

# P/PE/PH/PHQ/PHV gear units, geared motors Operating manual

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# 1 User information

This documentation is a part of the product. It applies to products in the standard design according to the corresponding STOBER catalog.

## 1.1 Storage and transfer

As this documentation contains important information for handling the product safely and efficiently, it must be stored in the immediate vicinity of the product until product disposal and be accessible to qualified personnel at all times.

Also pass on this documentation if the product is transferred or sold to a third party.

## 1.2 Original language

The original language of this documentation is German; all other language versions are derived from the original language.

## 1.3 Formatting conventions

Orientation guides in the form of signal words are used to emphasize specific information so that you are able identify it in this documentation quickly.

Safety notes indicate special risks when handling the product and are accompanied by relevant signal words that express the extent of the risk. In addition, warning notes for possible property damage and useful information are also indicated by signal words.

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### **DANGER!**

#### **Danger**

This word with a warning triangle indicates that there is a considerable risk of fatal injury

- if the stated precautionary measures are not taken.
- 

---

### **WARNING!**

#### **Warning**

This word with a warning triangle means there may be a considerable risk of fatal injury

- if the stated precautionary measures are not taken.
- 

---

### **CAUTION!**

#### **Caution**

This word with a warning triangle indicates that minor personal injury may occur

- if the stated precautionary measures are not taken.
- 

---

### **ATTENTION!**

#### **Notice**

This indicates that damage to property may occur

- if the stated precautionary measures are not taken.
-

## Information

Information indicates important information about the product or serves to emphasize a section in the documentation that deserves special attention from the reader.

### Embedded warning information

Embedded warning information is integrated directly into the instruction manual and is structured as follows:

**SIGNAL WORD! Type of hazard, its cause and possible consequences of disregarding it!** Measures for avoiding the hazard.

Signal words in embedded warning information have the same meaning as in the normal warning information described previously.

## 1.4 Terms

This documentation describes both STOBER gear units and gear components of STOBER geared motors. For reasons of clarity, the collective term drives is used for these.

## 1.5 Supporting documents

Separate documents apply to the drive components which can be attached to STOBER gear units, depending on the design. These documents can be found by entering the serial number of the gear unit at <https://id.stober.com> or by scanning the QR code on the nameplate of the gear unit.

Alternatively, you can find supporting documents at <http://www.stoeber.de/en/downloads/>. Enter the ID of the documentation in the Search... field:

Drive components	Operating manual ID
LM Lean motor	443048_en
EZ synchronous servo motor	443032_en
MB motor adapter with brake	441846_en

## 1.6 Limitation of liability

This documentation was created taking into account the applicable standards and regulations as well as the current state of technology.

STOBER shall assume no responsibility for damage resulting from failure to comply with the documentation or from use that deviates from the intended use of the product. This is especially true for damage caused by individual technical modifications to the product or projecting and operation of the product by unqualified personnel.

## 1.7 Product names and brands

Product names that are registered as brands are not specifically identified in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

## 1.8 Copyright notice

Copyright © STOBER. All rights reserved.

## 2 General safety instructions

There are risks associated with the product described in this documentation that can be prevented by complying with the described warning and safety instructions as well as the included technical rules and regulations.

### 2.1 Intended use

The drives described in this documentation are intended for installation in industrial machines or systems.

The following are considered non-intended use:

- Any overloading of the drives
- Operation in ambient conditions that deviate from those described in the corresponding technical documentation
- Modifying or refitting the drives
- Using the drives for an application other than that defined during project configuration

Commissioning the machine in which the drives are installed is prohibited until it has been determined that the machine corresponds to regional laws and guidelines. In particular, the (Machinery) Directive 2006/42/EC is to be observed in the respective scope.

Operation of the drives in potentially explosive atmospheres is prohibited, unless they are expressly designed for this.

### 2.2 Requirements for personnel

All mechanical tasks that arise during the assembly, commissioning, maintenance and removal of the product may be performed only by specialized personnel who hold a corresponding qualification in the field of metal technology.

All electrical tasks that arise during the assembly, commissioning, maintenance and removal of the product may be performed only by electricians who hold a corresponding qualification in the field of electrical engineering.

Tasks that arise during transport, storage and disposal may be performed by personnel who have been instructed in the suitable method for doing so.

Furthermore, personnel who handle the product must carefully read, understand and observe the valid regulations, legal requirements and applicable basic rules as well as this documentation and the safety instructions it contains.

### 2.3 Prevention of personal injury

#### 2.3.1 Mechanical hazards

#### **WARNING!**

##### **Dangerous movements of machine parts!**

Moving machine parts can cause serious injuries or even death!

- ✓ Before starting the motor or drive:
  - Install all protective devices necessary for operation.
  - Make sure that no one is standing in the danger area or able to enter it unchecked.
  - Leave the danger area.

---

**⚠ WARNING!****Sinking or falling of gravity-loaded axes or vertical axes after switching off the motor due to gravity!**

Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!

- Be aware that the holding brake of the motor does not offer sufficient safety for persons that are in the hazard area of gravity-loaded axes or vertical axes.
  - Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before allowing people to enter the danger area.
- 

**⚠ WARNING!****Unsecured feather keys or drive elements can be thrown due to the rotation of the input shaft!**

Flying metal parts can cause serious injuries!

- Mount the provided drive elements properly or remove them before a test run.
- 

## 2.3.2 Thermal hazards

**⚠ CAUTION!****The surface of the drive can reach temperatures over 65 °C during operation!**

Touching the hot surface of the drive can cause severe skin burns!

- Do not touch the drive during operation or immediately afterward.
  - Allow the drive to cool sufficiently before carrying out work on the drive.
  - Wear protective gloves when working on the drive.
- 

## 2.4 Prevention of property damage

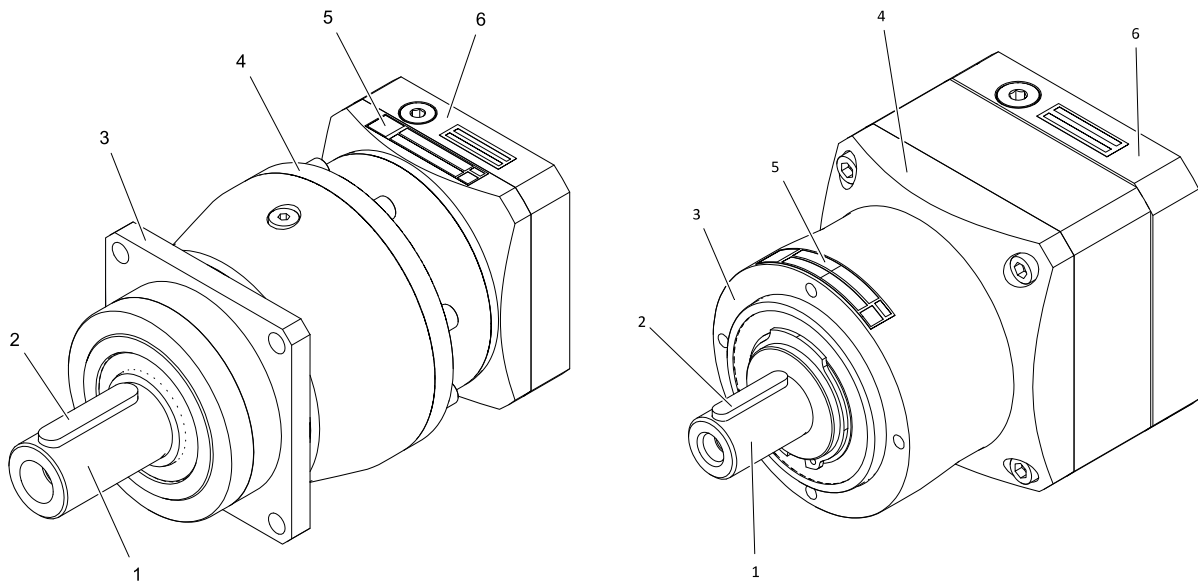
**ATTENTION! Damage to bearings and shafts due to improper assembly!** Never use force when installing machine elements with fittings, e.g. hitting power transmission elements, shafts or the motor or gear unit housing with a hammer, but rather install them in accordance with the following instructions.

**ATTENTION! Shaft seal rings can be damaged by solvents!** Prevent shaft seal rings from coming into contact with solvents when cleaning and degreasing unpainted surfaces.

## 3 Product description

In this chapter, you can find product details that are relevant for assembly, commissioning and maintenance. Detailed technical data on your gear unit/geared motor can be found in the order confirmation. You will find more product information and dimensional drawings in the corresponding catalog ([Additional documentation](#) ▶ 15]). The respective separate technical documentation applies to the attached motors.

### 3.1 Basic structure of P, PE

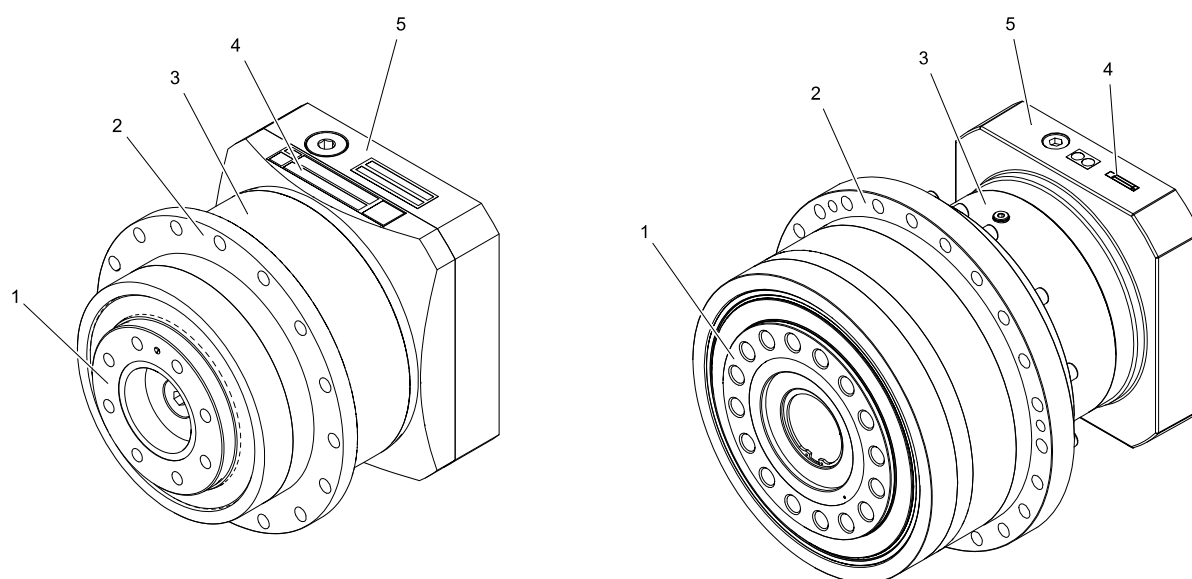


Tab. 1: Basic structure of a P532 two-stage gear unit (left) and PE411 single-stage gear unit (right)

1	Solid shaft	2	Feather key (if present)
3	Output flange	4	Gear unit housing
5	Nameplate	6	ME motor adapter



## 3.2 Basic structure of PH, PHQ, PHV



Tab. 2: Basic structure of a PH431 single-stage gear unit (left) and PHQ1232 two-stage gear unit (right)

1	Flange shaft	2	Output flange
3	Gear unit housing	4	Nameplate
5	ME motor adapter		

## 3.3 PE type designation

In this chapter, you can find an explanation of the type designation for the gear unit types mentioned in the title.

### Sample code

PE	4	1	2	S	G	R	0200	ME
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### Explanation

Code	Designation	Design
PE	Type	Planetary gear unit
4	Size	4 (example)
1	Generation	Generation 1
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
G	Shaft	Solid shaft without feather key
P		Solid shaft with feather key
R	Bearing	Standard bearing
0200	Transmission ratio (i x 10)	i = 20 (example)
ME	Motor adapter	Motor adapter with EasyAdapt coupling
MEL		Motor adapter with EasyAdapt coupling for large motors

## 3.4 P2 – P9, PH3 – PH8, PHQ4 – PHQ8 type designation

In this chapter, you can find an explanation of the type designation for the gear unit types mentioned in the title.

### Sample code

<b>P</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>S</b>	<b>G</b>	<b>S</b>	<b>S</b>	<b>0100</b>	<b>ME</b>
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### Explanation

Code	Designation	Design
<b>P</b>	Type	Planetary gear unit with solid shaft
PH		Planetary gear unit with flange shaft
PHQ		Planetary gear unit with flange shaft
<b>4</b>	Size	4 (example)
<b>3</b>	Generation	Generation 3
<b>1</b>	Stages	Single-stage
<b>2</b>		Two-stage
<b>3</b>		Three-stage
<b>S</b>	Housing	Standard
<b>F</b>	Shaft	Flange shaft (PH, PHQ gear unit)
<b>G</b>		Solid shaft without feather key (P gear unit)
<b>P</b>		Solid shaft with feather key (P gear unit)
<b>S</b>	Bearing	Standard bearing
<b>D</b>		Axially reinforced bearing (P gear unit)
<b>Z</b>		Radially reinforced bearing (P gear unit)
<b>V</b>		Reinforced bearing (PH/PHQ gear unit)
<b>S</b>	Backlash	Standard
<b>R</b>		Reduced
<b>0100</b>	Transmission ratio (i x 10)	i = 10 (example)
<b>ME</b>	Motor adapter	Motor adapter with EasyAdapt coupling
MEL		Motor adapter with EasyAdapt coupling for large motors
MF		Motor adapter with FlexiAdapt coupling
MFL		Motor adapter with FlexiAdapt coupling for large motors
MB		ServoStop motor adapter with brake
EZ		Motor
LM		LM Lean motor

## 3.5 PH9 – PH10, PHQ9 – PHQ12, PHV9 – PHV10 type designation

In this chapter, you can find an explanation of the type designation for the gear unit types mentioned in the title.

### Sample code

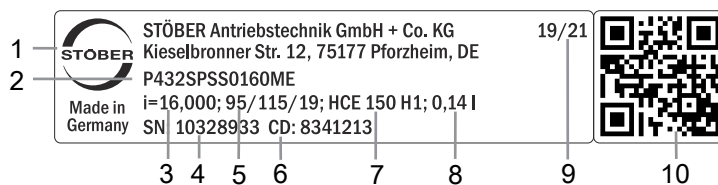
PH	9	3	2	F	0200	ME
----	---	---	---	---	------	----

### Explanation

Code	Designation	Design
PH	Type	Planetary gear unit with flange shaft
PHQ		
PHV		
9	Size	9 (example)
3	Generation	Generation 3
F	Shaft	Flange shaft
0200	Transmission ratio (i x 10)	i = 20 (example)
ME	Motor adapter	Motor adapter with EasyAdapt coupling
MEL		Motor adapter with EasyAdapt coupling for large motors
MF		Motor adapter with FlexiAdapt coupling
MFL		Motor adapter with FlexiAdapt coupling for large motors
MB		ServoStop motor adapter with brake
EZ	Motor	EZ synchronous servo motor
LM		LM Lean motor

## 3.6 Nameplate

An example gear unit nameplate is explained in the figure below.

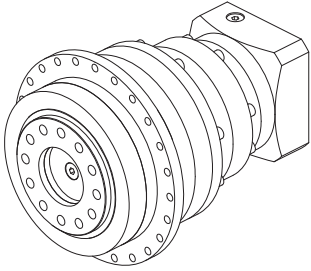
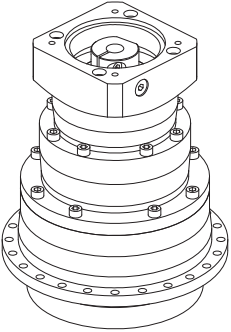
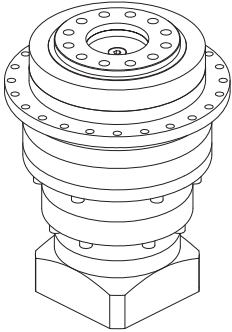


Code	Designation
1	Name of manufacturer
2	Type designation
3	Gear ratio of the gear unit
4	Serial number of the gear unit
5	Dimensions of the motor adapter (diameter of pilot/bolt circle/motor shaft)

Code	Designation
6	Customer-specific data
7	Lubricant specification
8	Lubricant fill volume
9	Date of manufacture (year/calendar week)
10	QR code (link to product information)

### 3.7 Mounting positions

The planetary gear unit can be installed in any mounting position. This does not include PHQ three-stage planetary gear units, for which the lubricant fill volume depends on the mounting position. These planetary gear units must be installed in the mounting position that was specified in the order.

EL1	EL5	EL6
		
Horizontal output	Vertical downward output	Vertical upward output

Tab. 3: Mounting positions of a PHQ three-stage planetary gear unit

### 3.8 Direction of rotation

The input and output shafts of the planetary gear unit rotate in the same direction.

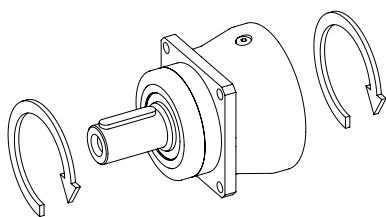


Fig. 1: Direction of rotation, using a P planetary gear unit as an example

### 3.9 Reverse operation

If you want to operate the gear unit in cyclic reverse operation, observe the following information to ensure the lubrication of the circulating gearing parts:

- PE planetary gear units can be operated in reverse operation without any additional steps.
- In vertical mounting positions (output shafts pointing up or down), the orientation of the output shaft is unimportant when installing the machine.
- In horizontal mounting positions, the output shaft for P/PH/PHQ/PHV planetary gear units must be oriented as follows when installing the machine. The marks or the position of the feather key indicate the center position of reverse operation.

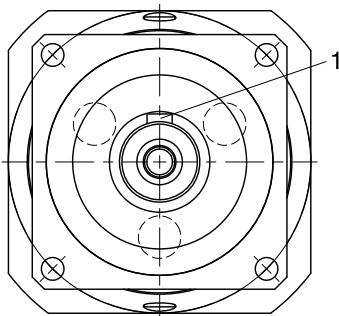


Fig. 2: Orientation of the feather key (1) during reverse operation of P planetary gear units with solid shaft and feather key

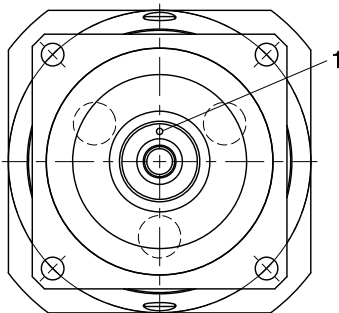


Fig. 3: Orientation of the mark (1) during reverse operation of P planetary gear units with shaft without feather key

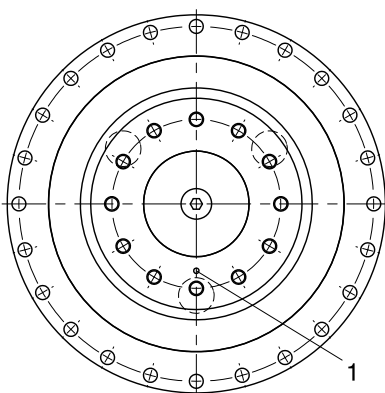


Fig. 4: Orientation of the mark (1) during reverse operation of PH/PHQ/PHV planetary gear units with flange shaft

### 3.10 Ambient conditions

Standard ambient conditions for transport, storage and operation of the gear unit are described in this chapter. Deviating ambient conditions for special designs are specified in the order confirmation. Ambient conditions for motors attached to a gear unit can be found in the technical documentation of the motor.

Feature	Description
Transport/storage surrounding temperature	-10 °C to +50 °C
Surrounding operating temperature	0 °C to +40 °C
Installation altitude	≤ 1000 m above sea level

#### Notes

In order to prevent corrosion damage and damage to the shaft seal rings, protect the drive from the following influences:

- Environments with harmful oils, acids, gases, vapors, dust or radiation
- Extreme temperature fluctuations with high humidity
- Thawing or icing
- Strong UV radiation (e.g. direct sunlight)
- Presence of salt spray
- Sparks

In potentially explosive atmospheres, only gear units in an explosion-proof design in accordance with (ATEX) Directive 2014/34/EU may be used. Separate documentation applies to the explosion-proof design.

### 3.11 Other product features

Other features of gear units in the standard design can be found in the following table.

Feature	Description
Maximum permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
Lubricant	Synthetic; for specification and quantity, see nameplate
Ventilation	Gear unit housing closed on all sides, no ventilation provided
Weight	See order documents
Protection class	IP65

With a geared motor, keep in mind that the motor protection class may be lower.

## 3.12 Additional documentation

You will find more information about the product at <http://www.stoeber.de/en/downloads/>. Enter the ID of the documentation in the Search... field.

Product combination	Catalog title	ID
Gear unit + MB motor adapter with brake	Motor adapters with brake	441904
Gear unit + ME/MEL/MF/MFL motor adapter	Servo gear units	443054_en
Gear unit + EZ synchronous servo motor	EZ synchronous servo geared motors	442437_en
Gear unit + LM Lean motor	Lean motors	443016_en

If you have questions about your drive that are not answered by this documentation, please contact STOBBER Service ([Service \[▶ 32\]](#)).

## 4 Transport and storage

STOBER products are packaged carefully and delivered ready for installation. The type of packaging depends on the product size and the transport method.

Observe the following information during transport and storage:

- Inspect the delivery for any transport damage immediately upon receiving it and report any transport damage immediately. Do not put damaged products into operation.
- Check your delivery for completeness using the delivery note and report any missing parts to the supplier.
- Transport and store the product in the original packaging in order to protect it from damage. Remove the original packaging and transport safety devices shortly before assembly.

### Ambient conditions

The ambient conditions for transport and storage can be found in the chapter [Ambient conditions](#) [► 14].

## 4.1 Transport



### Suspended loads!

Loads that become loose and fall during the lifting process can cause serious injuries or even death!

- Observe the following instructions.
- Cordon off the danger zone and ensure that no one stands under the suspended loads.
- Wear safety shoes.

Lifting and transporting the drive may require lifting gear (e.g. a crane), depending on the weight. The weight of your drive is specified in the accompanying delivery documents.

Lift and transport the drive as follows:

- Use lifting gear with a sufficient lifting capacity for the weight of the drive.
- Run hoist slings directly around the drive housing and secure the hoist slings from slipping.

In order to prevent the drive from falling or getting damaged during transport, observe the following:

- Do not lift or fasten the drive on the output shaft or attached parts.
- Fasten the motor installed on the gear unit as well and make sure that there is no diagonal pull.

## 4.2 Storage

Store the drive in a dry, dust-free environment in the original packaging at a storage temperature between  $-10\text{ °C}$  and  $+50\text{ °C}$ .

### 4.2.1 Long-term storage

If you would like to store the drive for longer than 6 months, take the following steps to prevent corrosion damage:

1. Apply a suitable corrosion protection agent to unpainted surfaces, such as shaft ends or flange contact surfaces.
2. Completely fill the gear unit with lubricant. The lubricant specification can be found by entering the serial number of the gear unit at <https://id.stober.com> or by scanning the QR code on the nameplate of the gear unit.

Before commissioning the gear unit, reduce the lubricant fill volume to the fill volume that is specified on the nameplate of the gear unit.



## 5 Installation

This chapter contains information on how to correctly mount standard STOBER drive designs and avoid injury to persons or damage to property. Differing information for customer-specific designs is included in the order documents.

Observe the technical documentation of the motor for the assembly and electrical connection of the motor.

Inspect the drive for transport or storage damage. If the drive is damaged, do not install it and contact the STOBER Service department.

The following tools and equipment are required for mounting the drive:

- If necessary due to the overall weight, lifting gear with appropriate fastening elements and sufficient lifting capacity
- Open-end wrench set
- Socket wrench set
- Long hexagon insert set
- Torque wrench
- Grease
- Cleaning agent or solvent

Information about the specific tools or equipment can be found in the respective chapter.

### 5.1 Cleaning agent and solvent

Upon delivery, unpainted surfaces of the drive are protected by a corrosion protection agent. The corrosion protection agent must be removed from contact surfaces such as shaft ends and flange contact surfaces before assembly. STOBER recommends removing the corrosion protection with a suitable cold cleaner (e.g. Carlofon Autocleaner) which, in contrast to volatile solvents, is almost odorless and does not weaken the sealing lips of the shaft seal rings. Otherwise, you can use commercially available solvents.

Be aware that all surfaces that come into contact with each other in a clamp connection must be degreased with a cold cleaner or solvent for error-free torque transmission. Additional information can be found in the following chapters.

**ATTENTION! Shaft seal rings can be damaged by solvents!** Prevent shaft seal rings from coming into contact with solvents when cleaning and degreasing unpainted surfaces.

### 5.2 Mounting the motor on a gear unit

This chapter contains information on how to mount a motor on a STOBER gear unit with a motor adapter. The motor adapter type of your gear unit can be found on the nameplate of the gear unit. STOBER recommends using a motor with a shaft without a feather key, since the keyway negatively affects smooth operation.

If you have a STOBER geared motor, you can skip this chapter.

**ATTENTION! Damage to encoders, bearings and shafts due to improper assembly!** Never use force when mounting drive elements with fittings, e.g. hitting drive elements, shafts or the motor or gear unit housing with a hammer, and instead install them in accordance with the instructions in the documentation.

#### Information

To make mounting the motor easier, stick to the following principal assembly order when possible:

- First mount the motor on the gear unit, then the geared motor on the machine
- Mount the motor on the gear unit with the motor shaft pointing down vertically in order to prevent unfavorable shifting and tilting of the motor shaft.

### 5.2.1 Permitted tilting torques at the gear unit input

If you mount a STOBBER gear unit on the machine in a horizontal mounting position, check that the permitted tilting torque is not exceeded on the gear unit input before mounting the corresponding motor. Information on the permitted tilting torque can be found in the corresponding catalog ([Additional documentation \[► 15\]](#)).

### 5.2.2 Tolerances for the add-on motor

This chapter describes tolerances for motors that are required for assembly on a STOBBER gear unit with motor adapter. Dimensional drawings of the motor adapter can be found in the corresponding catalog ([Additional documentation \[► 15\]](#)).

#### Tolerances for shafts in accordance with DIN 748-1

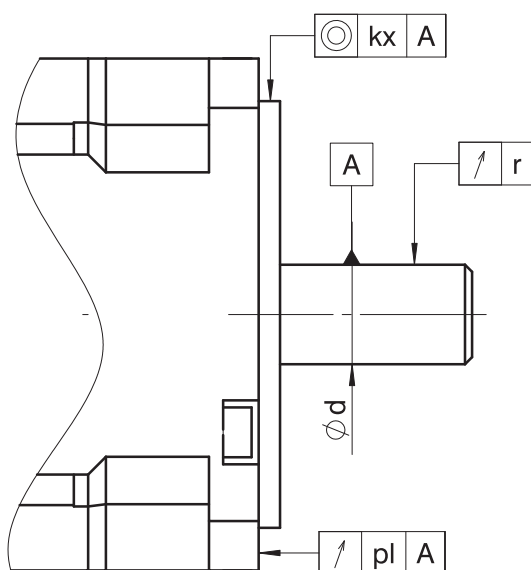
Diameter [mm]	Tolerance
≤ 50	ISO k6
> 50	ISO m6

#### Tolerances for centering diameter on the motor flange in accordance with EN 50347

Centering diameter [mm]	Flange size [mm]	Tolerance
≤ 230	65 – 300	ISO j6
> 230	350 – 500	ISO h6

#### Tolerances for radial runout, axial runout and concentricity in accordance with IEC 60072-1 (normal class)

Symbol	Unit	Explanation
kx	μm	Concentricity of the flange centering in relation to the shaft
pl	μm	Axial runout of the flange mounting surface in relation to the shaft
r	μm	Radial runout of the shaft end



$\varnothing d$ [mm]	$r$ [ $\mu\text{m}$ ]
$d \leq 10$	30
$10 < d \leq 18$	35
$18 < d \leq 30$	40
$30 < d \leq 50$	50
$50 < d \leq 80$	60

Centering diameter [mm]	Flange size	$k_x$ [ $\mu\text{m}$ ]	$p_l$ [ $\mu\text{m}$ ]
50 – 95	65 – 115	80	80
110 – 130	130 – 165	100	100
250 – 450	300 – 500	125	125

## 5.2.3 Mounting the motor on a gear unit with ME/MEL/MF/MFL adapter

This chapter describes the assembly of a motor on a STOBBER gear unit with an ME/MEL/MF/MFL motor adapter.

### Prerequisites

- Dimensional tolerances of the motor correspond to the requirements in the chapter [Tolerances for the add-on motor](#) [[18](#)]
- The permitted tilting torque on the gear unit input is not exceeded (see [Permitted tilting torques at the gear unit input](#) [[18](#)])
- Four screws of strength class 8.8 are available for mounting the motor on a gear unit. The minimum screw depth for these screws is 1.6x the nominal diameter of the screw
- The necessary tools and aids are available (see [Installation](#) [[17](#)])
- The information in the chapter [Cleaning agent and solvent](#) [[17](#)] is observed

### Procedure

In order to prevent unfavorable shifting or tilting of the motor shaft, STOBBER recommends mounting the motor on the gear unit with the motor shaft pointing down vertically.

1. Position the gear unit (5), if necessary with the aid of lifting gear, on a suitable support (1) so that the motor can be mounted in a vertical position. Make sure that the weight of the gear unit is not supported on the output shaft.
2. Remove the transport cover of the motor adapter.
3. If a feather key is installed on the motor shaft, remove it.
4. Remove all corrosion protection from the motor shaft and contact surfaces of the motor and motor adapter.
5. Carefully remove any lubricant from the inner hole of the clamping hub (15) and, if available, the inner and outer surface of the clamping sleeve (6) for the motor shaft.
6. Unscrew the threaded sealing plug (13).
7. Turn the clamping hub so that the locking screw (11) can be turned over the bore for the threaded sealing plug (13), guide the hexagon insert (3) through the bore and insert it into the hexagon socket of the locking screw.
8. If a clamping sleeve (6) is necessary, insert the clamping sleeve into the inner hole of the clamping hub (15) as far as it will go and turn the clamping sleeve so that the slot of the clamping sleeve coincides with the slot of the clamping hub (10).

9. If necessary, use two suitable attachment points to secure the motor with the lifting gear so that the motor shaft is pointing down vertically.
10. Turn the motor in an axial position to the gear unit so that the nameplates are on the same side, if possible, and can also be read after installation in the machine.
11. If the motor shaft has a keyway, position the motor shaft so that the keyway faces the slot of the clamping hub (10).
12. An elastic bellow coupling is installed in the MF/MFL motor adapter that can assume a slightly tilted position, as long as the clamping hub is not connected with the motor shaft. Correct any existing tilt of the clamping hub before inserting the motor shaft.
13. Carefully place the motor on the motor adapter (4) and make sure that the motor shaft is inserted (7) in the clamping hub (15) so that it is centered and not at an angle.
14. If the motor shaft cannot be inserted into the clamping hub, do not use force and instead turn the locking screw (11) counterclockwise one quarter rotation with the hexagon insert (3) (in this process, the clamping hub widens because the cross pin (12) locks against the cylinder head of the locking screw). The size of the hexagon insert can be found on the adhesive label (14) as well as in the following tables.
15. If necessary, repeat the previous step.
16. The contact surfaces of the motor flange and motor adapter flange must fit together without a gap. If this is not the case, do not use force and instead check the dimensions of the motor.
17. Mount the motor on the motor adapter with screws (9). Tighten the screws evenly, with increasing torque and alternating diagonally. The tightening torque can be found in the chapter [Tightening torques \[► 28\]](#).
18. Insert the torque wrench (2) in the hexagon insert (3) and tighten the locking screw (11). The corresponding tightening torque can be found in the following table and on the adhesive label on the motor adapter.
19. If the motor flange does not fully cover the bores or openings of the motor adapter, seal off the openings with a suitable sealant. This maintains the protection class of the gear unit so that dust and water cannot get into the interior of the motor adapter.
20. Plug the access hole with the threaded sealing plug (13) by screwing it in until it is flush with the surface of the motor adapter.

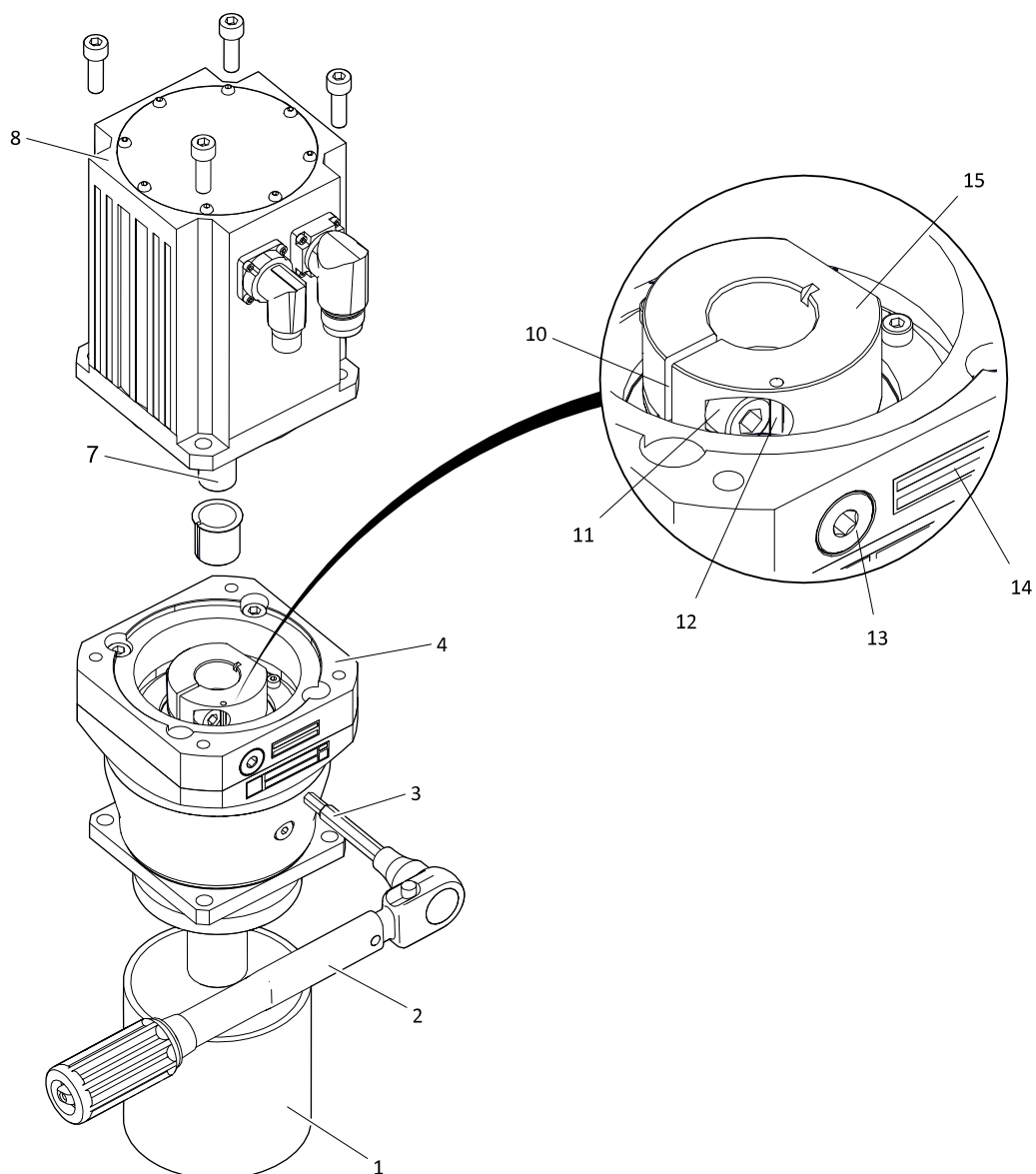


Fig. 5: Mounting a motor on a P planetary gear unit with ME motor adapter (example)

1	Support	2	Torque wrench
3	Hexagon insert	4	Motor adapter
5	Planetary gear unit	6	Clamping sleeve (if present)
7	Motor shaft	8	Motor
9	Screw	10	Slot of the clamping hub
11	Locking screw	12	Cross pin
13	Threaded sealing plug	14	Adhesive label
15	Clamping hub		

**Tightening torques for the locking screw (11) for P/PH/PHQ/PHV planetary gear units**

Type	ME/MF			MEL/MFL		
	KS	s	M <sub>A</sub>	KS	s	M <sub>A</sub>
		[mm]	[Nm]		[mm]	[Nm]
P231	M4	3	4,5	–	–	–
P232	M4	3	4,5	–	–	–
P331	M5	4	9,0	M6	5	16
P332	M4	3	4,5	–	–	–
P431	M6	5	16	M8	6	40
P432	M5	4	9,0	M6	5	16
P531	M8	6	40	M10	8	75
P532	M6	5	16	M8	6	40
P731	M10	8	75	M12	10	130
P732	M8	6	40	M10	8	75
P831	M12	10	130	M16	14	310
P832	M10	8	75	M12	10	130
P931	M16	14	310	–	–	–
P932	M12	10	130	M16	14	310
PH331	M5	4	9,0	M6	5	16
PH431	M6	5	16	M8	6	40
PH432	M5	4	9,0	M6	5	16
PH531	M8	6	40	M10	8	75
PH532	M6	5	16	M8	6	40
PH731	M10	8	75	M12	10	130
PH732	M8	6	40	M10	8	75
PH831	M12	10	130	M16	14	310
PH832	M10	8	75	M12	10	130
PH932	M12	10	130	M16	14	310
PH1032	M12	10	130	M16	14	310
PHQ431	M6	5	16	M8	6	40
PHQ432	M5	4	9,0	M6	5	16
PHQ531	M8	6	40	M10	8	75
PHQ532	M6	5	16	M8	6	40
PHQ533	M5	4	9,0	M6	5	16
PHQ731	M10	8	75	M12	10	130
PHQ732	M8	6	40	M10	8	75
PHQ733	M6	5	16	M8	6	40
PHQ831	M12	10	130	M16	14	310
PHQ832	M10	8	75	M12	10	130
PHQ833	M8	6	40	M10	8	75
PHQ932	M12	10	130	M16	14	310

Type	ME/MF			MEL/MFL		
	KS	s	M <sub>A</sub>	KS	s	M <sub>A</sub>
		[mm]	[Nm]		[mm]	[Nm]
PHQ933	M10	8	75	M12	10	130
PHQ1032	M16	14	310	–	–	–
PHQ1033	M12	10	130	M16	14	310
PHQ1132	M16	14	310	–	–	–
PHQ1133	M12	10	130	M16	14	310
PHQ1232	M20	17	610	–	–	–
PHQ1233	M16	14	310	–	–	–
PHV933	M10	8	75	M12	10	130
PHV1033	M12	10	130	M16	14	310

### Tightening torques for the locking screw (11) for PE planetary gear units

Type	ME			MEL		
	KS	s	M <sub>A</sub>	KS	s	M <sub>A</sub>
		[mm]	[Nm]		[mm]	[Nm]
PE211	M4	3	4,5	–	–	–
PE212	M4	3	4,5	–	–	–
PE311	M5	4	9,0	M6	5	16
PE312	M5	4	9,0	M6	5	16
PE411	M6	5	16	M8	6	40
PE412	M6	5	16	M8	6	40
PE511	M8	6	40	M10	8	75
PE512	M8	6	40	M10	8	75

Abbreviations used:

- KS = Nominal diameter of the locking screw (11)
- M<sub>A</sub> = Tightening torque for the locking screw (11)
- s = Size of the hexagon insert (3)

## 5.2.4 Mounting the motor on a gear unit with MB adapter

The assembly of a motor on a gear unit with an MB motor adapter with brake is described in a separate document (see [Supporting documents \[► 5\]](#)).

## 5.3 Mounting drive elements on a solid shaft

This chapter describes the assembly of drive elements, such as hubs, belt drives, couplings, pinions or sprockets, on the output of a gear unit with a solid shaft and feather key.

When mounting drive elements on a solid shaft without a feather key, observe the technical documentation of the drive element in question.

**ATTENTION! Damage to encoders, bearings and shafts due to improper assembly!** Never use force when mounting drive elements with fittings, e.g. hitting drive elements, shafts or the motor or gear unit housing with a hammer, and instead install them in accordance with the instructions in the documentation.

**Prerequisites**

- The drive element does not cause any impermissible shaft loads (e.g. tensioning the belt on a belt drive). Information on permissible shaft loads can be found in the corresponding catalog (see [Additional documentation \[▶ 15\]](#)).
- The drive element is balanced.
- The tolerance of the inner hole of the drive element corresponds to ISO H7.
- The keyway of the drive element corresponds to DIN 6885-1 (if not otherwise specified).
- The information in the chapter [Cleaning agent and solvent \[▶ 17\]](#) is observed
- A mounting device suitable for the drive element is available (not included in the scope of delivery).

**Procedure**

1. Remove the corrosion protection from the solid shaft.
2. Degrease the inner hole of the drive element.
3. Mount the drive element on the solid shaft with the aid of a mounting device positioned on the centering hole of the solid shaft. Details can be found in the following figure and table.
4. If the drive element is difficult to hoist, do not use force and instead heat it to about 80 °C beforehand.
5. If the length of the solid shaft is greater than the length of the drive element, use an appropriate spacer bushing that you position between the plate (1) and drive element (5).

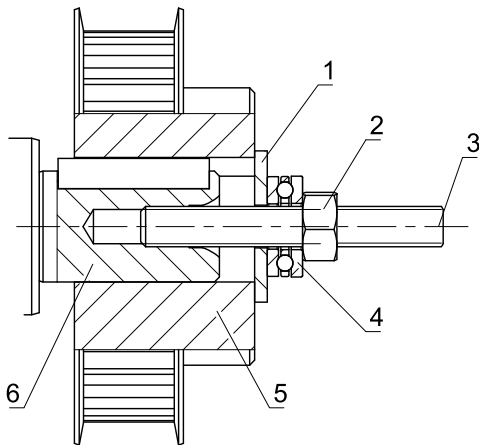


Fig. 6: Mounting device for a belt drive (example)

1	Washer	2	Nut
3	Threaded pin	4	Axial bearing
5	Belt drive (example)	6	Solid shaft

## 5.4 Mounting drive elements on a flange shaft

This chapter describes the assembly of drive elements, such as belt drives or pinions, on a flange shaft.



**ATTENTION! Damage to encoders, bearings and shafts due to improper assembly!** Never use force when mounting drive elements with fittings, e.g. hitting drive elements, shafts or the motor or gear unit housing with a hammer, and instead install them in accordance with the instructions in the documentation.

### Prerequisites

- The drive element does not cause any impermissible shaft loads (e.g. tensioning the belt on a belt drive). Information on permissible shaft loads can be found in the corresponding catalog (see [Additional documentation](#) [▶ 15]).
- The information in the chapter [Cleaning agent and solvent](#) [▶ 17] is observed

### Procedure

1. Remove the corrosion protection from the contact surfaces of the flange shaft and drive element.
2. Center the drive element over the inner or outer pilot of the flange shaft. The inner pilot has a fit of ISO H6 and the outer pilot of ISO h7 (see the figure in the chapter [Mounting the gear unit on the machine](#) [▶ 26]).
3. Mount the drive element on the flange shaft with screws of **strength class 12.9**. Further details on the screws can be found in the following table.
4. Tighten the screws evenly in multiple passes with increasing torque and alternating diagonally. The tightening torques can be found in the chapter [Tightening torques](#) [▶ 28].

Gear unit type	Number of screws	Screw size	Min. screw-in depth [mm]
PH3	8	M5	7
PH4	8	M6	11
PH5	12	M6	11
PH7	12	M8	14
PH8	12	M10	18
PH9, PHV9	12	M16	24
PH10, PHV10	12	M20	30
PHQ4	12	M6	11
PHQ5	12	M8	12
PHQ7	12	M10	16
PHQ8	12	M12	17
PHQ9	12	M20	28
PHQ10	12	M24	35
PHQ11	15	M24	35.5
PHQ12	16	M30	48

Tab. 4: Information on screws for mounting drive elements on the flange shaft

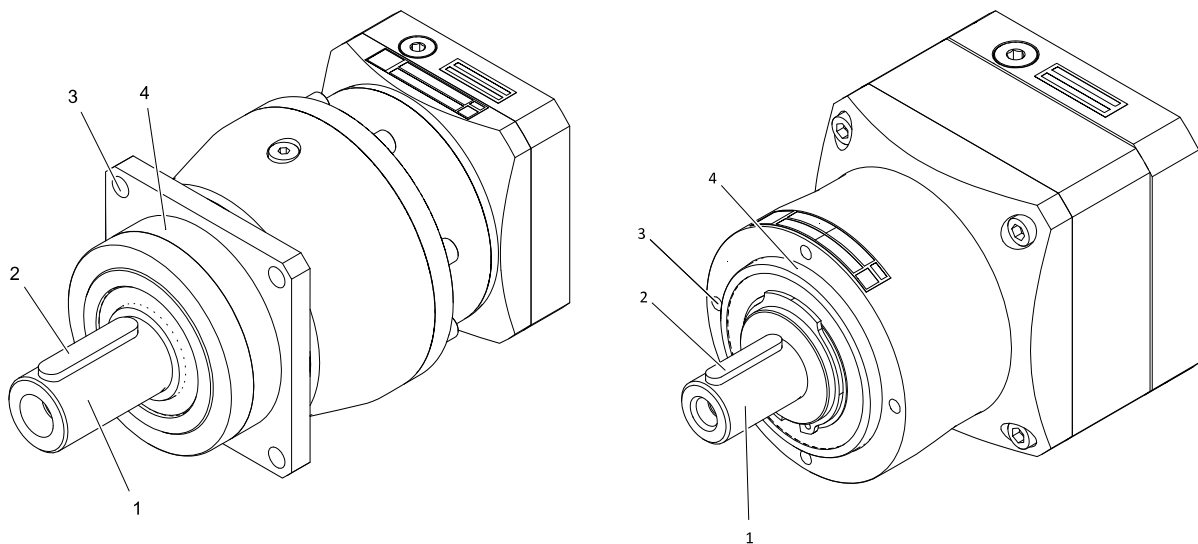
## 5.5 Mounting the gear unit on the machine

### Prerequisites

- The connecting structure for the drive in the machine is designed according to the weight and torque and takes into account forces that act on the drive.
- The connecting structure is flat, vibration-reducing and torsion-resistant.  
The perpendicularity deviation of the flange contact surface of the connecting structure to the gear unit shaft axis does not exceed 0.03 mm per 100 mm.
- The gear unit housing is grounded via the connecting structure or attached motor.
- The centering diameter of the connecting structure has the tolerance of ISO H7.
- Sufficient ventilation for the mounted drive is ensured.

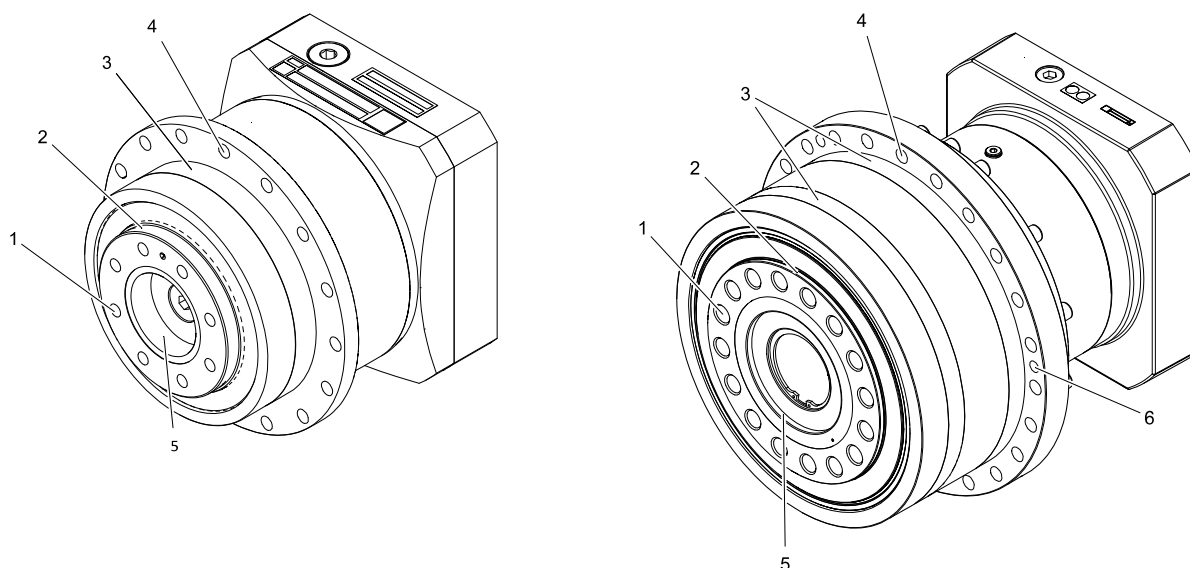
### Procedure

1. Position the gear unit so that the nameplate of the gear unit is still visible after mounting.
2. If the gear unit is to be operated in reverse operation, make sure that the output shaft is positioned according to the specifications in the chapter [Reverse operation](#) [▶ 13].
3. Center the gear unit in the connecting structure using the pilot/pilots of the gear unit housing.
4. Mount the output flange of the gear unit to the connecting structure using screws. Details on the screws can be found in the following table.
5. Tighten the screws evenly in multiple passes with increasing torque and alternating diagonally. The tightening torques can be found in the chapter [Tightening torques](#) [▶ 28].



Tab. 5: Mounting the gear unit on the machine, using P532 (left) and PE411 (right) as an example

1	Solid shaft	2	Feather key (if present)
3	Output flange bore	4	Housing pilot



Tab. 6: Mounting the gear unit on the machine, using PH431 (left) and PHQ1232 (right) as an example

1	Threaded hole of the flange shaft	2	Outer pilot of the flange shaft
3	Pilot/pilots of the housing	4	Output flange bore
5	Inner pilot of the flange shaft	6	Threaded hole for disassembly (if present)

Gear unit type	Number of screws	Screw size	Min. screw-in depth [mm]	Strength class
P2	4	M5	–	12.9
P3	4	M5	–	12.9
P4	4	M6	–	12.9
P5	4	M8	–	12.9
P7	4	M10	–	12.9
P8	4	M12	–	12.9
P9	4	M16	–	12.9
PE2	4	M4	8	10.9
PE3	4	M5	10	10.9
PE4	4	M6	13	10.9
PE5	4	M8	16	10.9
PH3	8	M4	–	12.9
PH4	16	M5	–	12.9
PH5	16	M5	–	12.9
PH7	24	M6	–	12.9
PH8	24	M8	–	12.9
PH9, PHV9	32	M12	–	12.9
PH10, PHV10	32	M12	–	12.9
PHQ4	8	M4	–	12.9
PHQ5	16	M5	–	12.9
PHQ7	24	M6	–	12.9
PHQ8	24	M8	–	12.9

Gear unit type	Number of screws	Screw size	Min. screw-in depth [mm]	Strength class
PHQ9	32	M12	–	12.9
PHQ10	32	M12	–	12.9
PHQ11	24	M16	–	12.9
PHQ12	24	M20	–	12.9

Tab. 7: Information on screws for mounting the gear unit housing on the machine

## 5.6 Tightening torques

Note that the following tightening torques apply to screws that are used for mounting the motor on the gear unit or the gear unit on the machine. For clamp couplings, clamping screws of shrink rings and other connection elements, other tightening torques apply that are specified in the specific context.

Thread	Tightening torque $M_A$ [Nm]		
	Strength class 8.8	Strength class 10.9	Strength class 12.9
M4	3.3	4.8	5.6
M5	6.5	9.5	11.2
M6	11.3	16.5	19.3
M8	27.3	40.1	46.9
M10	54	79	93
M12	93	137	160
M14	148	218	255
M16	230	338	395
M18	329	469	549
M20	464	661	773
M22	634	904	1057
M24	798	1136	1329
M27	1176	1674	1959
M30	1597	2274	2662
M36	2778	3957	4631

Tab. 8: Tightening torques for screws with metric standard thread in accordance with DIN 13-1 (coefficient of friction  $\mu_{ges} = 0.14$ ).

## 6 Commissioning

### 6.1 Before commissioning

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

Before commissioning the drive, make sure that the following prerequisites are met:

- The drive is undamaged
- The mechanical assembly and electrical connection of the drive has been completed
- The drive is not blocked
- Any present feather keys are secured against being thrown for a test run with drive elements
- All protective devices have been properly mounted
- All monitoring equipment is activated
- The drive controller is adjusted so that an overload of the gear unit in relation to the permitted torque is prevented by the motor
- The ambient conditions are observed (see [Ambient conditions](#) [▶ 14])

### 6.2 During commissioning

**WARNING! Moving machine parts can cause serious injuries or even death!** Make sure that no one is standing in the danger area or able to enter it unchecked.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**WARNING! If the motor is in operation while plug connectors are being disconnected, electric arcs can cause severe injury or even death.** Do not connect or disconnect the plug connectors until after the motor is de-energized.

**WARNING! Flying metal parts can cause serious injuries!** Assemble the provided power transmission elements properly or remove the feather key before a test run.

**CAUTION! The surface of the drive can reach temperatures over 65 °C during operation!** Allow the drive to cool sufficiently before working on it. Wear gloves.

During commissioning, check the following:

- After the any existing brakes released before starting the drive?
- Is the direction of rotation of the drive correct?
- When the drive is running, do any overloading, unwanted speed fluctuations, unusual noises or vibrations occur?

In case of faults, observe the chapter [Troubleshooting faults](#) [▶ 31].

#### Measurement of the surface temperature

For safe operation, it must be ensured that the surface temperature of the gear unit does not exceed the maximum permitted value. For this purpose, perform measurements with a commercially available temperature measuring device. Determine the surface temperature at the transition between gear unit and motor adapter or between gear unit and motor.

The maximum surface temperature occurs in approx. 3 hours, depending on the utilization of the drive, and must not exceed the maximum value of 90 °C in the event of a maximum surrounding temperature. Immediately shutdown the drive if the maximum value is exceeded and contact STÖBER Service.

# 7 Servicing

## 7.1 Cleaning

If the surface of the gear unit/geared motor is dirty, sufficient heat dissipation through the ambient air is no longer possible. As a result, impermissibly high operating temperatures could occur, which reduce the lubricating effect of the lubricant and accelerate its aging. This has a negative effect on the service life of the gear unit/geared motor. Furthermore, the thermal winding protection may force a shutdown of the drive before the drive has reached its nominal values.

Determine the cleaning intervals according to the expected operating conditions, but every 12 months at the latest. Clean the gear unit/geared motor according to the following instructions.

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the drive can reach temperatures over 65 °C during operation!** Allow the drive to cool sufficiently before working on it. Wear gloves.

**ATTENTION! Improper cleaning can cause damage to the gear unit/geared motor!** Do not use steam jet cleaners, high-pressure cleaners or compressed air to clean the gear unit/geared motor, as this can result in water and dirt entering the interior of the gear unit/geared motor through the seals and can damage it. In addition, do not use solvents, as these can damage the seals and the nameplate. Comply with the following instructions.

- Remove dust and chips with a suitable industrial vacuum.
- Remove contamination from the surface of the gear unit/geared motor with a suitable industrial cleaner.

## 7.2 Inspection

Perform regular inspections on the gear unit according to the following specifications. Inspect the attached motor in accordance with the documentation of the motor manufacturer.

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the drive can reach temperatures over 65 °C during operation!** Allow the drive to cool sufficiently before working on it. Wear gloves.

The gear units are filled with synthetic lubricant at the factory. With proper use, the lubricant does not need to be changed over the entire service life of the gear unit. The specification and fill volume of the lubricant is specified on the nameplate of the gear unit.

Interval	Task
Every 3000 operating hours or every 6 months	Check shaft seal rings for external damage and leaks
Annually	Check paint for damage and touch up if necessary
	Check tightening torques of the screw connections between gear unit/machine and between gear shaft/drive elements (see the chapter <a href="#">Tightening torques</a> )

## 7.3 Remediating faults

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

Notify all personnel working on the machine or the drive of deviations from normal operation. These deviations indicate that the function of the drive is impaired. These include:

- Higher operating temperatures or increased vibrations
- Unusual noises or smells
- Triggering of monitoring systems
- Leaks on the housing of the gear unit

In such an event, shut down the drive and notify the responsible service personnel immediately.

### 7.3.1 Troubleshooting faults

The following table describes faults that can occur during the operation of the gear unit. Read through the table from top to bottom when troubleshooting faults.

Faults	Possible causes	Actions
Operating temperature is higher or exceeds the permitted temperature of the gear unit	Speed or torque is too high	Check the design of the gear unit
	Motor heats the gear unit (too much)	Cool the motor sufficiently
		Check the wiring of the motor
		Replace the motor
	Surrounding temperature is too high	Provide sufficient cooling for the gear unit
Bearing damage	Contact STOBBER Service	
Increased or different noises or vibrations in operation	Motor is mounted with too much tension	Check the assembly of the motor
	Gear unit is mounted incorrectly or with too much tension	Check the assembly of the gear unit
	Bearing damage	Contact STOBBER Service
	Gear damage	Contact STOBBER Service
Leaks	Radial shaft seal ring leaks	Contact STOBBER Service
	Output shaft damaged at the sealing point	Contact STOBBER Service
	Increased inner pressure due to operating temperature that is too high	See measures in case of fault <a href="#">Operating temperature is higher ... of the gear unit</a>
	Gear unit housing leaks	Contact STOBBER Service
Output shaft does not turn although motor is running	Clamp coupling is defective or tightened incorrectly	Check the clamp coupling

## 7.4 Servicing

Have the necessary servicing work carried out on the drive by the STOBBER Service department or by STOBBER service partners. Be aware that improper servicing may cause material damage and may void the manufacturer's warranty.

Only use replacement parts delivered by STOBBER. Specify the type designation and serial number of the drive when ordering replacement parts. These can be found on the nameplate of the drive.

## 7.5 Service

If you contact STÖBER Service, have the following information ready:

- Serial number and type designation of the drive according to the nameplate
- Type of fault and surrounding circumstances
- Presumed cause
- If possible, digital photo of the drive or a video recording of the drive in the context of the fault

### **Contact data of parent company in Germany**

STÖBER Antriebstechnik GmbH + Co. KG

Kieselbronner Strasse 12

75177 Pforzheim

Germany

Service hotline: +49 7231 582-3000

mail@stoerber.de

### **Contact data of subsidiary in US**

STÖBER Drives Inc.

1781 Downing Drive

Maysville, KY 41056

Service Hotline +1 606 563-6035

service@stoerber.com



## 8 Removal and disposal

### 8.1 Disassembly

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the drive can reach temperatures over 65 °C during operation!** Allow the drive to cool sufficiently before working on it. Wear gloves.

**ATTENTION! Damage to encoders, bearings and shafts due to improper disassembly!** Never use force when disassembling drive elements with fittings, e.g. hitting drive elements, shafts or the motor or gear unit housing with a hammer, and instead disassemble them in accordance with the following instructions.

Remove the drive as follows:

1. If the drive had been in operation immediately beforehand, allow it to cool.
2. Disconnect the connection cable and the grounding conductor from the motor.
3. If necessary, remove drive elements connected to the output shaft, such as belts, chains or couplings, with suitable removal devices.
4. Fasten the drive with suitable fastening elements (see the chapter [Transport \[► 16\]](#)).
5. Unscrew the screws used to mount the drive to the machine.
6. Pull the output flange of the gear unit off of the machine. For gear units with a flange shaft, use the provided threaded holes in the output flange (see the chapter [Mounting the gear unit on the machine \[► 26\]](#)).
7. If necessary, remove the motor from the gear unit. To do so, first release the locking screw of the motor adapter by turning it counterclockwise approx. one quarter rotation. Then, unscrew the screws of the motor used to mount the motor to the gear unit (see the chapter [Mounting the motor on a gear unit \[► 17\]](#)).
8. Transport the drive according to the chapter [Transport \[► 16\]](#).

### 8.2 Disposal

Dispose of the component parts of the gear unit according to applicable national regulations and when doing so, observe the following information:

- If possible, separate the gear unit into component parts made of steel/cast iron, aluminum and plastic.
- The gear unit contains lubricants (oil or grease) that pose a risk to the environment and to health. Collect the used oil and grease without mixing them and dispose of them properly.



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