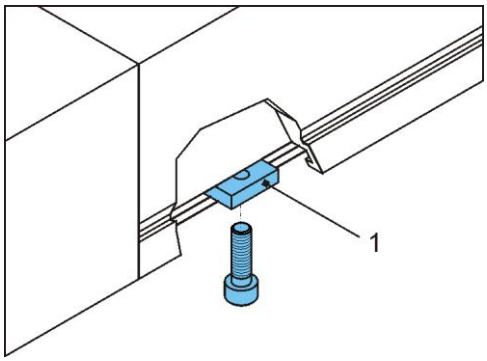



*Figure 4: Sliding blocks (1) in the groove on the underside of the base profile*

Attach the linear unit by the fixing screws from below using the sliding blocks or the tapped hole rails in the aluminium base profile (figure 3).

**Procedure**

1. Align the linear unit.
2. Align the sliding blocks (1)/tapped hole rails.
3. Tighten the linear unit
   (for tightening torques see section 3).

## 6.3 Setting maximum travel

DANGER

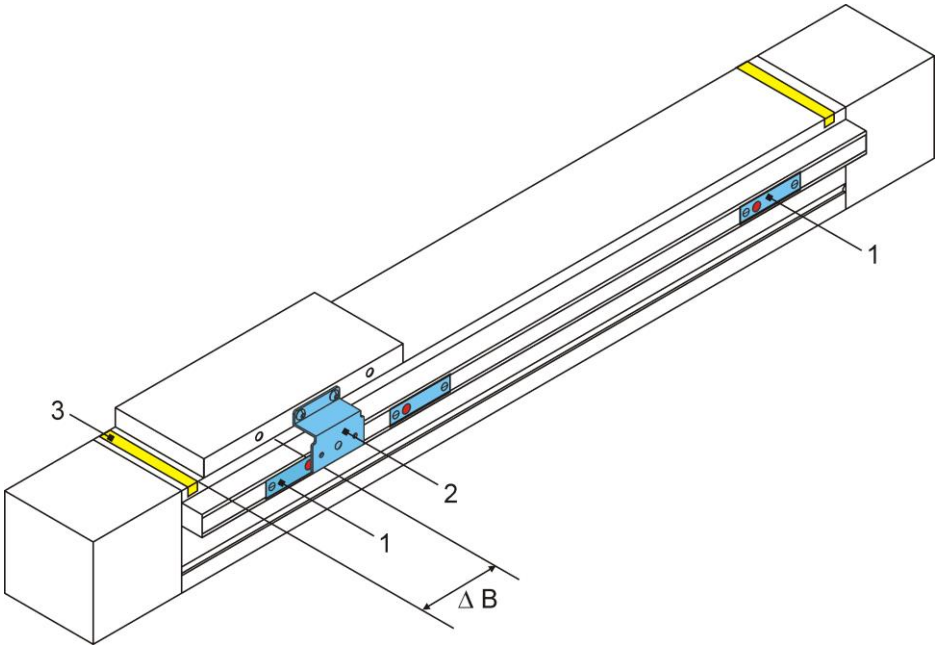
Serious injury may result if the transport carriers topple over.
If the carriage moves to its full extent beyond the safety zone, the transport carrier mounted on it may break away or topple over. The linear unit may be destroyed
During setup, observe the specified safety zone and set the limit switches accordingly.
Electrical switches may only be connected by qualified electricians.

☛ To stop the carriage promptly in the event of an emergency stop, allow for adequate braking distance.

### 6.3.1 Setting the positions of the inductive limit switches

The function of inductive proximity switches is to shut down the electric drive before the mechanical end position is reached.

The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the proximity switch and the actual mechanical end position.




| Key | | |
|---|---|---|
| | 1 | Inductive limit switch |
| | 2 | Switching cam |
| | 3 | Band marking saf ty zone |

*Figure 5: Inductive limit switches*

CAUTION

The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

**Procedure**

1. Connect the power to the limit switches.
2. Slacken the limit switch fixing screws.
3. Run the carriage as far as the braking position.
4. Move the limit switch (NC contact) under the switching cam until it trips and the LED on the sensor goes out.
5. Move the carriage away.
6. Tighten the limit switch.
7. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
8. Fit the limit switch array covering.

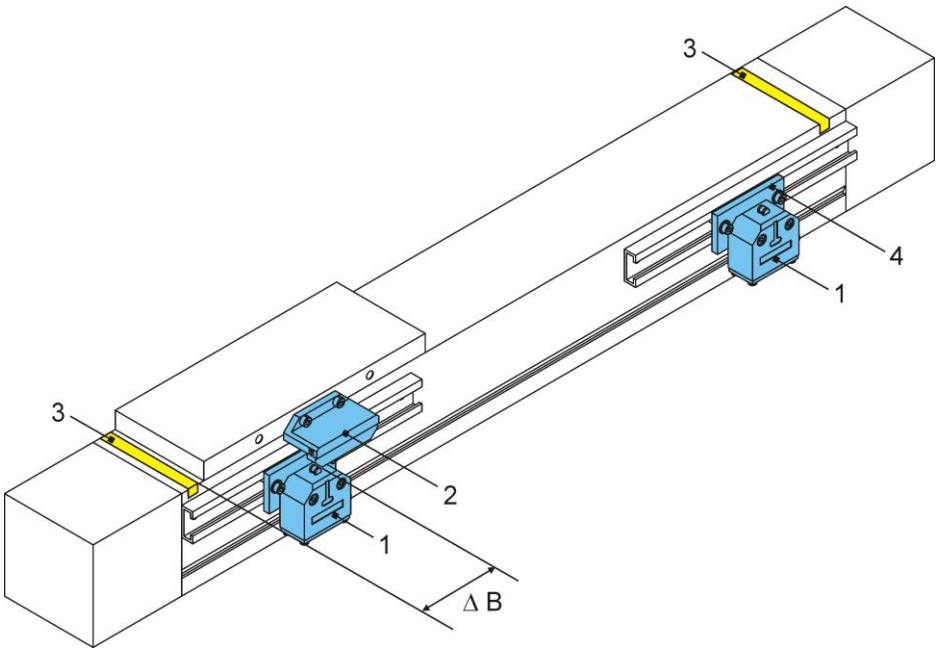
### 6.3.2 Setting the positions of the mechanical limit switches

Mechanical safety limit switches (NC contacts) must be used if a hazard is posed to personnel as soon as the electric drive fails to shut down.

The drive may only be started up when all limit switches are connected and correctly set!

A combination with inductive proximity switches is possible.

External shock-absorbers must be fitted to protect against mechanical destruction.
The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the limit switch and the actual mechanical end position (figure 5).




| Key | | |
|---|---|---|
| | 1 | Mechanical limit switches |
| | 2 | Switching cam |
| | 3 | Band arking safety zone |
| | 4 | Bracket |
| | B | Braking distance |

*Figure 6: Mechanical limit switches*

CAUTION

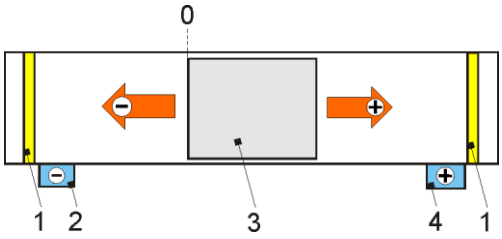
The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

**Procedure**

1. Connect the power to the limit switches.
2. Slacken the bracket fixing screw (figure 5).
3. Run the carriage as far as the safety zone.
4. Move the limit switch until it trips.
5. Tighten the bracket fixing screw.
6. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
   If the braking distance is too short, repeat the set-up.

## 6.4 Mounting a drive unit

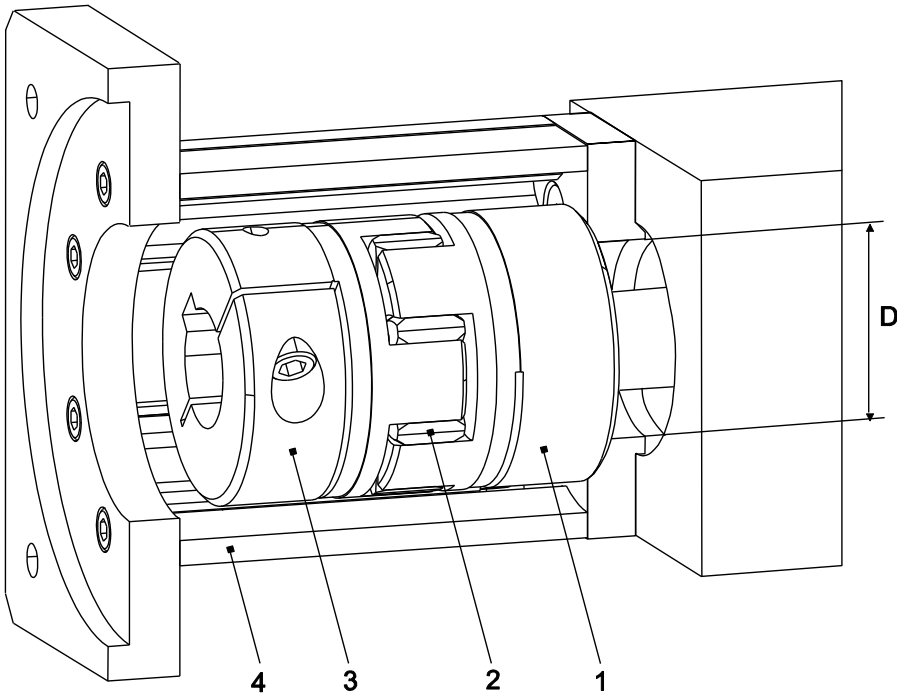
Make sure the direction of rotation of the external drive unit takes into account the direction of the spindle or timing belt so that the limit switches work correctly.




| Key | | | | |
|---|---|---|---|---|
| | 1 | Safety zone | 3 | Carriage with positive and negative directions from reference point 0 |
| | 2 | Negative limit switch | 4 | Positive limit switch |

*Figure 7: Example of travel direction and limit switch configuration*

### 6.4.1 Mounting a motor




| Key | | | | |
|---|---|---|---|---|
| | 1 | Clutch half 1 | 4 | Motor housing |
| | 2 | Clutch ring | D | Diameter on motor housing |
| | 3 | Clutch half 2 | | |

*Figure 8 Motor housing with motor clutch on drive pin*

**Procedure**

1. Place the motor and the clutch components in mounting position adjacent to the linear unit.
2. Check the direction of rotation of the motor. It must take into account the safety limit switches (figure 6). Alter the direction of the motor as necessary.
3. If the clutch diameter is less than the measure D on the motor housing (4), first mount clutch half 1 (1) (hole flush with drive shaft) and then the motor housing (4)
   (figure 7).

   If the clutch diameter is greater than the measure D on the motor housing (4), first mount the motor housing (4) and then the clutch half 1 (1) (hole flush with drive shaft). Tighten the clutch clamping screw through the mounting hole on the motor housing (4).
4. Slot the clutch ring (2) onto the clutch.
5. Mount clutch half 2 (3) on the motor pin.
6. Mount the motor on the motor housing.

# 7 Start-up

WARNING

Risk of personal injury or damage to other system components caused by rapid linear motion of the transport carrier,
caused by thrown loads.
Only authorised specialist personnel may start up the linear unit.

DANGER

Risk of crushing due to incorrect direction of movement of the transport devices.
Should the direction of rotation of the drive (motor or gear) and the sliding carriage drive (spindle or toothed belt) not correspond, the mounted transport devices may travel in the wrong direction. Around all rotating parts, e.g. GX shaft and around the toothed belt (when used without cover band), there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage. These hazards can be countered by installing effective safety mechanisms that comply with the current standards and are state-of-the-art. These are not supplied with the linear unit and must be installed by the manufacturer of the overall installation.
Use of the deflection belt drive without the protective hood supplied is not permitted.
Only qualified electricians may carry out the electrical installation and check the direction of rotation.

**Checks before start-up**

Before starting the unit, check the following:

- Make sure the retaining fixtures conform to the mass and acceleration data provided by the manufacturers.
- Make sure the machine or line into which the linear unit is installed conforms to the EU Machinery Directive, the harmonised European standards or applicable national standards.
- Make sure the linear unit is correctly installed.
- Make sure the inductive and/or mechanical limit switches are correctly connected and working properly.
- Make sure the direction of rotation of the motor shaft and - where appropriate - of the interposed gearbox - matches that of the spindle or timing belt.

If the checks reveal any defects, prohibit start-up of the unit.

**Trial run**

To prevent accidents and collisions, run the linear unit along the extent of its travel at a speed slow enough for it to be stopped promptly in an emergency.

The line may be started up once it has been established that there is no risk of collision when the maximum travel is overrun.

# 8 Operation

WARNUNG

The drive motor can heat up considerably during operation.
In this case, refer to the operating instructions supplied for the drive motor.
In addition, hazards can occur due to noise, tilting and falling, failure to observe ergonomic principles, and the surroundings in which the unit is used.
Various combinations of hazards are also possible.
These items should be analysed by the manufacturer or operator of the overall installation in a separate risk assessment.

CAUTION

Risk of damage from harmful environmental influences!
Operate the linear unit only under the ambient conditions approved by the manufacturers.

**Ambient conditions**

Operate the linear unit only within the permissible temperature range of 0 … 80 °C.

If the linear unit is operated in moist, abrasive medium, foreign bodies may penetrate it. To prevent that, the operating company must take appropriate measures to prevent intrusion of foreign bodies, such as by installing deflectors, baffle plates or air barriers.

**Duty of inspection**

The proper functioning of the linear unit must be checked periodically during operation.

The responsible personnel must check the linear unit and the line for external signs of damage and defects at least once every shift.

If changes occur which are detrimental to safety, shut down the line immediately.

# 9 Shutdown

WARNING

Risk of personal injury or damage to other system components caused by falling system components.
Only authorised specialist personnel may disassemble the linear unit.

1. Cut the power to the machine/line.
2. Dismantle the drive from the linear unit.
3. Detach the linear unit from the machine/line.

# 10 Maintenance

DANGER

Around all rotating parts, e.g. GX shaft and around the toothed belt (when used without cover band), there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage.

For this reason, lubrication of the linear unit may only be carried out while it is moving slowly (max. 0.025 m/s), and for any cleaning work the linear unit drive must be shut down and secured against being restarted.

- All installed ball bearings are sealed and maintenance-free.
- Remove excessive dust and dirt from the cover band and other components of the linear unit on a regular basis.
- Relubricate the thread drives of the linear axes on a regular basis.

## 10.1 Lubrication

**Influencing factors**

The following factors are key to determining the exact lubrication intervals required:

- Loading
- Velocity
- Motion
- Operating temperature
- Degree of dirtying

**Short lubrication intervals**

Short lubrication intervals are necessary:

- where there is susceptibility to dust and damp;
- under major loading;
- when running at high velocity (up to $V_{max}$);
- when running over short travel distances.

**Initial lubrication**

☛ Carry out an initial lubrication after starting up the unit for the first time. A basic lubrication was applied at the factory.

Refer to the lubrication regulations on the following pages.

**Lubrication points on linear units**

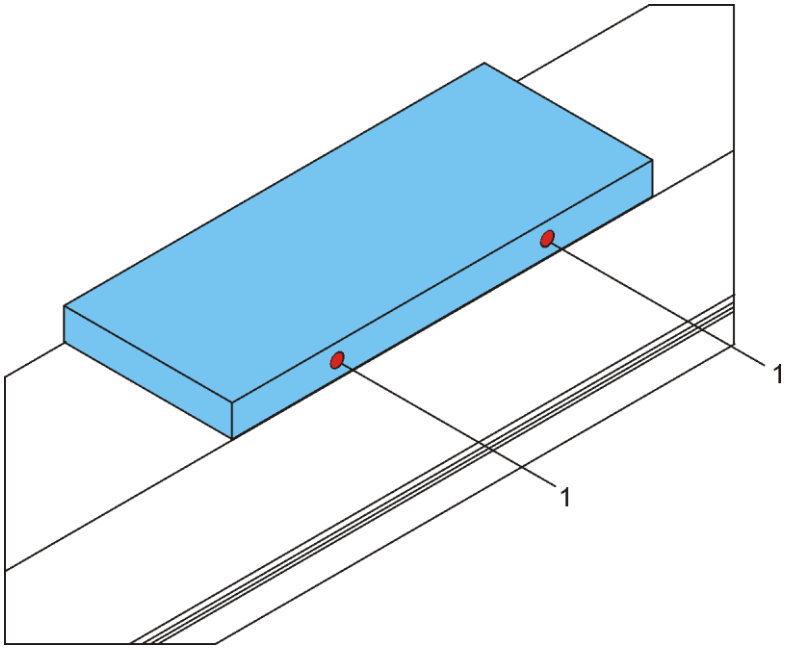



*Figure 9: Possible lubrication points (1) on the carriage*

The categories and positions of lubrication point depend on the model of linear unit. The categories of lubrication point are identified by the markings S, F, O on the unit.
There is a separate lubrication schedule for each lubrication point category.

| Lubrication point category | Lubrication for… | Lubricant |
|---|---|---|
| S | Spindle | Grease |
| F | Guide elements | Grease |
| O | Guide elements | Oil |

**Lubrication method**

Lubrication should, as far as possible, take place while the unit is running, so that the grease is distributed evenly and no pressure is built up.

**Schedule for lubrication point S (for ball screw drive)**

| BSD* type | Lubrication intervals at roll-overs | Grease quantity [cm³] per ball screw nut | Grease type |
|---|---|---|---|
| 1204 | 25.000.000** | 0,50 | Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102<br>☛ If other greases are used, pay attention to manufacturers' specifications!<br>☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used! |
| 1205 | | 0,55 | |
| 1605 | | 1,70 | |
| 1610 | | 1,80 | |
| 1620 | | 1,90 | |
| 2005 | | 2,00 | |
| 2010 | | 2,30 | |
| 2020 | | 2,30 | |
| 2050 | | 4,50 | |
| 2505 | | 2,60 | |
| 2510 | | 3,40 | |
| 2525 | | 3,10 | |
| 2550 | | 4,80 | |
| 3205 | | 4,20 | |
| 3210 | | 13,10 | |
| 3220 | | 8,40 | |
| 3232 | | 5,30 | |
| 3240 | | 3,00 | |
| 4005 | 15.000.000** | 5,30 | |
| 4010 | | 15,40 | |
| 4020 | | 10,20 | |
| 4040 | | 9,50 | |
| 5010 | | 25,90 | |
| 5020 | | 26,50 | |

**BSD = Ball Screw Drive*
*** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 11). Relubrication "in motion"!*

**Schedule for lubrication point F (for linear guide)**

| Carriage size | Lubrication interval | Grease quantity [cm³] per carriage | Grease type |
|---|---|---|---|
| 15 with ball chain | approx. 5,000 km* | approx. 0.4 | Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102<br>☛ If other greases are used, pay attention to manufacturers' specifications!<br>☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used! |
| 20 with ball chain | | approx. 0.6 | |
| 25(L) with ball chain | | approx. 1.2 | |
| 30 with ball chain | | approx. 1.5 | |
| 35 with ball chain | | approx. 1.7 | |
| 15 without ball chain | approx. 2,000 km* | approx. 0.8 | |
| 20 without ball chain | | approx. 1.4 | |
| 25(L) without ball chain | | approx. 2.8 | |
| 30 without ball chain | | approx. 4.4 | |
| 35 without ball chain | | approx. 4.4 | |
| ** Or at least 2 x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 11). Relubrication "in motion"!* | | | |

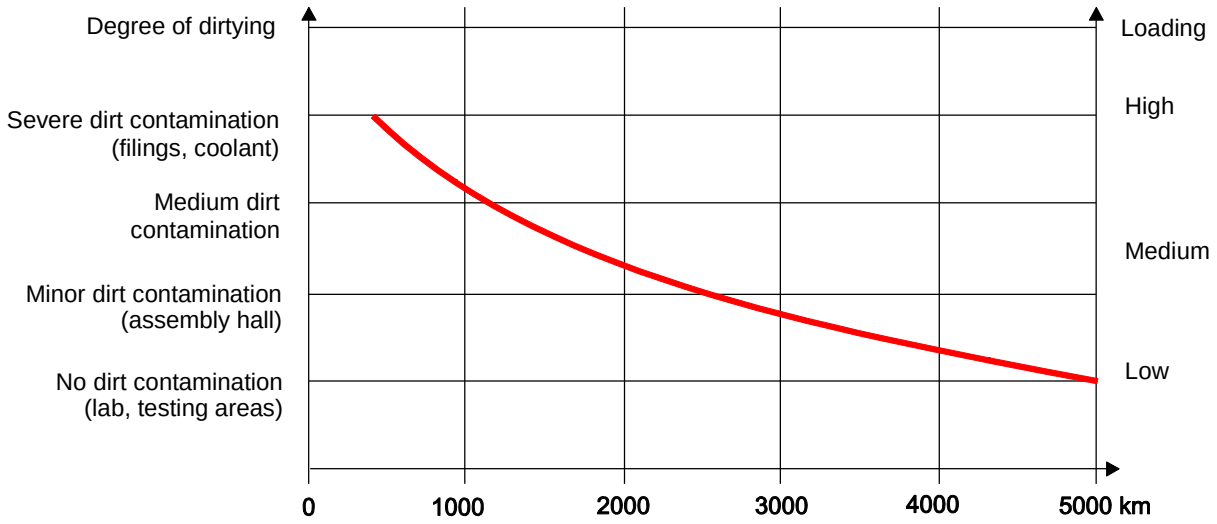



*Figure 10: Relubrication intervals for the linear guidance system with recirculating linear ball bearings*

**Schedule for lubrication point O (for roller guideway)**

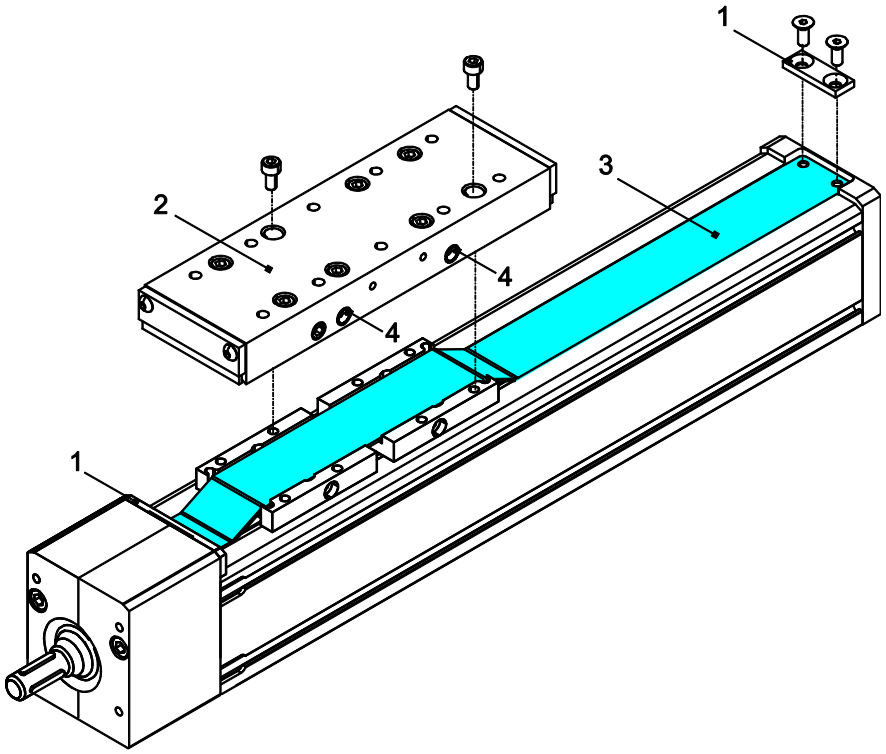
| Lubrication interval | Oil quantity [cm³] | Oil type |
|---|---|---|
| Every 2,000 km* | approx. 0.4 | Oil to DIN 51825-KPE1R-20, e.g. Febis K68 or INTERFLON fin super<br><br>☛ If other oils are used, pay attention to manufacturers' specifications! |
| ** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading.* | | |

## 10.2 Replacing cover bands

☛ To preserve the optimum running of the linear unit and prevent it from being damaged during operation, take care that no foreign bodies penetrate the base profile or other linear unit components during installation and assembly.

☛ Do not damage the standard parts (screws, pins, etc.) or the dismantled components; they will be refitted.

☛ If cover bands are worn, also replace the band guide elements. If cover bands are damaged, check the band guide elements for wear and replace them only as necessary.



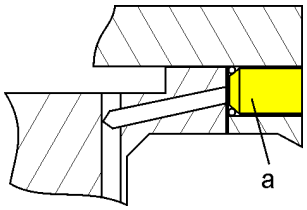

| Key | | |
|---|---|---|
| | 1 | Clamp fittings |
| | 2 | Carriage |
| | 3 | Cover band |
| | 4 | Lubricating nipple |

*Figure 11: Cover band based on the example of the Beta 60-SxS linear unit*

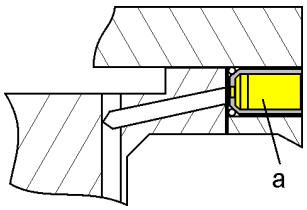
**Procedure**

**1.** Loosen the lubricating nipples:

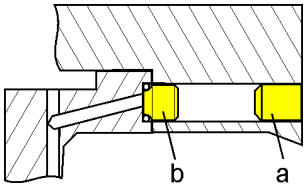
– On Beta 60 to 80
Unscrew all screw-fit lubricating nipples (a) about 2 turns so as not to damage the sealing faces.




– On Beta 60 to 80
Remove all conical lubricating nipples or the external lubrication ports and unscrew the lubricating adapters (a) about 2 turns so as not to damage the sealing faces.




– On Beta 100 to 180
Remove all screw-fit or conical lubricating nipples (a) or the external lubrication ports and unscrew the lubricating adapters (b) about 2 turns so as not to damage the sealing faces.




**2.** Move the carriage into the middle. Then unscrew it and lift it off. Caution! Do not rotate the carriage. It must be refitted in the same position!

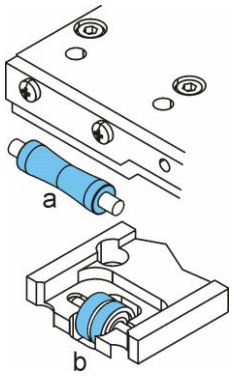
☛ Do not lose the O-rings fitted on the lubricating apertures on the inside of the carriage.

**3.** Detach the clamp fittings from the ends of the cover band and remove the cover band.

**4.** Check the band guide elements, such as the press rollers (a), lifting rollers (b) and locating pins, for wear.

– If the cover band is worn, be sure also to replace the band guide elements. Worn guide elements will damage the new cover band.

– If the cover band is damaged, only replace the band guide elements if they are damaged.
Fit press rollers (a) with the larger diameter on the outer.

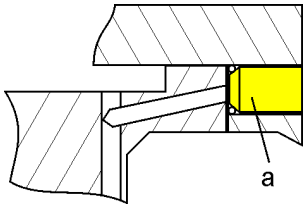



**5.** Insert the new cover band with its broader side (with the chamfered cutting edge) facing downwards and fix it at one end by the clamp fitting.

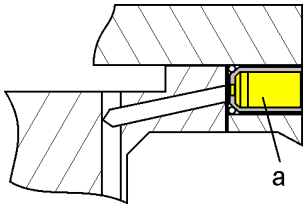
**6.** Carefully press the cover band into its guideway along its entire length until it audibly snaps into place. It must not stick out at any point, otherwise it will be damaged.

7. Stretch the cover band and fix it by the clamp fitting at the other end.
8. Make sure the O-rings are fitted on the lubricating apertures on the underside of the carriage and refit the carriage in the correct position.
9. To check that the carriage is correctly installed, run it slowly from one end of the linear unit to the other, ensuring the cover band is held all the time in its guideway.
10. Fit the lubricating nipples:

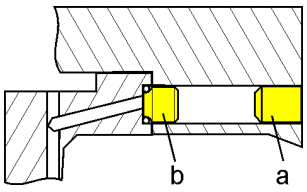
- On Beta 60 to 80
  Insert the screw-fit lubricating nipples.

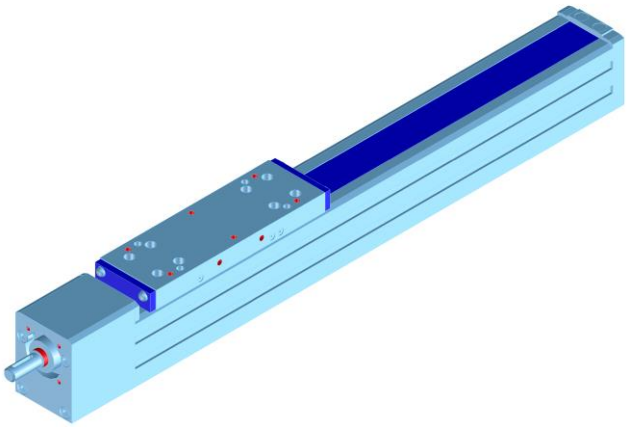



- On Beta 60 to 80
  Fit the lubricating adapters and then the conical lubricating nipples or the external lubrication ports.




- On Beta 100 to Beta 180
  Fit the lubricating adapter and then the screw-fit lubricating nipple.





# Original Assembly and Maintenance Manual

Linear Unit

HSB-beta®

Types
Beta 40-SGS-SSS
Beta 50-C-SRS

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# Contents

# 1 Safety

The Assembly and Maintenance Manual is a component element of the product package, and must always be kept to hand as a reference source.
The Manual must be passed on if the unit is sold on or given away.

If there is anything in this manual which you do not fully understand, please be sure to contact the manufacturers.

## 1.1 Symbols used

This Assembly and Maintenance Manual employs the following symbols to indicate hazards as well as other types of symbol:

| | |
|---|---|
| DANGER  | Indicates immediate danger.<br>Failure to observe this notice entails risk of death or very serious injury. |
| WARNING  | Indicates a danger carrying a medium to high risk.<br>Failure to observe this notice may result in death or serious injury. |
| CAUTION  | Indicates minor risk.<br>Failure to observe this notice may result in light to moderate injury or damage to property. |

☛ Note
Indicates tips on use of the machine and optimising its efficiency.

## 1.2 Regulation use

The mechanical linear unit is intended for installation in machines, and is used solely for manipulating, positioning, transporting, palletising , loading, unloading, clamping, clocking, tensioning, testing, measuring, handling and pushing workpieces or tools.

Pay attention to the basic applications of the linear unit set out in sections 4 and 3.

In order to comply with the EU Directive governing Electromagnetic Compatibility (EMC), the mechanical linear unit may only be used in industrial environments.

Any other use, or use for purposes beyond those stipulated, will be classed as illegitimate. The manufacturers accept no liability for any loss thereby incurred. The risk is borne solely by the operators.

## 1.3 General safety

**Preconditions for operation**

The linear unit must not be put into operation until the machine or line into which it is installed conforms to the following:

- Relevant accident prevention regulations
- Generally accepted safety standards
- EU directives
- Standards governing the electromagnetic compatibility of machinery
- Other applicable standards
- Applicable national legislation.

**Safe operation**

To ensure safe operation, refer to the following documents:

- This operating manual for the linear unit, particularly the technical data
- The operating manual for the line into which it is installed

## 1.4 Use in clean rooms (ISO 14644)

Linear units that are used in clean rooms are fitted with vent holes on the basic profile.

The following specifications must be adhered to:

- The linear unit must be connected to a suitable extractor.
- The linear unit must be lubricated with grease approved for clean room use (initial lubrication with Klüberplex BE11-462).

## 1.5 Use in explosive environments

If the linear units are used in potentially explosive environments, operators must take steps to prevent explosions in accordance with ATEX Directives 94/9/EC and 1999/92/EC and ensure explosion-proofing is installed.

The following ATEX rules must be observed:

- Operators must check the linear unit at least once a week, and ideally every day. The checks should cover: smooth running, functionality of all seals, and adequate lubrication.
- After being in continuous service for approximately 5000 hours, the functionality of the linear unit must be checked by a qualified expert assigned by the manufacturer.
- The operator/manufacturer of the end-product must ensure that the linear unit is integrated into the potential equalisation system of the overall plant at the ports provided for the purpose. Where the unit is

used in a dust-explosion hazard zone, the compressed air supply must additionally be connected to the linear unit.

- The limit switches must be supplied via an isolating amplifier. For the EX isolation an intrinsically safe input circuit is required. The isolating amplifier is not supplied by HSB.
- The linear unit may only be used under the operating conditions approved by the manufacturer. This includes:
  - Ambient temperature
  - Ambient conditions
  - Speed < 1 m/s;
    Speeds > 1 m/s only in combination with monitored central lubrication; operation in areas with potentially explosive dust possible with additional monitored compressed air loading
  - Maximum acceleration
  - Duty cycle
  - Load etc.

## 1.6 Technical condition of the linear unit

**State of the art**

The unit conforms to the current state of the art and applicable rules and regulations. The unit conforms to the EU Machinery Directive, harmonised European standards or corresponding national standards:

- Machinery Directive 2006/42/EC
- DIN EN ISO 12 100:2011-03 Safety of Machinery, General Design Guidelines, Risk Assessment and Reduction
- DIN EN ISO 13850:2008-09: Safety of machinery; emergency-stop devices
- DIN EN 60 204-1:2006: Electrical equipment for industrial machines
- 2004/108/EC: EMC Directive
- EMVG: German law relating to the electromagnetic compatibility of equipment dated 26.02.2008 (Federal Gazette I p. 220)

## 1.7 Modifications to the linear unit

**Modifications**

The linear unit must not be modified, either in its basic design or in its safety components, without our written consent. Any such unauthorised modification will void our liability in respect of the unit.

The operating company may only carry out the maintenance and repair work detailed in this operating manual. Any other measures, such as to replace wearing parts and components, may be carried out only in consultation with our service engineers, by the service engineers

themselves, or by us directly.

Installed safety devices must never be dismantled or disabled.

When fitting special attachments to the unit, follow the fitting instructions provided by the manufacturers!

## 1.8 1.8 Requirements for personnel

The linear unit has been designed and built in accordance with the state of the art and accepted safety standards. Hazards may nevertheless be posed when operating it. Consequently, the unit may only be installed and operated by trained, competent personnel.

All personnel assigned to install, operate, maintain, repair or dismantle a linear unit must have read and understood this operating manual, and in particular section 1, “Safety”.

Work on parts carrying live electrical current may be carried out only by trained electricians. Such work includes:

- Installing safety limit switches
- Mounting a drive unit
- Checking the direction of rotation of the drive

## 1.9 Obligations of the operating company

**Instruction of personnel**

In accordance with EU Health and Safety Directive 89/655/EEC articles 6(1) and 7 and with the Framework Directive 89/391/EEC articles 1(1) and 6(1), the company operating the linear unit must provide personnel assigned to install, operate, maintain, repair or dismantle the unit with appropriate instruction, in particular with regard to safety.
We recommend that companies require their personnel to provide written confirmation of having received such instruction.

**Checking the unit**

In accordance with EU Health and Safety Directive 89/655/EEC article 4a, the operating company must subject to the unit to thorough checking prior to putting it into operation, after carrying out repairs, and after malfunctions have occurred.

**Legibility and maintenance of affixed notices and labels**

The operating company must ensure that all notices and labels attached to the unit are fully legible (in particular details of the serial number) and must ensure compliance with all instructions contained on them. Damaged or illegible notices and labels must be replaced.

# 2 Warranty

The warranty conditions are laid down in the terms and conditions of delivery and payment issued at time of order. Warranty cover will be

voided if:

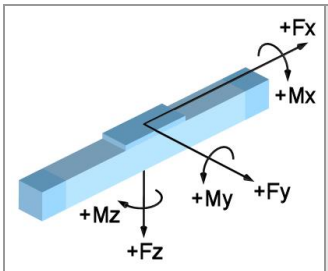
- the unit is not operated in accordance with the stipulated regulation use;
- the instructions set out in this operating manual are not followed;
- the unit is modified without the consent of the manufacturers;
- screws sealed by locking varnish are unlocked.

The manufacturer’s warranty in respect of maintenance and repair work applies only if original replacement parts are used.

# 3 Technical data – Standard model

| Technical data - Linear unit<br>Beta type with spindle drive | Sizes | | | | | |
|---|---|---|---|---|---|---|
| | Beta 40 | | | | Beta 50-C | |
| | SGS | | SSS | | SRS | |
| Drive element | KGT[2] | TGT[3] | BSD | TSD | BSD | TSD |
| Max. speed [rpm] | 3000 | 1500 | 3000 | 1500 | 3000 | 1500 |
| Spindle diameter [mm] | 12 | | | | 12 | |
| Spindle pitch [mm] | 4<br>5 | 3 | 4<br>5 | 3 | 4<br>5 | 3 |
| Moment of inertia [kgm²/m] | $1.20 \times 10^{-5}$ | | | | $1.20 \times 10^{-5}$ | |
| Max. velocity[1] [m/s] | 0,25 | | | | 0,25 | |
| Max. acceleration [m/s²] | 20 | | | | 20 | |
| No-load torque [Nm] | 0,30 | | 0,40 | | 0,30 | |
| Maximum travel (standard) [mm] | 890 | | 890 | | 860 | |
| Repeat accuracy [mm] | ±0,03 | | ±0,03 | | ±0,03 | |
| Operating temperature [°C] (continuous operation) | 0 ... 80 | | 0 ... 80 | | 0 ... 80 | |
| Geometrical moment of inertia $I_Y$ [mm⁴] | 88917 | | | | 236683 | |
| Geometrical moment of inertia $I_Z$ [mm⁴] | 133350 | | | | 295187 | |
| Length of standard carriage [mm] | 120 | | | | 150 | |
| Length of long carriage [mm] | 200 | | | | 200 | |
| Weight (without travel) [kg] | 1,50 | | 1,70 | | 1,50 | |
| Weight (per 100 mm travel) [kg] | 0,30 | | 0,40 | | 0,40 | |
| Weight of standard carriage [kg] | 0,30 | | 0,40 | | 0,45 | |
| Weight of long carriage [kg] | 0,50 | | 0,65 | | 0,60 | |
| Noise emission max. [dB A] [4] | 80 | | 80 | | 80 | |

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*




**Forces and moments - Beta linear unit with spindle drive**

| Type designation | Dynamic forces [Nm] | | | | Dynamic moments [Nm] | | | |
|---|---|---|---|---|---|---|---|---|
| | $F_X$ | $F_Y$ | $F_Z$ | $-F_Z$ | $M_X$ | $M_Y$ | $M_Z$ | $M_{no\text{-}load}$ |
| Beta 40-SGS | 1000 | 80 | 150 | 75 | 6 | 6 | 8 | 0,3 |
| Beta 40-SSS | 1000 | 500 | 600 | 300 | 12 | 30 | 30 | 0,3 |
| Beta50-C-SRS | 1000 | 300 | 600 | 400 | 30 | 60 | 50 | 0,3 |

*Figures in ( ) relate to the long carriage.*

*$M_{no\text{-}load}$ = No-load torque ±30%*

*The forces and moments quoted are maximum values for the single load. In the event of combined loading or simultaneous occurrence of multiple moments or forces, the individual values must be reduced. In case of doubt consult Technical Support.*

## Dynamic load ratings of ball screw drives - Beta linear unit

| Model and size | Nominal Ø in [mm] | Pitch in [mm] | $C_{dyn}$ [N] |
|---|---|---|---|
| Beta 40<br>Beta 50 C | 12 | 4 | 3400 |
| | | 5 | 4400 |
| | | 40 | 14900 |

*Dynamic load rating of ball screw nut to DIN 69051, 1989*

## Dynamic load ratings of rail guides - Beta linear unit

| Model | Size | Number of rails | Number of carriages | Load rating per carriage $C_{dyn}$ [N] THK / Rex* | Preten-sion $F_V$ THK / Rex* | $M_t$ [Nm] THK / Rex* | Guide spacing in direction x (lx1) [mm] | Guide spacing in direction y (ly) [mm] |
|---|---|---|---|---|---|---|---|---|
| Beta 40 | 12 | 1 | 2 | 3175 / 1205 | - | 25 / 14 | 83 (163) | - |

*Figures in ( ) relate to the long carriage*
*The load rating and pre-tension figures relate to the standard linear guidance system with recirculating linear ball bearings*
** Rex = Rexroth*

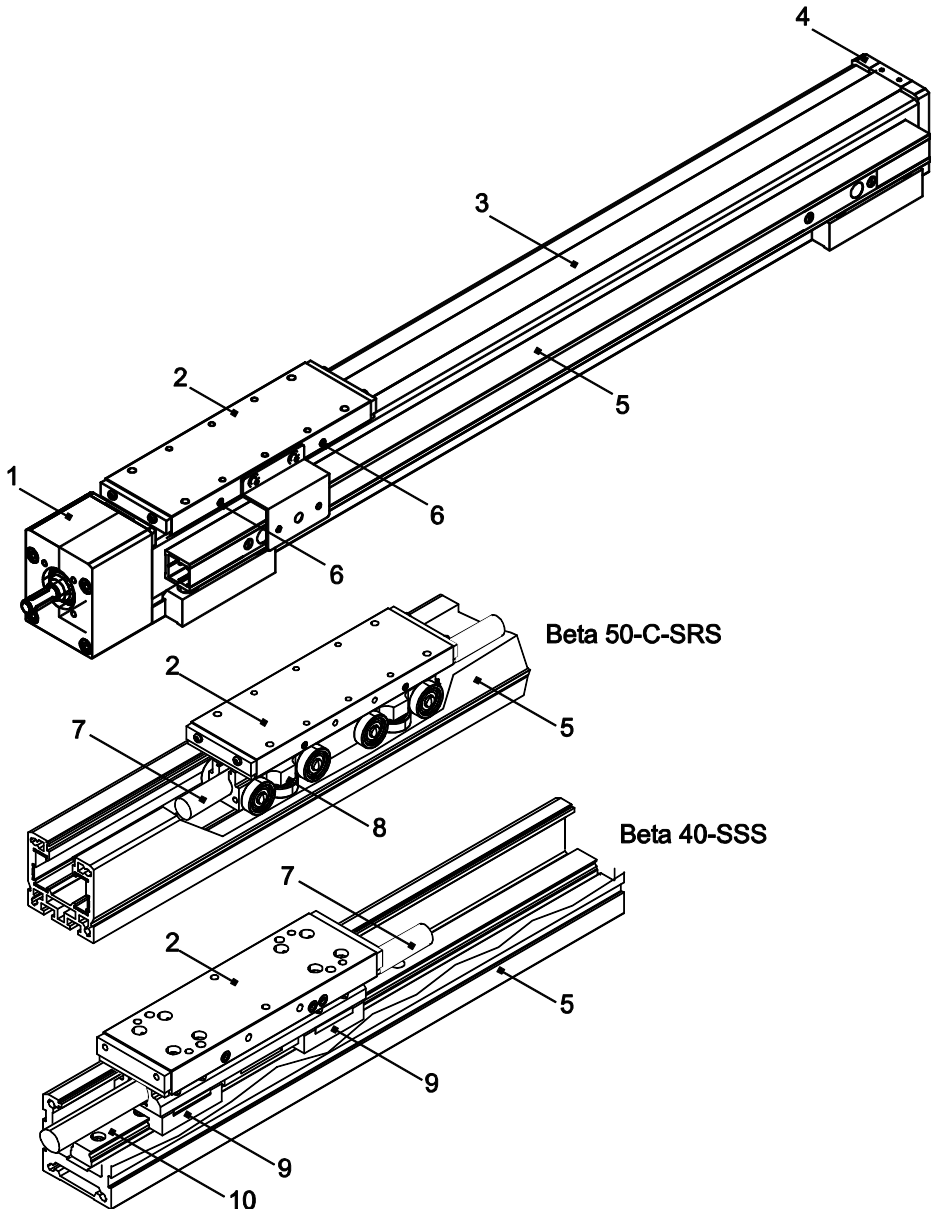
| Tightening torques [Nm] for fixing screws | | | | | | |
|---|---|---|---|---|---|---|
| **Fixing screws** | **M4** | **M5** | **M6** | **M8** | **M10** | The figures given are intended as guides. For shorter insertion depths, the figures must be adjusted accordingly. |
| DIN912/ISO4762-8.8 | 2,7 | 5,4 | 9,0 | 22,0 | 43,0 | |
| DIN912/ISO4762-10.9 | 3,0 | 5,7 | 9,0 | 22,0 | 43,0 | |
| DIN912/ISO4762-12.9 | 3,0 | 5,7 | 9,0 | 22,0 | 3438,0 | |

| Tightening torques [Nm] for clutch with clamping hub | | | | | |
|---|---|---|---|---|---|
| **Size** | **14** | **19** | **24** | **28** | **38** |
| Clutch diameter [mm] | 30 | 40 | 55 | 65 | 80 |
| Screw size | M3 | M6 | M6 | M8 | M8 |
| Tightening torque [Nm] | 1,34 | 10,50 | 10,50 | 25,00 | 25,00 |

| Tightening torques [Nm] for clutch with clamping ring hub | | | | | |
|---|---|---|---|---|---|
| **Size** | **14** | **19** | **24** | **28** | **38** |
| Clutch diameter [mm] | 30 | 40 | 55 | 65 | 80 |
| Screw size | M3 | M4 | M5 | M5 | M6 |
| Tightening torque [Nm] | 1,34 | 2,90 | 6,00 | 6,00 | 10,00 |

# 4 Product description

**Linear unit with spindle drive**




| Key | | | | |
|---|---|---|---|---|
| | 1 | Fixed bearing | 6 | Lubricating nipple |
| | 2 | Carriage | 7 | Thread drive |
| | 3 | Cover band | 8 | Roller bearing guidance system |
| | 4 | Movable bearing | 9 | Recirculating ball bearing |
| | 5 | Base profile | 10 | Guide rail |

*Figure 1: Component assemblies of the Beta 40 and Beta 50-C linear unit with spindle drive*

A mechanical linear unit converts rotational motion into linear motion and is used to move loads quickly, safely and precisely from one position to another. It consists of an aluminium base profile, a moving carriage supported by a guide element (recirculating ball bearing or roller bearing guidance system) and a drive element (screw or timing belt drive).

Depending on its design, the carriage is able to absorb forces and moments in all directions, and is positively connected to the guidance and drive elements by way of the so-called drivers.

The base profile is self-supporting up to a certain length, and is equipped with grooves for mounting.

As an option, the linear unit can be equipped with accessories such as a cover, screw supports, inductive or mechanical limit switches and other fittings(see section **6.3**).

The effective range can be flexibly configured. Multiple linear units of the Alpha, Beta or Delta type can be arranged two-dimensionally (2 axes) or three-dimensionally (3 axes).
Driven linear units can be connected to non-driven units of the same type by a plate, to be able to take large-area loads for example.

# 5 Transportation and storage

The mechanical linear unit is a precision item. Its mechanism may be damaged by heavy jolting, resulting in impairment of its functions.


Risk of damage by heavy jolting or bending!
Transport the assembled linear unit only with the transit protection fitted.

To prevent damage during transportation and storage, protect the linear unit against shaking and sliding as follows:

- Stow it in a box of sufficient size.
- Use packing.

Section 3 lists the unit weights.

Protect the unit against:

- dirt;
- corrosion;
- water;
- and aggressive atmospheres.

# 6 Installation and adjustment

The linear unit can be attached by the following methods:

- On mounting rails
- By screws inserted into the sliding blocks
- By screws inserted into the factory-fitted tapped hole rails

☛ Install the linear unit on a flat surface. Unit parallelism < 0.2 mm/1,000 mm.

☛ Mounting by the rails with tapped holes in them is the preferable solution:
for highly dynamic applications;
where the linear unit has only two attachment points.

## 6.1 Installing the linear unit by mounting rails

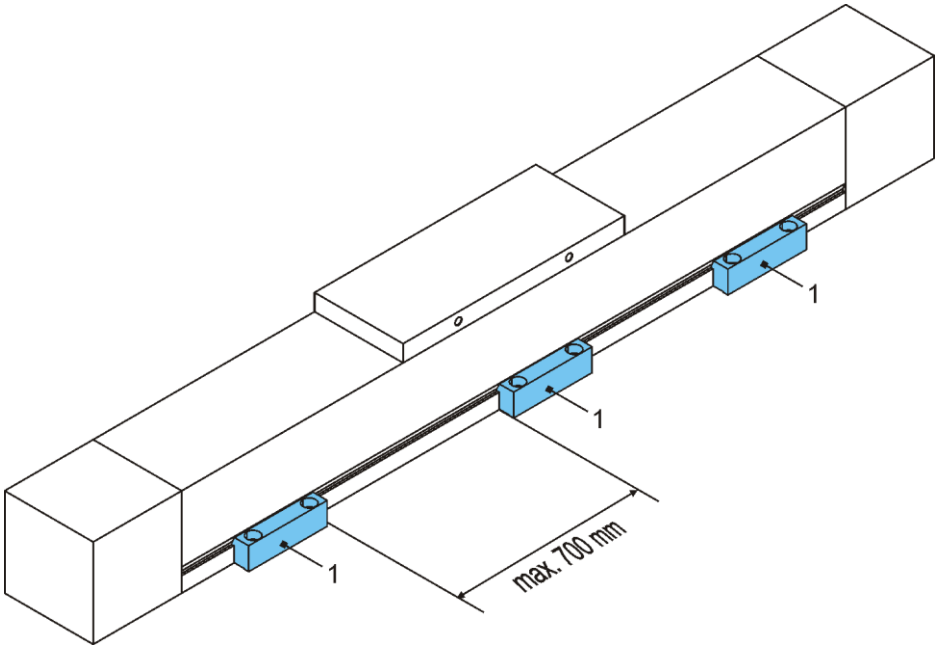



*Figure 2: Mounting rails (1)*

☛ The recommended maximum spacing between the mounting rails is 700 mm.

**Procedure**

1. Attach the mounting rails (1) loosely in position (Figure 2).
2. Align the linear unit axially.
3. Tighten the mounting rails (1)
(for tightening torques see section 3).

## 6.2 Screwing the linear unit into place from below

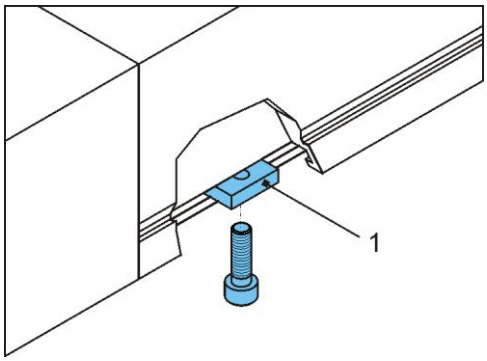



*Figure 3: Sliding blocks (1) in the groove on the underside of the base profile*

Attach the linear unit by the fixing screws from below using the sliding blocks or the tapped hole rails in the aluminium base profile (Figure 3).

**Procedure**

1. Align the linear unit.
2. Align the sliding blocks (1)/tapped hole rails.
3. Tighten the linear unit
   (for tightening torques see section 3).

## 6.3 Setting maximum travel

DANGER

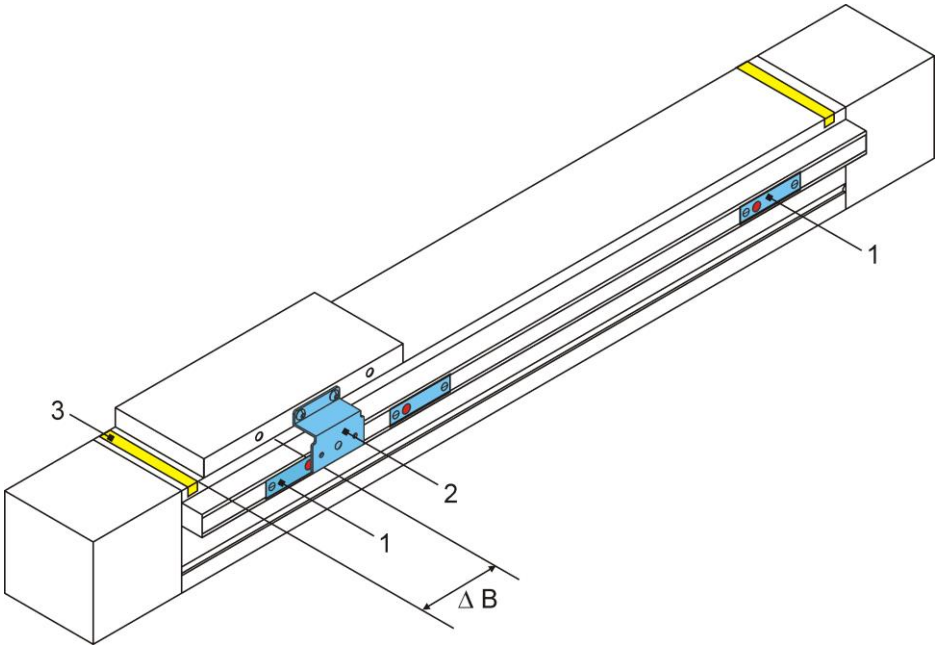
Serious injury may result if the transport carriers topple over.
If the carriage moves to its full extent beyond the safety zone, the transport carrier mounted on it may break away or topple over. The linear unit may be destroyed
During setup, observe the specified safety zone and set the limit switches accordingly.
Electrical switches may only be connected by qualified electricians.

☛ To stop the carriage promptly in the event of an emergency stop, allow for adequate braking distance.

### 6.3.1 Setting the positions of the inductive limit switches

The function of inductive proximity switches is to shut down the electric drive before the mechanical end position is reached.

The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the proximity switch and the actual mechanical end position.




| Key | | |
|---|---|---|
| | 1 | Inductive limit switch |
| | 2 | Switching cam |
| | 3 | Band marking saf ty zone |

*Figure 4: Inductive limit switches*


The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

**Procedure**

1. Connect the power to the limit switches.
2. Slacken the limit switch fixing screws.
3. Run the carriage as far as the braking position.
4. Move the limit switch (NC contact) under the switching cam until it trips and the LED on the sensor goes out.
5. Move the carriage away.
6. Tighten the limit switch.
7. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
8. Fit the limit switch array covering.

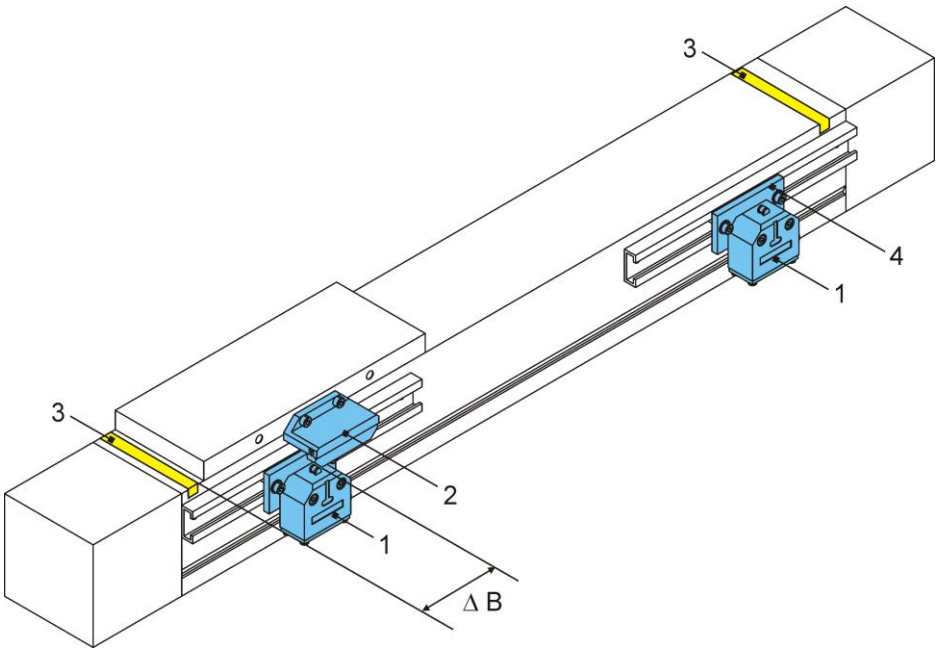
### 6.3.2 Setting the positions of the mechanical limit switches

Mechanical safety limit switches (NC contacts) must be used if a hazard is posed to personnel as soon as the electric drive fails to shut down.

The drive may only be started up when all limit switches are connected and correctly set!

A combination with inductive proximity switches is possible.

External shock-absorbers must be fitted to protect against mechanical destruction.
The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the limit switch and the actual mechanical end position (Figure 5).




| | | |
|---|---|---|
| Key | 1 | Mechanical limit switches |
| | 2 | Switching cam |
| | 3 | Band marking safety zone |
| | 4 | Bracket |
| | B | Braking distance |

*Figure 5: Mechanical limit switches*

CAUTION

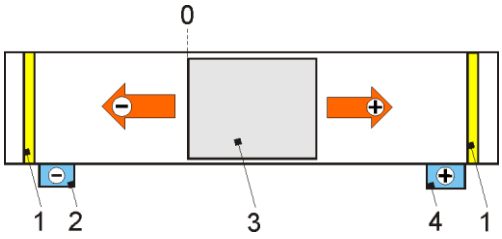
The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

**Procedure**

1. Connect the power to the limit switches.
2. Slacken the bracket fixing screw (Figure 5).
3. Run the carriage as far as the safety zone.
4. Move the limit switch until it trips.
5. Tighten the bracket fixing screw.
6. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
   If the braking distance is too short, repeat the set-up.

## 6.4 Mounting a drive unit

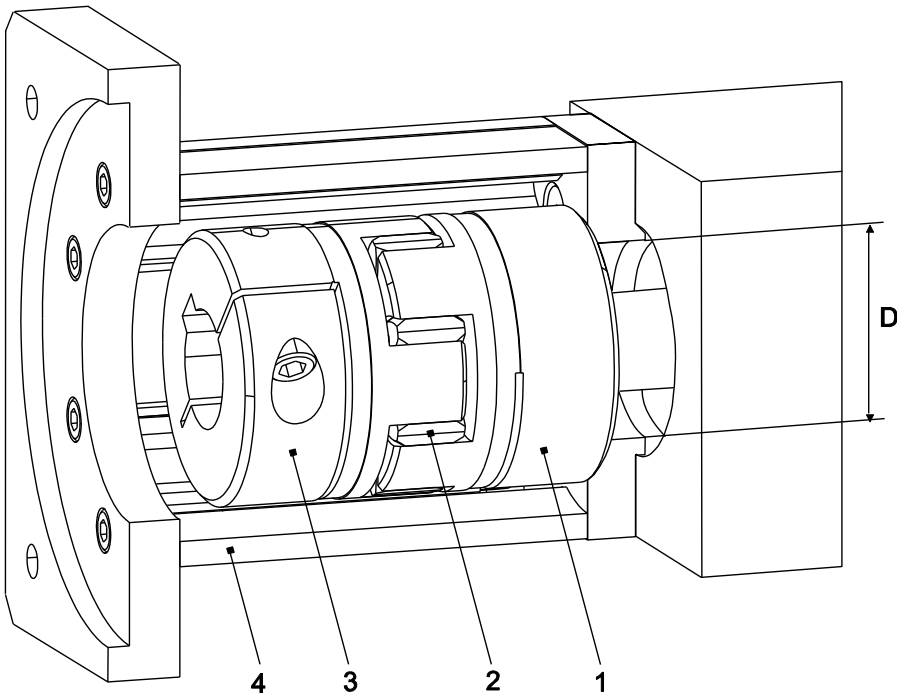
Make sure the direction of rotation of the external drive unit takes into account the direction of the spindle or timing belt so that the limit switches work correctly.




| Key | | | | |
|---|---|---|---|---|
| | 1 | Safety zone | 3 | Carriage with positive and negative directions from reference point 0 |
| | 2 | Negative limit switch | 4 | Positive limit switch |

*Figure 6: Example of travel direction and limit switch configuration*

### 6.4.1 Mounting a motor




| Key | | | | |
|---|---|---|---|---|
| | 1 | Clutch half 1 | 4 | Motor housing |
| | 2 | Clutch ring | D | Diameter on motor housing |
| | 3 | Clutch half 2 | | |

*Figure 7 Motor housing with motor clutch on drive pin*

**Procedure**

1. Place the motor and the clutch components in mounting position adjacent to the linear unit.
2. Check the direction of rotation of the motor. It must take into account the safety limit switches (Figure 6). Alter the direction of the motor as necessary.
3. If the clutch diameter is less than the measure D on the motor housing (4), first mount clutch half 1 (1) (hole flush with drive shaft) and then the motor housing (4)
   (Figure 7).

   If the clutch diameter is greater than the measure D on the motor housing (4), first mount the motor housing (4) and then the clutch half 1 (1) (hole flush with drive shaft). Tighten the clutch clamping screw through the mounting hole on the motor housing (4).
4. Slot the clutch ring (2) onto the clutch.
5. Mount clutch half 2 (3) on the motor pin.
6. Mount the motor on the motor housing.

# 7 Start-up

WARNING

Risk of personal injury or damage to other system components caused by rapid linear motion of the transport carrier, caused by thrown loads.
Only authorised specialist personnel may start up the linear unit.

DANGER

Risk of crushing due to incorrect direction of movement of the transport devices.
Should the direction of rotation of the drive (motor or gear) and the sliding carriage drive (spindle or toothed belt) not correspond, the mounted transport devices may travel in the wrong direction. Around all rotating parts, e.g. GX shaft and around the toothed belt (when used without cover band), there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage. These hazards can be countered by installing effective safety mechanisms that comply with the current standards and are state-of-the-art. These are not supplied with the linear unit and must be installed by the manufacturer of the overall installation.
Use of the deflection belt drive without the protective hood supplied is not permitted.
Only qualified electricians may carry out the electrical installation and check the direction of rotation.

**Checks before start-up**

Before starting the unit, check the following:

- Make sure the retaining fixtures conform to the mass and acceleration data provided by the manufacturers.
- Make sure the machine or line into which the linear unit is installed conforms to the EU Machinery Directive, the harmonised European standards or applicable national standards.
- Make sure the linear unit is correctly installed.
- Make sure the inductive and/or mechanical limit switches are correctly connected and working properly.
- Make sure the direction of rotation of the motor shaft and - where appropriate - of the interposed gearbox - matches that of the spindle or timing belt.

If the checks reveal any defects, prohibit start-up of the unit.

**Trial run**

To prevent accidents and collisions, run the linear unit along the extent of its travel at a speed slow enough for it to be stopped promptly in an emergency.

The line may be started up once it has been established that there is no risk of collision when the maximum travel is overrun.

# 8 Operation

WARNING

The drive motor can heat up considerably during operation.
In this case, refer to the operating instructions supplied for the drive motor.
In addition, hazards can occur due to noise, tilting and falling, failure to observe ergonomic principles, and the surroundings in which the unit is used.
Various combinations of hazards are also possible.
These items should be analysed by the manufacturer or operator of the overall installation in a separate risk assessment.

CAUTION

Risk of damage from harmful environmental influences!
Operate the linear unit only under the ambient conditions approved by the manufacturers.

**Ambient conditions**

Operate the linear unit only within the permissible temperature range of 0 … 80 °C.

If the linear unit is operated in moist, abrasive medium, foreign bodies may penetrate it. To prevent that, the operating company must take appropriate measures to prevent intrusion of foreign bodies, such as by installing deflectors, baffle plates or air barriers.

**Duty of inspection**

The proper functioning of the linear unit must be checked periodically during operation.

The responsible personnel must check the linear unit and the line for external signs of damage and defects at least once every shift.

If changes occur which are detrimental to safety, shut down the line immediately.

# 9 Shutdown

WARNING

Risk of personal injury or damage to other system components caused by falling system components.
Only authorised specialist personnel may disassemble the linear unit.

1. Cut the power to the machine/line.
2. Dismantle the drive from the linear unit.
3. Detach the linear unit from the machine/line.

# 10 Maintenance

DANGER

Around all rotating parts, e.g. GX shaft and around the toothed belt (when used without cover band), there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage.

For this reason, lubrication of the linear unit may only be carried out while it is moving slowly (max. 0.025 m/s), and for any cleaning work the linear unit drive must be shut down and secured against being restarted.

- All installed ball bearings are sealed and maintenance-free.
- Remove excessive dust and dirt from the cover band and other components of the linear unit on a regular basis.
- Relubricate the thread drives of the linear axes on a regular basis.

## 10.1 Lubrication

**Influencing factors**

The following factors are key to determining the exact lubrication intervals required:

- Loading
- Velocity
- Motion
- Operating temperature
- Degree of dirtying

**Short lubrication intervals**

Short lubrication intervals are necessary:

- where there is susceptibility to dust and damp;
- under major loading;
- when running at high velocity (up to $V_{max}$);
- when running over short travel distances.

**Initial lubrication**

☛ Carry out an initial lubrication after starting up the unit for the first time. A basic lubrication was applied at the factory.

Refer to the lubrication regulations on the following pages.

**Lubrication points on linear units**

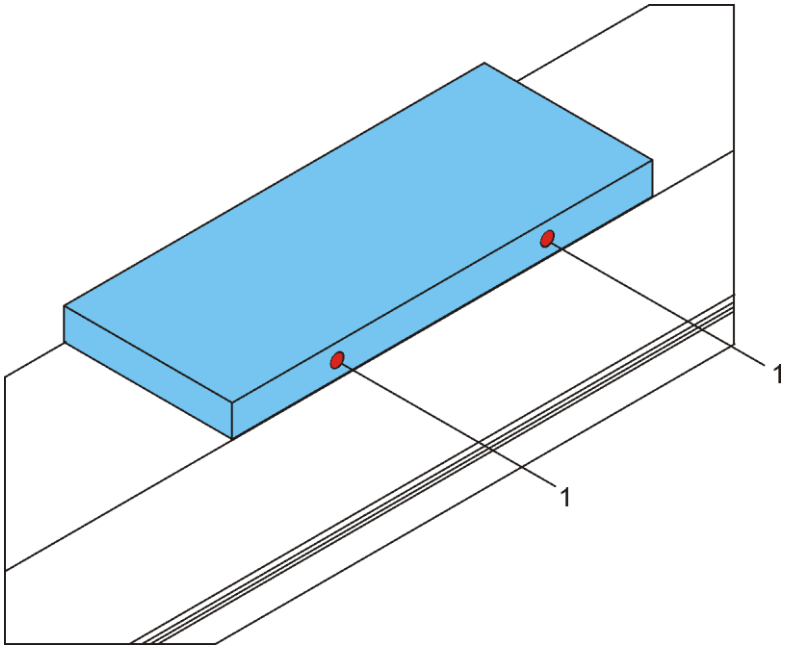



*Figure 8: Possible lubrication points (1) on the carriage*

The categories and positions of lubrication point depend on the model of linear unit. The categories of lubrication point are identified by the markings S, F, O on the unit.
There is a separate lubrication schedule for each lubrication point category.

| Lubrication point category | Lubrication for… | Lubricant |
|---|---|---|
| S | Spindle | Grease |
| F | Guide elements | Grease |
| O | Guide elements | Oil |

**Lubrication method**

Lubrication should, as far as possible, take place while the unit is running, so that the grease is distributed evenly and no pressure is built up.

**Schedule for lubrication point S (for ball screw drive)**

| BSD* type | Lubrication intervals at roll-overs | Grease quantity [cm³] per ball screw nut | Grease type |
|---|---|---|---|
| 1204 | 25.000.000** | 0,50 | Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102<br>☛ If other greases are used, pay attention to manufacturers' specifications!<br>☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used! |
| 1205 | | 0,55 | |
| 1605 | | 1,70 | |
| 1610 | | 1,80 | |
| 1620 | | 1,90 | |
| 2005 | | 2,00 | |
| 2020 | | 2,30 | |
| 2050 | | 4,50 | |
| 2505 | | 2,60 | |
| 2510 | | 3,40 | |
| 2525 | | 3,10 | |
| 2550 | | 4,80 | |
| 3205 | | 4,20 | |
| 3210 | | 13,10 | |
| 3220 | | 8,40 | |
| 3232 | | 5,30 | |
| 3240 | | 3,00 | |
| 4005 | 15.000.000** | 5,30 | |
| 4010 | | 15,40 | |
| 4020 | | 10,20 | |
| 4040 | | 9,50 | |
| **BSD = Ball Screw Drive*<br>*** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 9). Relubrication "in motion"!* | | | |

**Schedule for lubrication point F (for linear guide)**

| Carriage size | Lubrication interval | Grease quantity [cm³] per carriage | Grease type |
|---|---|---|---|
| 15 with ball chain | approx. 5,000 km* | ca. 0.4 | Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102<br>☛ If other greases are used, pay attention to manufacturers' specifications!<br>☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used! |
| 20 with ball chain | | ca. 0.6 | |
| 25(L) with ball chain | | ca. 1.2 | |
| 30 with ball chain | | ca. 1.5 | |
| 35 with ball chain | | ca. 1.7 | |
| 12 with ball chain | | ca. 0.14 | |
| 12 without ball chain | | ca. 0.15 | |
| 15 without ball chain | approx. 2,000 km* | ca. 0.8 | |
| 20 without ball chain | | ca. 1.4 | |
| 25(L) without ball chain | | ca. 2.8 | |
| 30 without ball chain | | ca. 4.4 | |
| 35 without ball chain | | ca. 4.4 | |

** Or at least 2 x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 9). Relubrication "in motion"!*

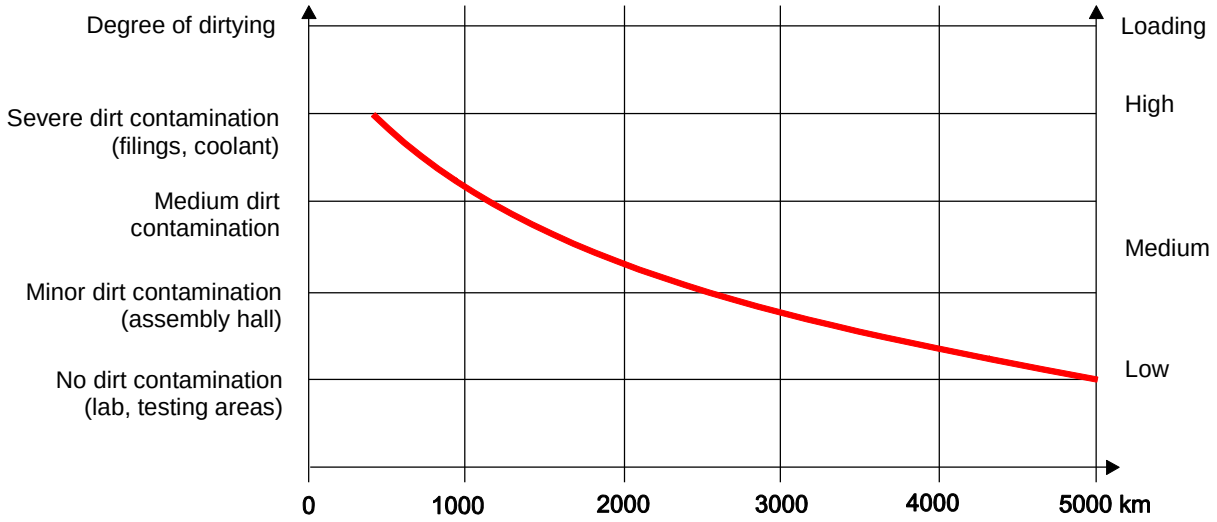



*Figure 9: Relubrication intervals for the linear guidance system with recirculating linear ball bearings*

**Schedule for lubrication point O (for roller guideway)**

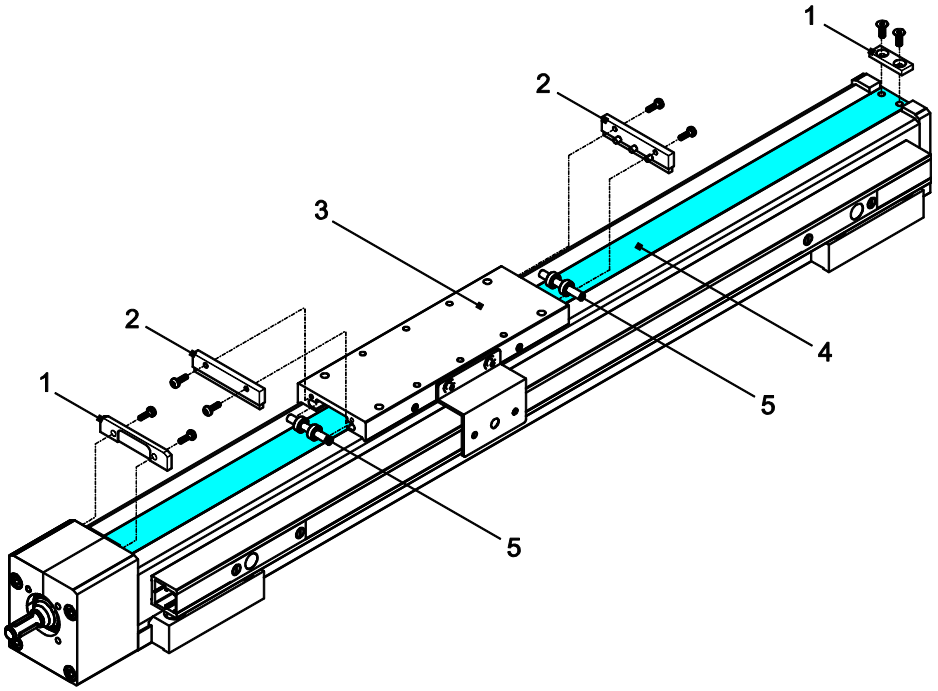
| Lubrication interval | Oil quantity [cm³] | Oil type |
|---|---|---|
| Every 2,000 km* | approx. 0.4 | Oil to DIN 51825-KPE1R-20, e.g. Febis K68 or INTERFLON fin super<br>☛ If other oils are used, pay attention to manufacturers' specifications! |
| ** Or at least 2 x per year. The lubrication interval depends on the ambient temperatures and on the loading.* | | |

## 10.2 Replacing cover bands

☛ To preserve the optimum running of the linear unit and prevent it from being damaged during operation, take care that no foreign bodies penetrate the base profile or other linear unit components during installation and assembly.

☛ Do not damage the standard parts (screws, pins, etc.) or the dismantled components; they will be refitted.

☛ If cover bands are worn, also replace the band guide elements. If cover bands are damaged, check the band guide elements for wear and replace them only as necessary.

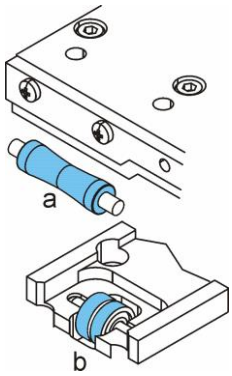



| Key | | |
|---|---|---|
| | 1 | Clamp fittings |
| | 2 | Stripper brushes |
| | 3 | Driver |
| | 4 | Cover band |
| | 5 | Band hold-down device |

*Figure 10: Cover bands based on the example of the Beta 50-C-SxS linear unit*

**Procedure**

1. Move the driver into the middle.
2. Unfasten the stripper brushes (if fitted) from both front faces.
3. Detach the clamp fittings from the ends of the cover band and pull the cover band out of the driver.
4. Pull the press rollers (a) on both front faces of the driver out of the clamp (using a hook).
5. Check the band guide elements, such as the press rollers (a), lifting rollers (b) and locating pins, for wear.




   - If the cover band is worn, be sure also to replace the band guide elements. Worn guide elements will damage the new cover band.
   - If the cover band is damaged, only replace the band guide elements if they are damaged.
     Fit press rollers (a) with the larger diameter on the outer.
6. Push the new cover band with its broader side (with the chamfered cutting edge) facing downwards through the driver and fix it at one end by the clamp fitting.
7. Carefully press the cover band into its guideway along its entire length until it audibly snaps into place. It must not stick out at any point, otherwise it will be damaged.
8. Clamp the press rollers in place.
9. Stretch the cover band and fix it by the clamp fitting at the other end.
10. Bolt on the stripper brushes (if fitted).
11. To check that the carriage is correctly installed, run it slowly from one end of the linear unit to the other, ensuring the cover band is held all the time in its guideway.