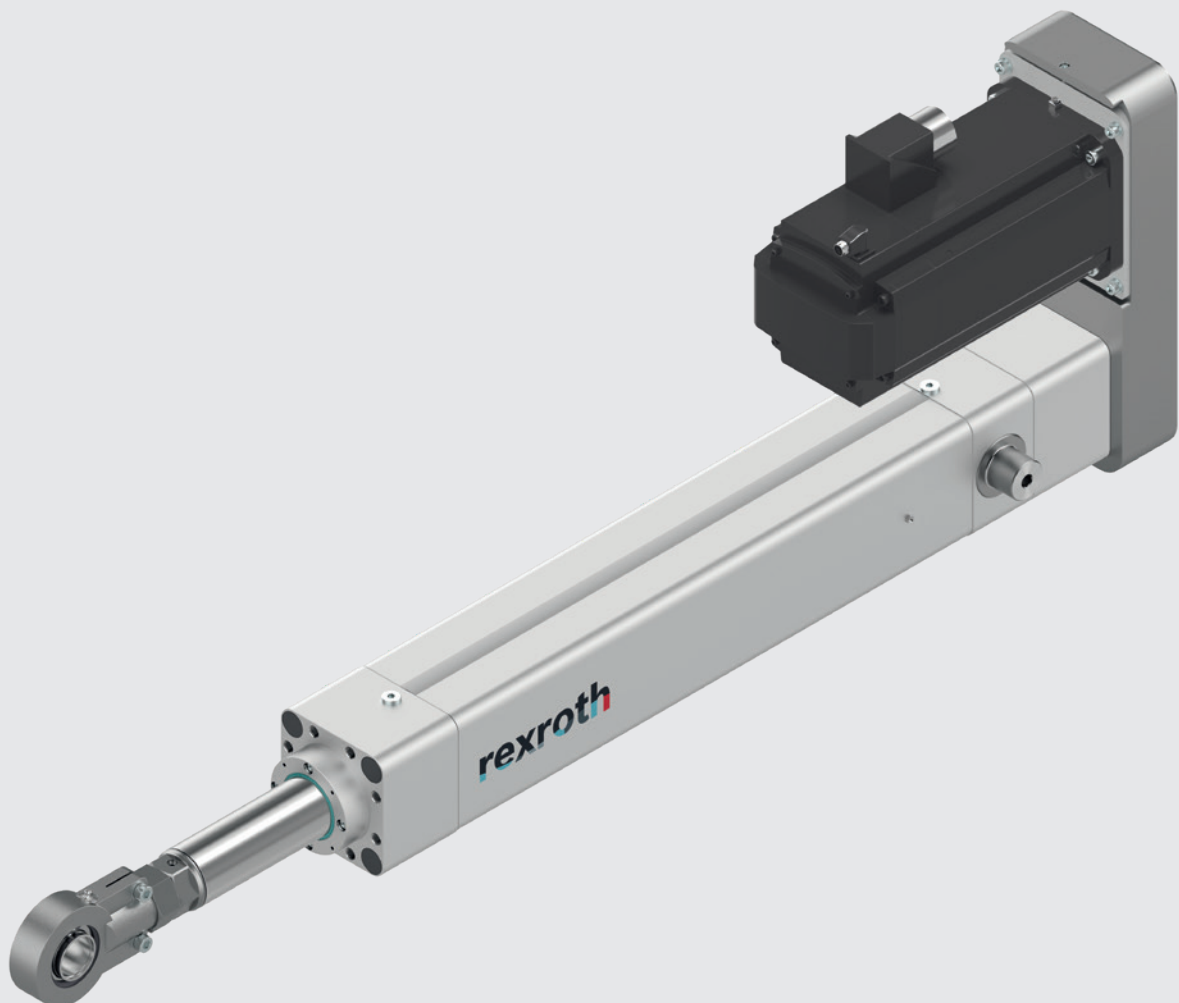


Electromechanical cylinder EMC-HP

R320103219/2021-11
EN



Instructions



The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain purpose can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. Please note that our products are subject to a natural process of wear and aging.

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The title page contains an illustration of a sample configuration. The product as delivered can differ from the illustration. The original instructions are in German.

Any dissemination of the product must include these mounting instructions and the safety instructions and information for linear motion systems R320103152.

Die vorliegende Anleitung ist in folgenden Sprachen verfügbar.
These instructions are available in the following languages.

DE German (Original document)

EN English

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1 About this documentation

1.1 Validity of the documentation

This documentation applies to the following products:

- Electromechanical Cylinders EMC-HP as described in the catalog "Electromechanical Cylinders EMC-HP".

This documentation is intended for assembly/installation personnel, line operators and machinery/plant users or manufacturers.

This documentation contains important information for proper and safe installation, operation, maintenance and disassembly of the electromechanical cylinder EMC-HP and for troubleshooting simple errors oneself.

- Before commencing any work with the product, be sure to read these Instructions and the "Safety Instructions for linear motion systems" carefully and completely.

1.2 Required and supplementary documentation

Documentation which is indicated by the book symbol  must be obtained before handling the EMC-HP and must be adhered to:

Table 1: Required documentation

	Title	Document number	Document type
	Safety instructions for linear motion systems	R320103152	Safety instructions
	Electromechanical cylinders EMC-HP	R999002086	Catalog
	Safety data sheet for Dynalub 510	R320103160	
	Safety data sheet for Dynalub 520	R320103161	
	Product data sheet for Dynalub 510	R310 2052	
	Product data sheet for Dynalub 520	R310 2053	
	System documentation from the system manufacturer		
	Instructions for the other system components		

The Rexroth documentation is available for download at www.boschrexroth.com/medienverzeichnis.

1.3 Presentation of information

To enable you to work rapidly and safely with the EMC-HP while following these instructions, this documentation uses standardized safety instructions, symbols, terms and definitions, and abbreviations. These are explained in the following sections.

1.3.1 Safety instructions in this document

This document contains safety instructions preceding any actions that involve a risk of personal injury or damage to property. The safety precautions described must be adhered to.

Safety instructions are structured as follows:

 SIGNAL WORD
Type and source of hazard! Consequences if ignored. ▶ Hazard prevention measure.

- **Warning sign:** draws attention to the hazard
- **Signal word:** indicates the severity of the hazard
- **Type and source of hazard:** indicates the type or source of the hazard
- **Consequences:** describes the consequences that may occur if the hazard avoidance precautions are ignored.
- **Hazard prevention measure:** indicates how to avoid the hazard

The safety instructions cover the following hazard classes. The hazard class describes the risks involved if the safety instruction is not complied with.

Table 2: Hazard classes according to ANSI Z535.6

Warning sign, signal word	Meaning
 DANGER	Indicates a hazardous situation which will result in death or serious injury if not avoided.
 WARNING	Indicates a hazardous situation which may result in death or serious injury if not avoided.
 CAUTION	Indicates a hazardous situation which may result in minor or moderate injury if not avoided.
NOTICE	Property damage: The product or surroundings may be damaged

1.3.2 Symbols

The following symbols indicate notes which are not related to safety but make the documentation easier to understand.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product will not be optimally used / operated.
▶	Single, independent work step
1.	Numbered work steps
2.	The numbers indicate the sequence of the work steps.
⇒ 7	See section 7
⇒  Fig. 7.1	See figure 7.1
	Screw with strength class ...
	Tightening torque
μ	Friction factor for screws

1.3.3 Abbreviations

The following abbreviations are used in this documentation:

Table 4: Abbreviations and definitions

Abbreviation	Meaning
EMC-HP	Electro M echanical C ylinder - H igh P ower
PLSA	P lanetary S crew A ssembly

2 Safety instructions

The general safety instructions for this product can be found in the documentation "Safety Instructions for linear motion systems". You must have read and understood these before handling the product.

3 Scope of delivery

The following is included within the scope of delivery:

- Electromechanical cylinders EMC-HP according to the ordered configuration
- "Safety Instructions for linear motion systems"
- Instruction manual "Electromechanical Cylinder EMC-HP"
- Final inspection certificate
- Upon receipt of the delivery, immediately check for completeness against the receipt and notify the carrier or Bosch Rexroth AG if any parts are missing.

3.1 Condition as delivered

- The electromechanical cylinder EMC-HP is delivered as a completely assembled unit. The only parts not pre-assembled are pillow blocks, clevis brackets and the switches.

3.2 Accessories

The following accessories are available:

- Fastening accessories
- Load measuring pin
- Switches
- Motor attachment kit (flange and coupling, timing belt side drive, gear unit)



Dimensions, material numbers, additional fastening accessories, and further information ►► Catalog "Electromechanical Cylinders EMC-HP".

4 Product description

4.1 Performance description

The electromechanical cylinder EMC-HP is a mechanical linear axis with a piston rod.

The mechanics are based on established screw drives, which convert the rotary motion of the motor into linear motion of the piston rod.

When installing vertically, it should be remembered that the screw drive is not self-locking and must therefore be secured against falling.

4.2 Device description

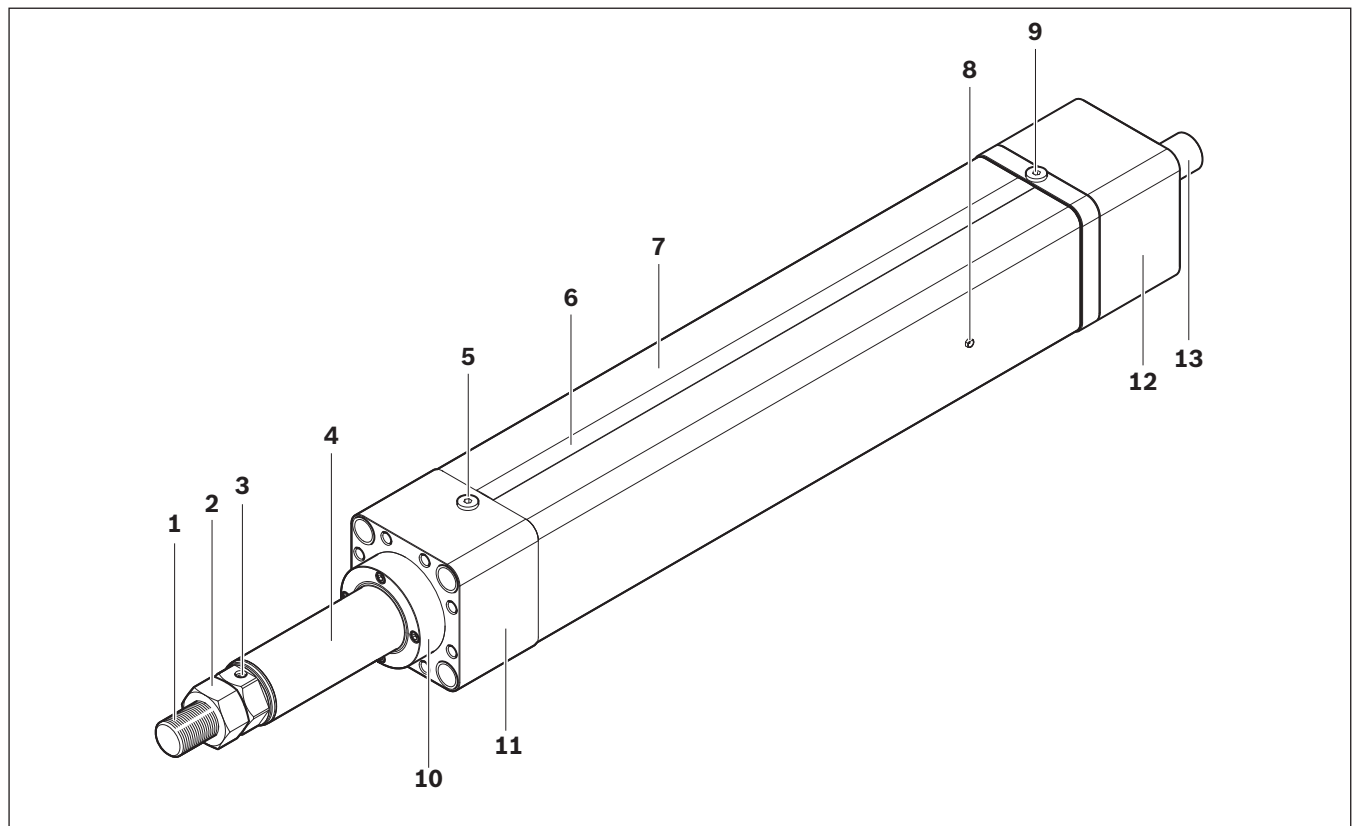


Fig. 1: Components of the electromechanical cylinder EMC-HP

An electromechanical cylinder EMC-HP comprises the following parts:

- | | |
|-----------------------------------|-------------------------------------|
| 1 Threaded bolt | 8 Lube nipple |
| 2 Hexagon nut | 9 Connection for air balance |
| 3 Wrench flats | 10 Seal holder |
| 4 Piston rod | 11 Cover |
| 5 Service opening | 12 Bottom |
| 6 Cover profile cable duct | 13 Drive journal |
| 7 Housing | |

4.3 Identification

► When ordering spare parts, please specify all the data on the nameplate.

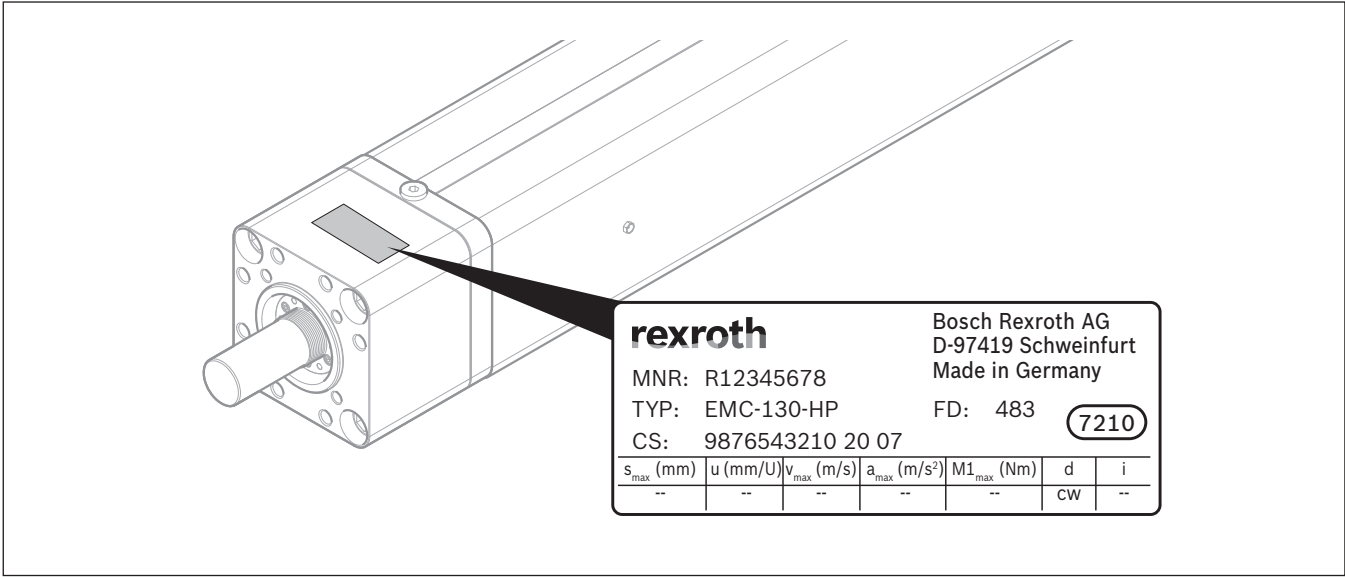


Fig. 2: Nameplate

The nameplate of the EMC-HP carries the following information:

Table 5: Information on nameplate

Name plate information	Meaning
MNR	Material number
TYP	Type designation and size
CS	Customer order number
FD	Date of manufacture
7210	Manufacturing location

The name plate contains additional technical data for start-up ➡ 7.1 on page 30.

5 Transport and storage

5.1 Transporting the EMC-HP

 **WARNING**

Risk of EMC-HP falling due to inadequate load hoisting equipment!
Death or severe injury.

- Use only inspected and suitable load handling equipment.
- Only attach load hoisting equipment to the housing and fasten with care.
- Do not stand under suspended loads.

NOTICE

Risk of damage to motor attachment through vibrations or shocks!

Motor can get torn off.

- ▶ When transporting the product with assembled motor, always provide support for the motor.
or
- ▶ Disassemble the motor prior to transport.

Risk of damage to the product due to improper transport/lifting ⇒ Fig. 3!

Damage to the EMC-HP.

- ▶ Pay attention to the center of gravity (C).
- ▶ Avoid damage.
- ▶ Retract the piston rod (1).
- ▶ Attach slings to the bearing housing and the front end of the housing (1).
- ▶ Prevent the EMC-HP from swinging during transport (2).
- ▶ Do not lift the EMC-HP by the piston rod (3).
The screw drive is not self-locking.
- ▶ With motor attachment (4/5) and (6/7 with holding brake), take note of the changed center of gravity and attach the rear sling to the flange or gear unit, if necessary.

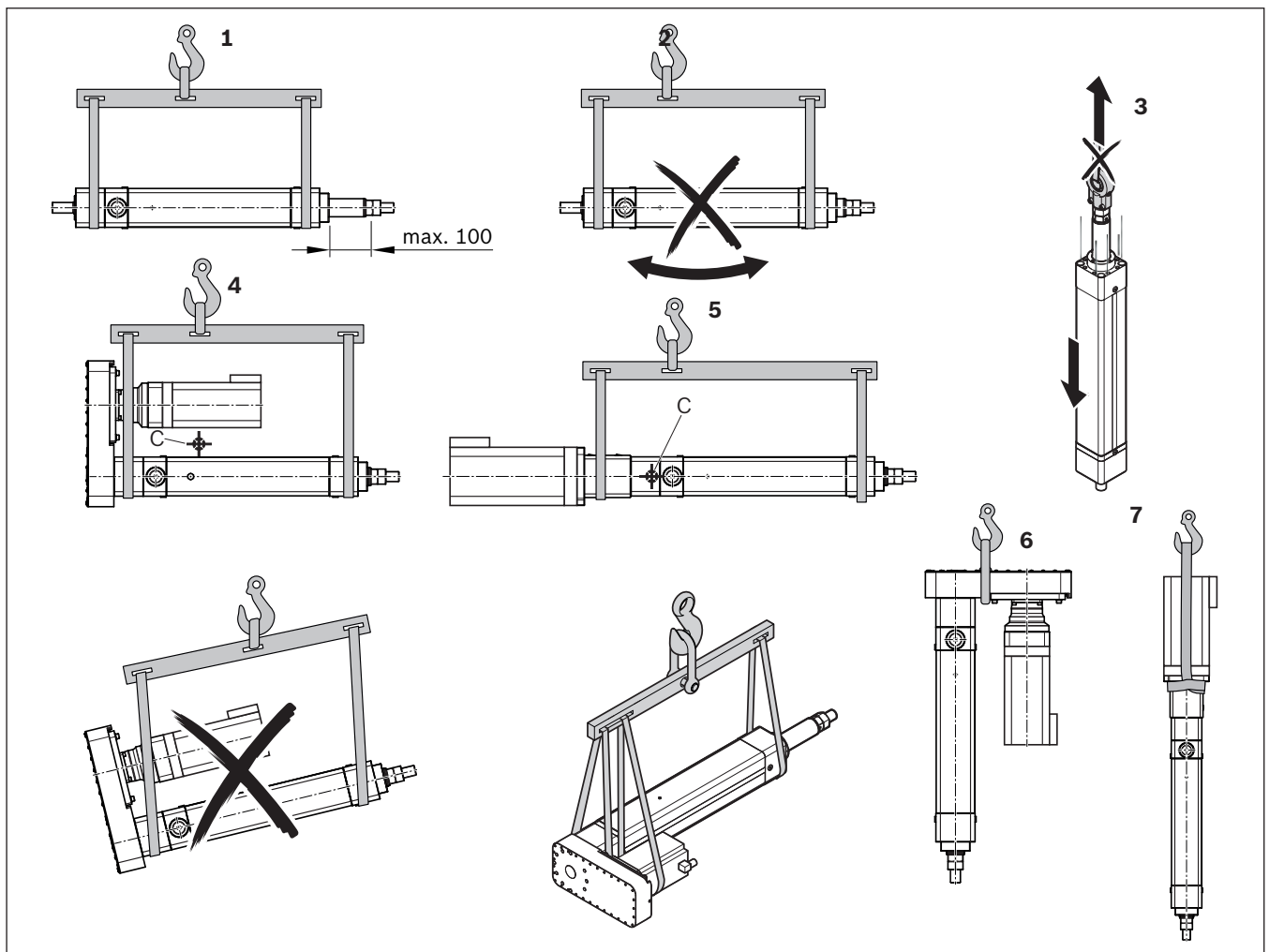


Fig. 3: Transporting the EMC-HP

5.2 Storing the EMC-HP

NOTICE

Risk of damage due to improper storage!

Potential corrosion of EMC-HP parts.

- ▶ Store the EMC-HP only in a roofed, dry area.
- ▶ Protect the EMC-HP from humidity and corrosive influences.

6 Mounting

For dimensions and material numbers of the individual components ➡ Catalog "Electromechanical Cylinders EMC-HP".

⚠ WARNING

Risk of EMC-HP crashing down in vertical or hanging installations due to lack of protection against falling loads!

Death or severe injury.

- ▶ Secure the EMC-HP against falling.
- ▶ Do not stand under the EMC-HP in the hazard zone.

- ▶ Before hoisting the EMC-HP, take note of the weight ➡ Catalog "Electromechanical Cylinders EMC-HP", chapter "Technical Data".

6.1 Unpacking the EMC-HP

1. Before hoisting the EMC-HP, take note of the weight ➡ Catalog "Electromechanical Cylinders EMC-HP", chapter "Technical Data".
2. Lift the EMC-HP out of the packaging and remove the packaging material.
3. Dispose of the packing material according to the local regulations in your country.

6.2 Required accessories

- ▶ Use suitable screws for fastening.

6.3 Installation conditions

- Observe the operating conditions ► 14 on page 40 and the catalog "Electromechanical Cylinders EMC-HP".
- For special operating conditions, please contact us.

NOTICE

Risk of damage due to improper loads!

Damage to the product.

- Do not attach any projecting loads.
- Do not turn the piston rod.
- Do not use the housing for attaching other optional machine elements to absorb forces.
- Attach only standard Rexroth elements to the housing.

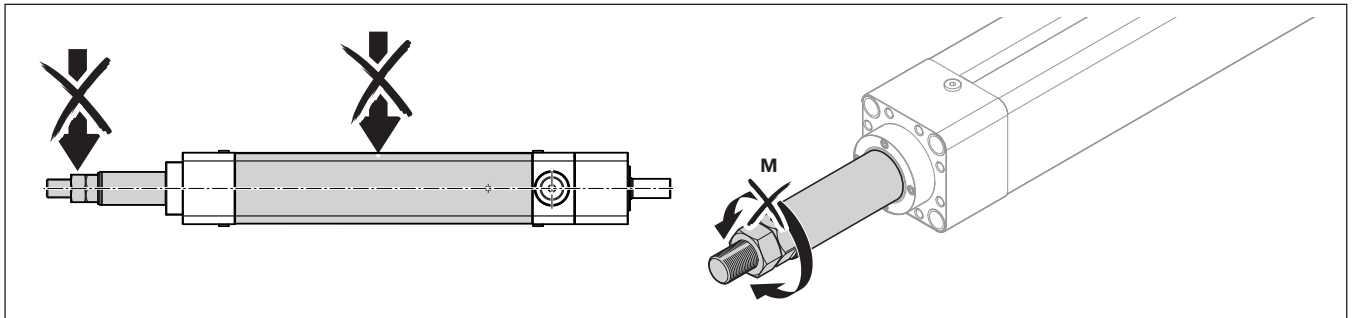


Fig. 4: Non-permissible loads

6.4 Installation position

The EMC-HP can generally be installed in any position.

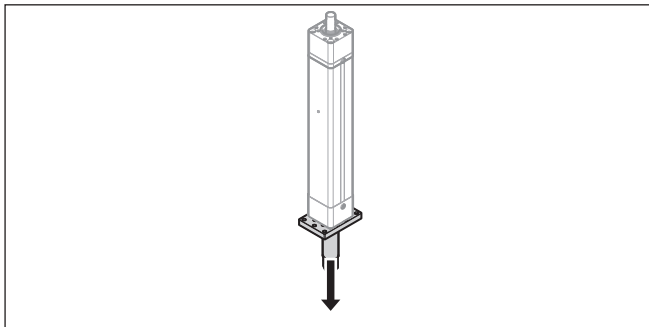


Fig. 5: EMC-HP with flange

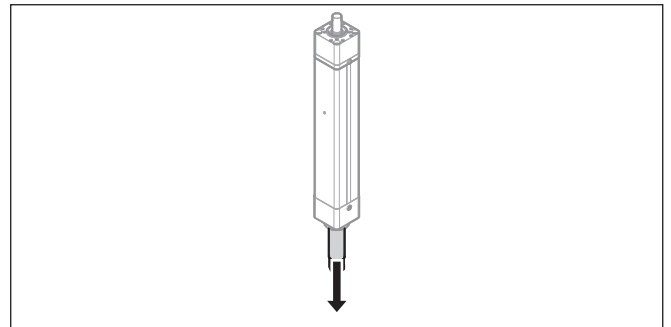


Fig. 6: Secure the piston rod against falling



For the version with flange, only vertical mounting is permissible!

! WARNING

Risk of piston rod crashing down in vertical or slanting installations due to lack of arrestor devices!

Death or severe injury.

- In vertical or slanting installations, secure the piston rod of the EMC-HP against falling.
- Do not stand in the fall direction of the piston rod.

6.5 Fastening elements

The EMC-HP is supplied with the ordered fastening elements. Foot mounting, pillow blocks and clevis brackets are not ready-mounted on the EMC-HP upon delivery.

The fastening elements can also be ordered separately as accessories. Fastening elements can be mounted at the following locations on the EMC-HP:

- 1 Timing belt side drive (customer-built accessories may be attached here)
- 2 Threaded bolt (customer-built accessories may be attached here)
- 3 Cover (only Rexroth fastening elements permissible here)
- 4 Bottom (only Rexroth fastening elements permissible here)

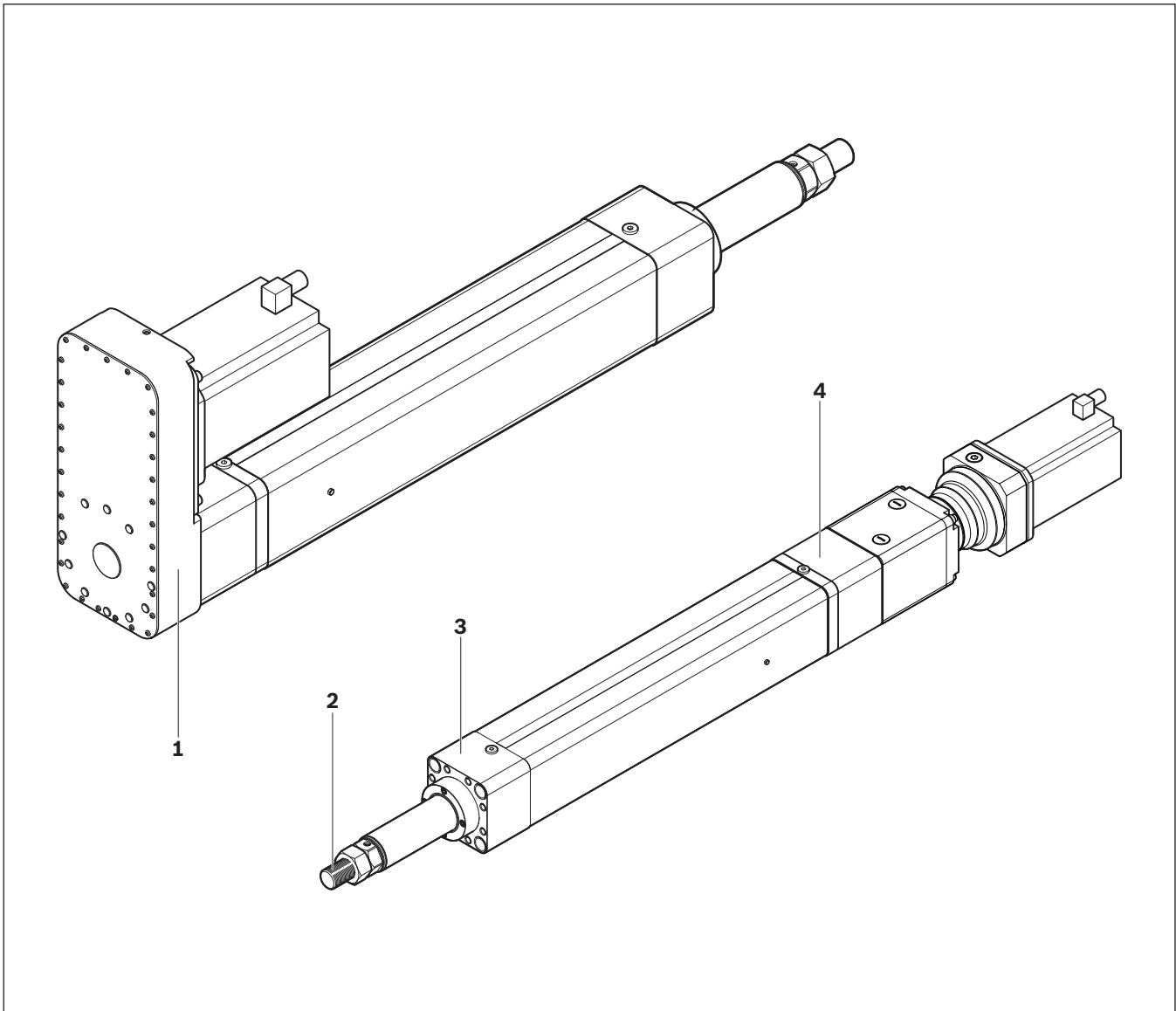
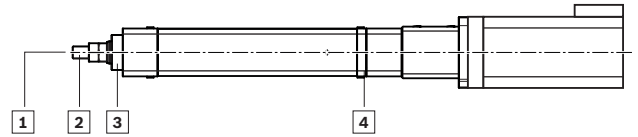
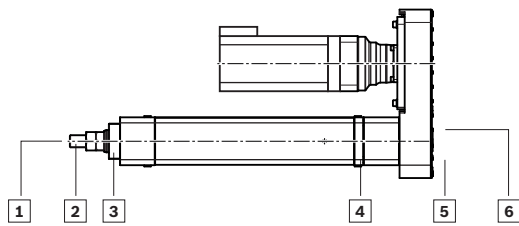
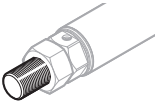
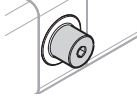
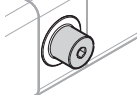
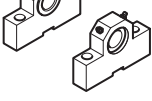
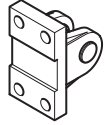
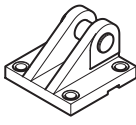
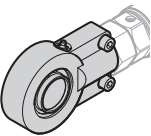
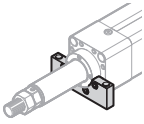
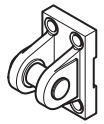
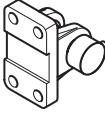
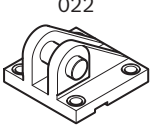
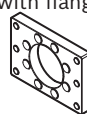


Fig. 7: Fastening options on the EMC-HP



Group 1	Group 2		Group 3		Version	Group 4	Group 5	Group 6
000	011 		000		Motor attachment with flange F001	002 with trunnion 		000
000						002 with trunnion 	000	001 
021 							000	000
022 	012 		011 Foot mounting 		Motor attachment with belt side drive S000 S090 S180 S270	000 without trunnion	011 (not with screw cooling) 	000 021 
031 ¹⁾ 								022 
								031 ¹⁾ 
			014 with flange 			000 without trunnion	000	000

¹⁾ With load measuring pin

6.5.1 Mounting fastening elements on the EMC-HP



CAUTION

Risk of exceeding the permissible load!

Risk of injury.

► Ensure that the actual load does not exceed the max. axial force values ➡ Chapter "Maximum Axial Loading of Mechanical Cylinder System $F_{max EMC-HP}$ " in the catalog "Electromechanical Cylinders EMC-HP".

Mounting the spherical rod end bearing

NOTICE

Risk of twisting the piston rod due to incorrect mounting!

Damage to the EMC-HP due to application of torque!

► Take care not to subject the piston rod to torsion when tightening and loosening the lock nut.

1. Screw the lock nut **(1)** onto the threaded bolt to the stop.
2. Screw the spherical rod end bearing to the stop/to the lock nut on the threaded bolt and align. To align, turn back the lock nut max 1.5 revolutions against the spherical rod end bearing.
3. Tighten the lock nut against the spherical rod end bearing, at the same time observing the tightening torques **M_K** .
4. Tighten the mounting screws **(2)** in equal steps, at the same time observing the tightening torques **M_B** .
5. Mount any further fastening elements as shown in the illustration. Tighten the fixing screws in equal steps, at the same time observing the tightening torques **M_B** .

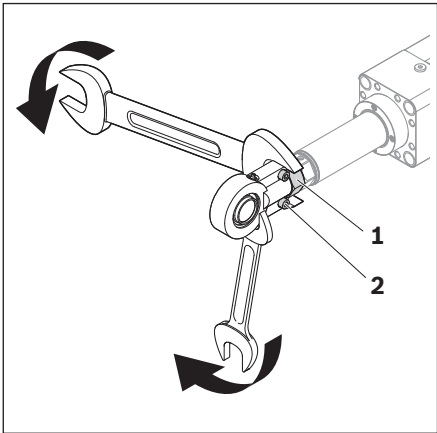
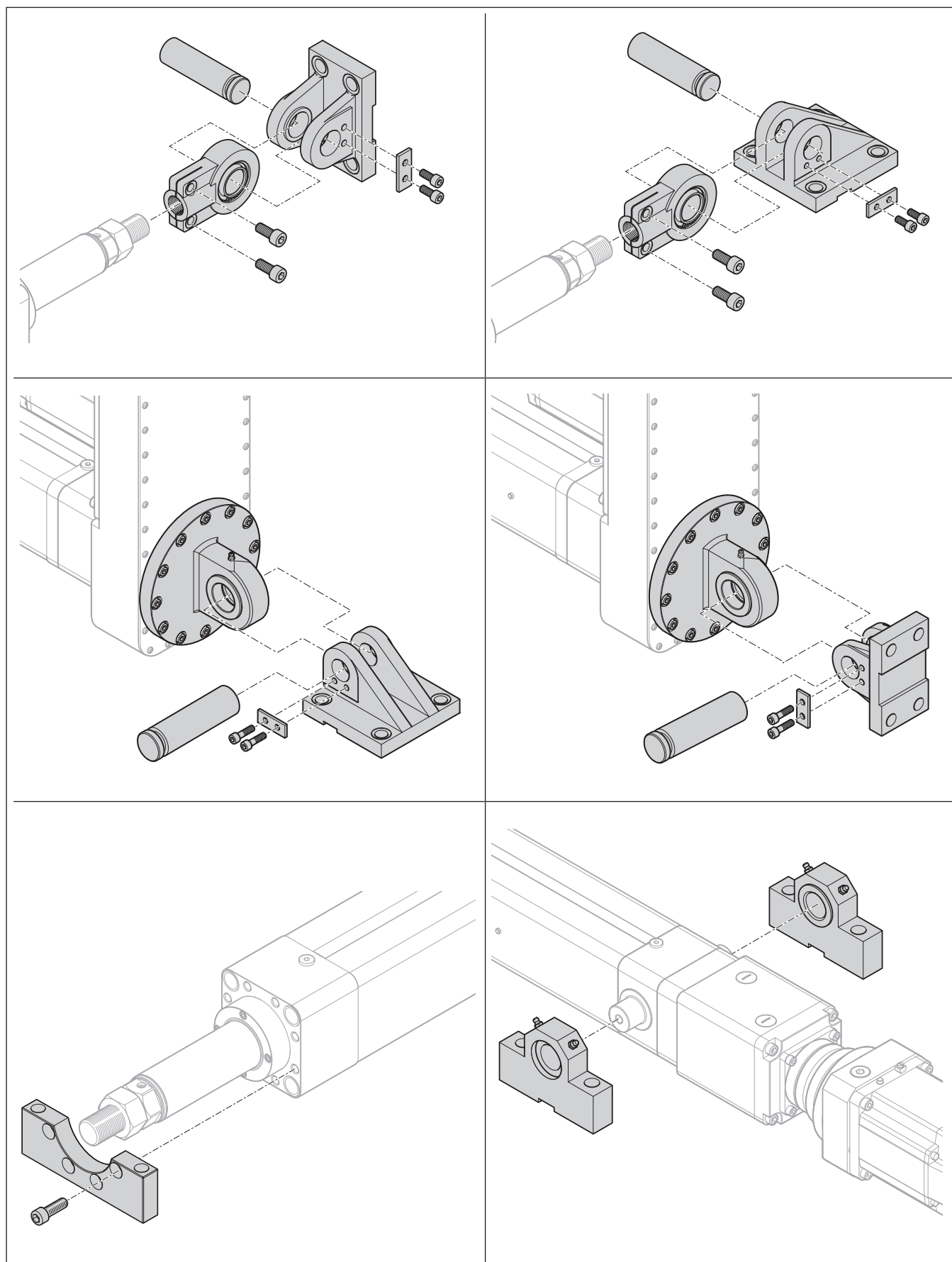


Fig. 8: Mounting the spherical rod end bearing

Table 6: Tightening torques for the spherical rod end bearing

Size	Tightening torque	
	Lock nut M_K	Fixing screws M_B
	(Nm)	(Nm)
EMC-115-HP	25	59
EMC-130-HP	30	59
EMC-160-HP	30	100

**Fig. 9: Mounting the fastening elements**

Mounting the load measuring pin

The load measuring pin replaces the standard pin. Like the standard pin, it is installed between the spherical rod end bearing and the clevis bracket or in connection with the belt side drive between the swivel bearing and the clevis bracket.

i The load measuring pin may only be used on the EMC-HP version with anti-twist feature. It is not suitable for absorbing torques!

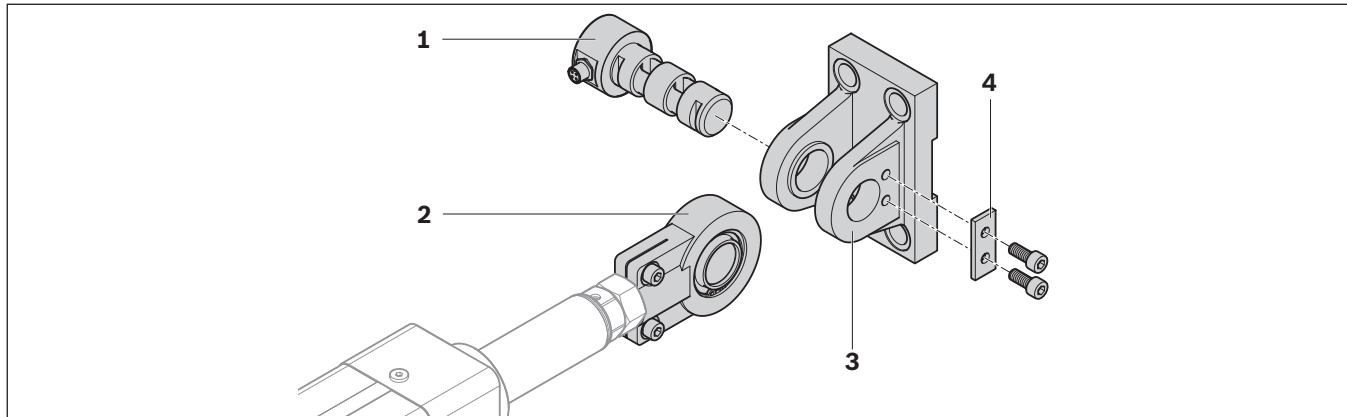


Fig. 10: Load measuring pin

1. Remove the pin lock (4) on the standard pin.
2. Take out the standard pin.

NOTICE

Potential malfunction due to incorrect mounting!

Damage to the load measuring pin or even failure.

- Push the load measuring pin into the bore by hand.
- Do **not** use a hammer or press to fit the load measuring pin.

3. Push the load measuring pin (1) by hand between the spherical rod end bearing (2) and the clevis bracket (3).
4. Use the included pin lock (4) to secure the load measuring pin (1) axially and against twisting on one side of the clevis bracket (3).
5. Align the electrical connection on the load measuring pin according to the application. Polarity of the connection
 ➔ Fig. 11 on page 16.

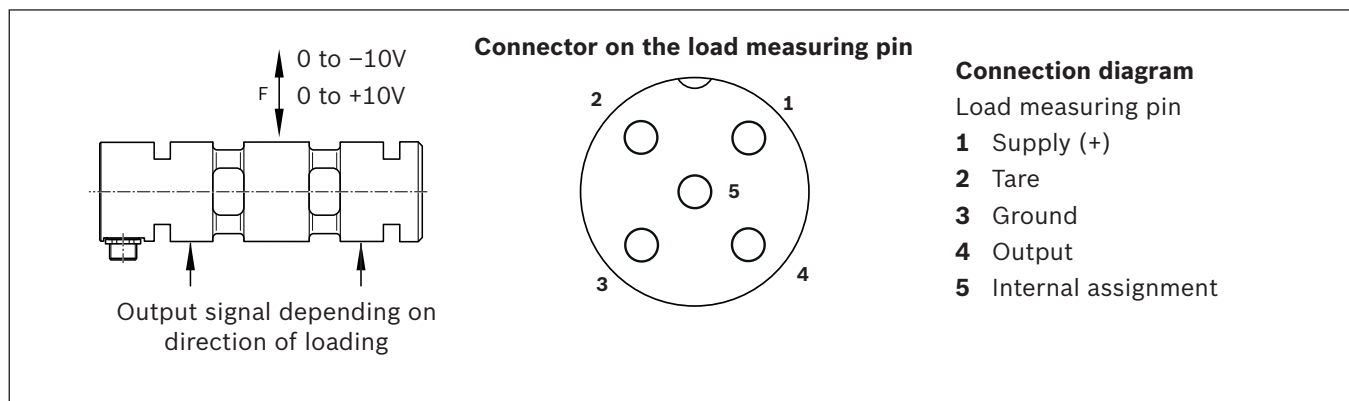


Fig. 11: Connecting the electrical power supply to the load measuring pin

Table 7: Metrological specifications for load measuring pin

Measurement range	EMC-115-HP: 44 kN
	EMC-130-HP: 70 kN
	EMC-160-HP: 100 kN
Material	Stainless steel
Protection class	IP65
Hardness (load range)	38 HRC
Mechanical system	
Operating load	150% of MB ¹⁾
Breaking load	300% of MB
Accuracy	
Non-linearity	±0.5% of MB
Repeatability	±0.25% of MB
Hysteresis	±0.2% of MB
Temperature drift at zero point	±0.05% of MB/K. ²⁾
Temperature drift over measurement range	±0.05% of MB/K.
Compensated temperature	+10 ... +40 °C
Operating temperature	-20 ... +60 °C

Table 8: Electrical specifications for load measuring pin

	EMC-115-HP, EMC-160-HP	EMC-130-HP
Output signal 0 kN	0 ±0.03 V	0 ±0.03 V
Output signal MB	-10 ... 10 V ±0.2 V	-10 ... 10 V ±0.2 V
Power supply voltage	19 ... 28 V	24 V ±2 V
Tare (zero setting function)	7.2 ... 24 V	7.2 ... 24 V
Current consumption	50 mA (24 V)	25 mA (24 V)
Bandwidth	2.5 ±0.2 KHz	2.5 ±0.2 KHz
Connection	Connector M12x1	Connector M12x1

¹⁾ MB = Measurement range

²⁾ MB/K. = Measurement range per Kelvin

Connection cable

Table 9: Technical data, connection cable

Length	5 m
Rated voltage	250 V
Rated current	4 A
Connector outlet	angled
Connection type 1	Female connector M12, 4-pin
Connection type 2	Flying leads
Type of cable	PUR black, shielded
Suitable for drag chains	ja
Cable cross-section	4x0.34 mm ²
Cable diameter D	5.9 ±0.2 mm
Static bending radius	>10 x D
Dynamic bending radius	>5 x D
Bending cycles	> 2 million
Ambient temperature, stationary	-25 ... +80 °C
Ambient temperature, in motion	-40 ... +80 °C
Protection class	IP65

Table 10: Colors, connection cable

Color	Function
brn	Supply (+)
wht	Tare
blu	GND 0V
blk	Output
-	Internal assignment

6.6 Fastening the EMC-HP to the adjoining structure

⚠ WARNING

Risk of piston rod crashing down in vertical or slanting installations due to lack of arrestor devices!

Death or severe injury.

- ▶ In vertical or slanting installations, secure the piston rod of the EMC-HP against falling.
- ▶ Do not stand in the fall direction of the piston rod.

NOTICE

Risk of distortive stress on the EMC-HP due to incorrect fastening!

Malfunction of the EMC-HP.

- ▶ Avoid any distortive stress on the piston rod and housing.

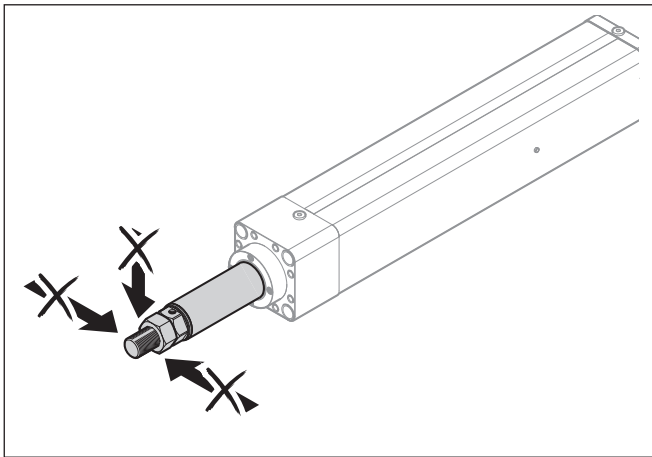


Fig. 13: Avoid distortive stress

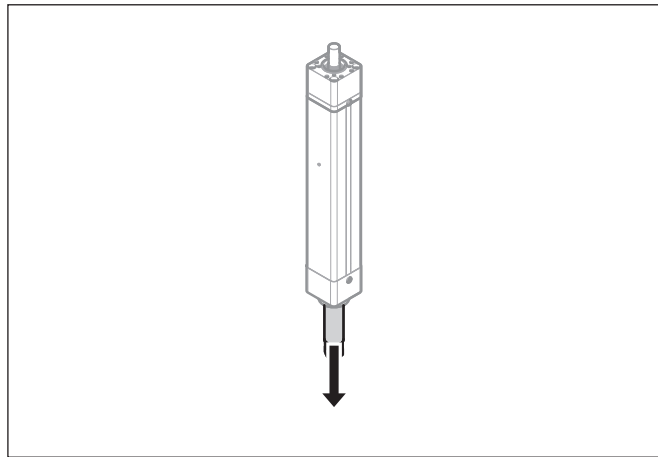


Fig. 12: Secure the piston rod in vertical installations

1. Bring the EMC-HP into position (piston rod extended/retracted).
2. To extend the piston rod, turn the drive journal of the EMC-HP counterclockwise. It is best to turn the drive journal by hand.
If a motor brake is installed, loosen it and remove the sealing plug (1). Insert the Allen key into the end of the screw and turn to set the piston rod position. Screw in the screw plug.
If the piston rod is extended using the motor, use only a low motor speed.

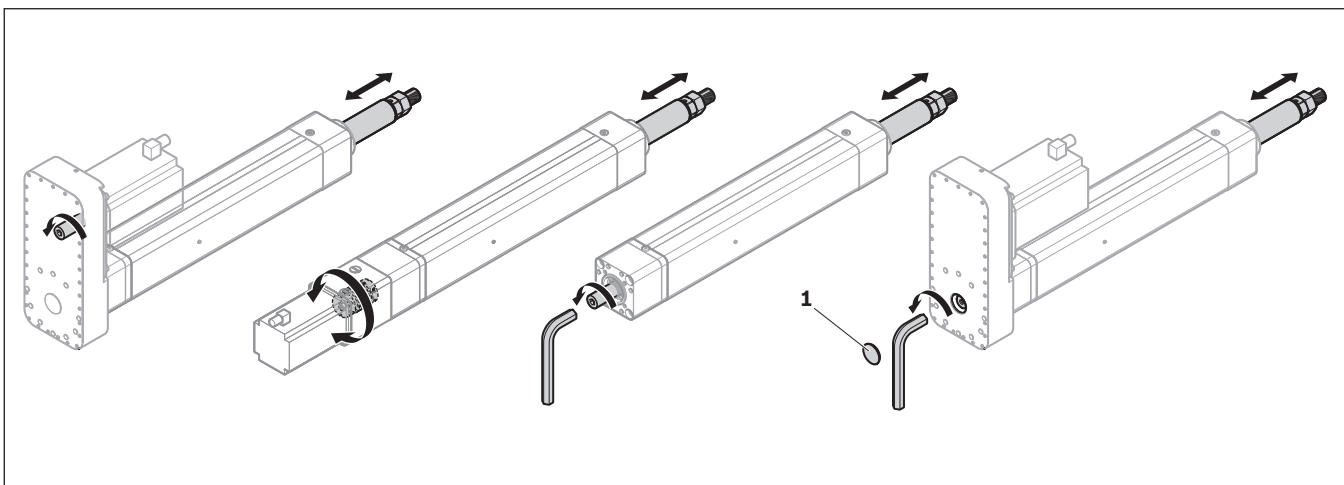


Fig. 14: Extending the piston rod

6.7 Mounting the electric drive

NOTICE

Risk of excessive torque and rotary speed if limits are not observed!

Damage to the EMC-HP.

- Observe the specified limits.

Technical data and limits ➡ Catalog "Electromechanical Cylinders EMC-HP".

The EMC-HP has the following drive types:

- Flange (2) and coupling with motor (1) (optionally with gear unit)
- Timing belt side drive (3) with motor (1) (optionally with gear unit)

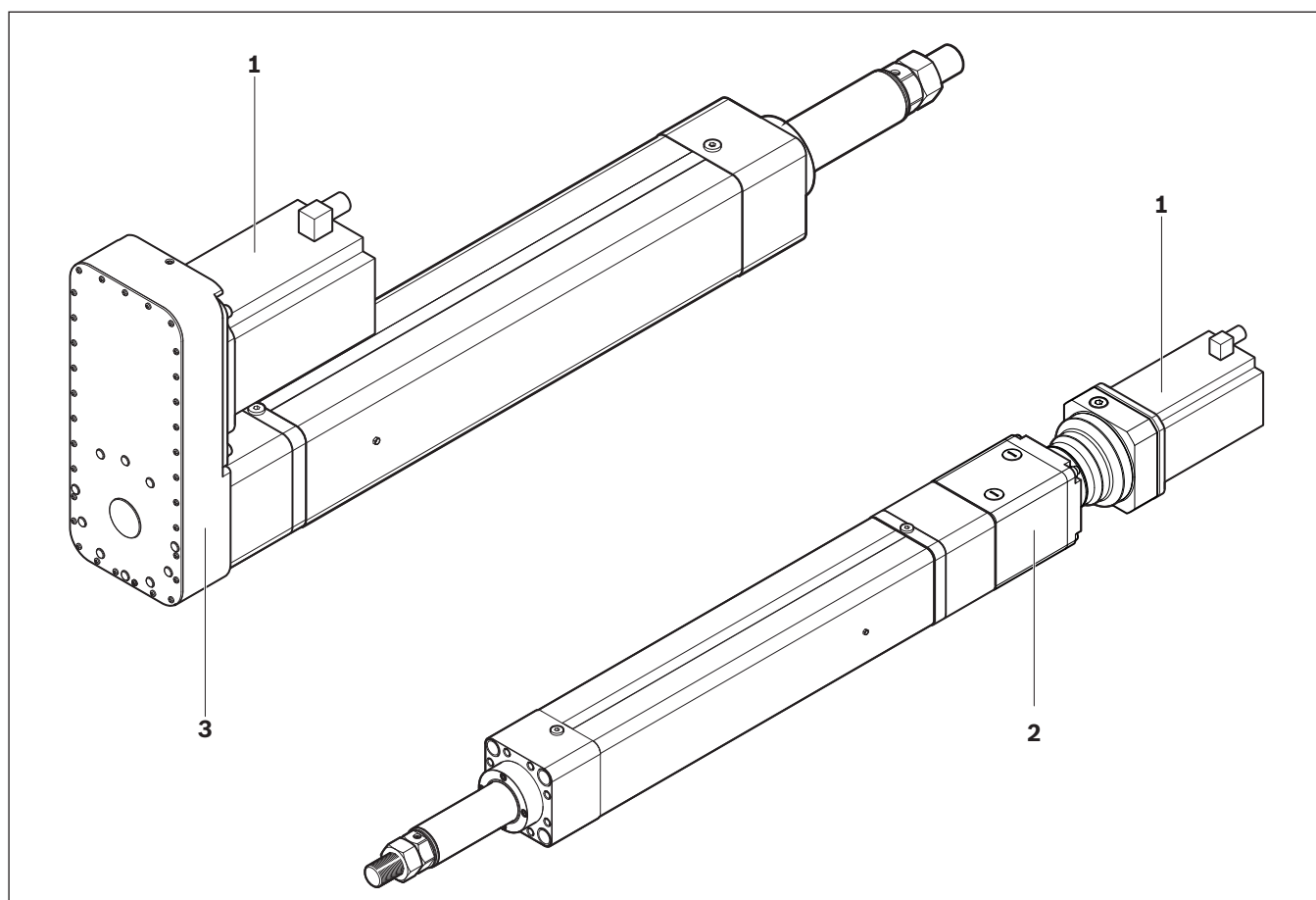


Fig. 15: Drive types

6.7.1 Mounting the motor with flange and coupling

 The screw journal of the EMC-HP and the motor journal must be completely free of grease and oil before mounting. Observe specified tightening torque ➡ Table 20 on page 40.

1. Push the flange (4) into the locating feature on the EMC-HP and screw down using four screws (5). Observe the specified tightening torques ➡ Table 20 on page 40.

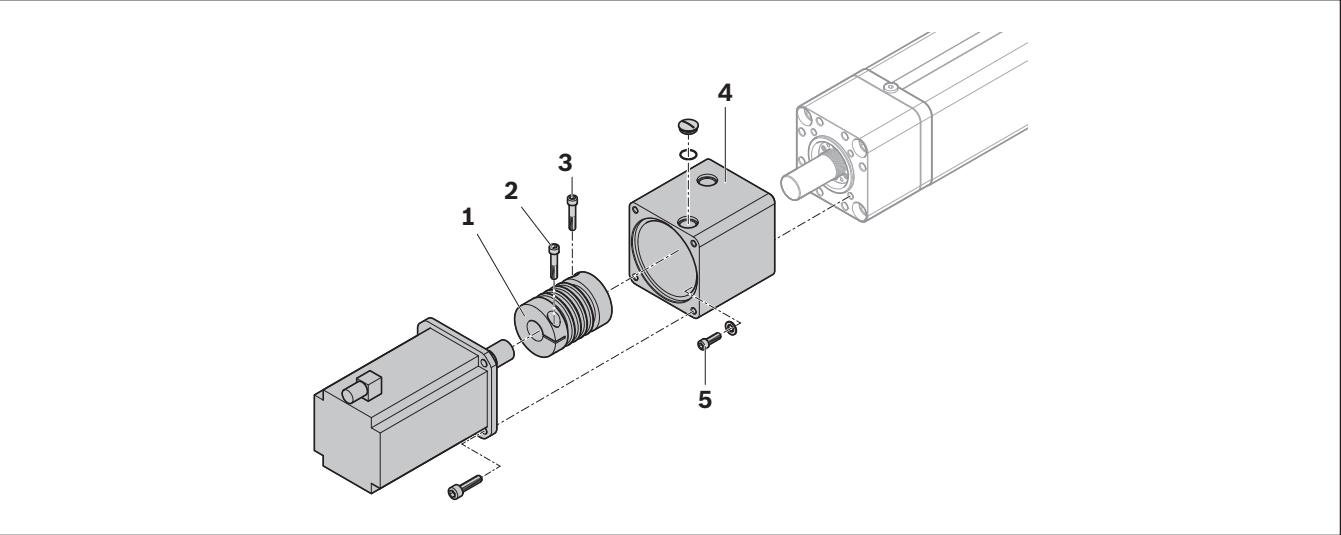


Fig. 16: Mounting the flange with coupling

2. Insert the coupling (1) in the flange (4) on the screw journal of the EMC-HP until a mounting screw (3) on the coupling becomes accessible through the bore in the flange.
3. Adjust dimension A.

Table 11: Adjusting dimension A

Motor	Gear ratio i =	A (mm)		
		EMC-115-HP	EMC-130-HP	EMC-160-HP
MS2N07	1	10	10	—
MS2N10	1	10	10	7
	3	—	—	7

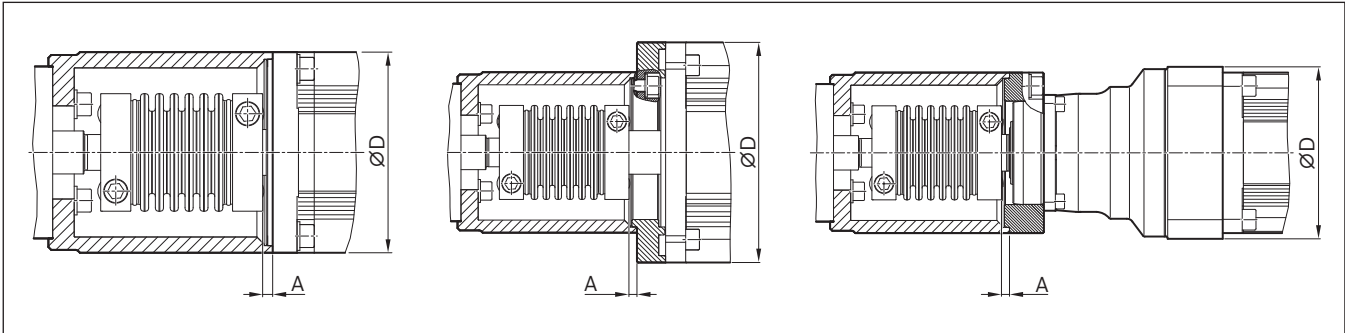


Fig. 17: Adjusting dimension A

4. If necessary for tightening the screw (1), move the piston rod (2) so that the screw journal turns.

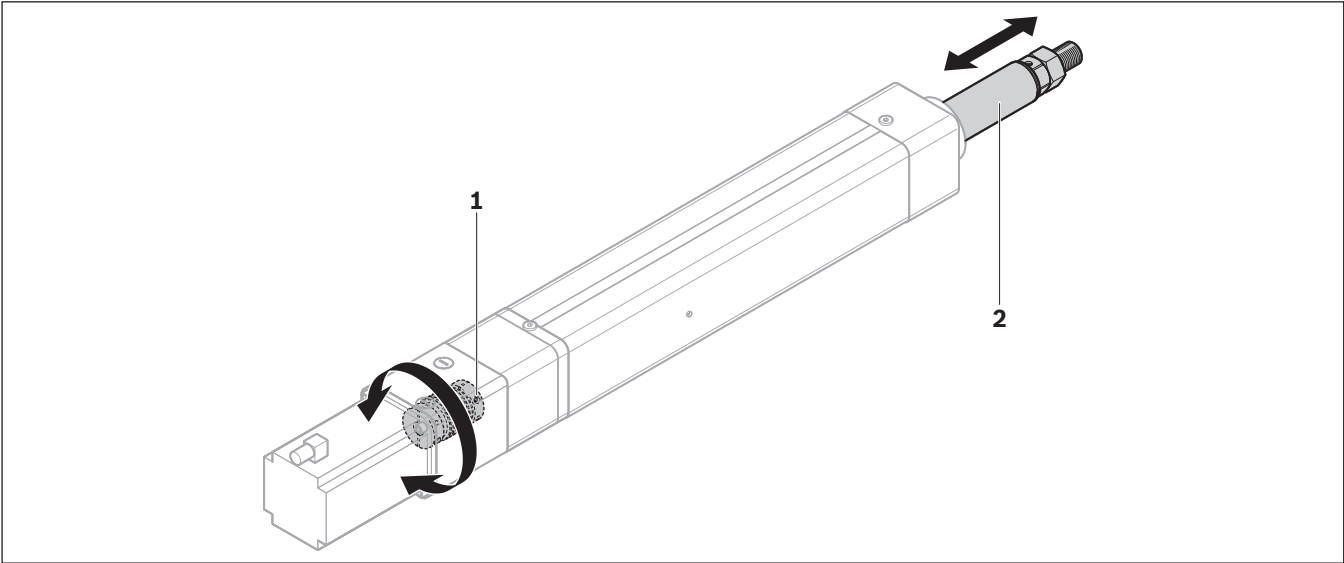


Fig. 18: Moving the piston rod

5. Tighten the fixing screw (3) of the coupling with the tightening torque M_A ➔ Table 12 on page 21.

Table 12: Tightening torques for the coupling

 12.9	M10	M12
⌀ M_A (Nm)	50	85

6. Insert the motor into the locating feature of flange and coupling ➔ Fig. 16 on page 20.
7. Tighten the four screws to the specified tightening torque ➔ Table 12 on page 21.
8. Tighten the fixing screw (2) of the coupling on the motor side with the tightening torque M_A ➔ Table 12 on page 21.
9. If necessary for tightening the second screw (3), release the motor brake and move the piston rod so that the screw journal turns.
10. Seal all threads in the flange using screw plugs.

6.7.2 Mounting the motor with belt side drive

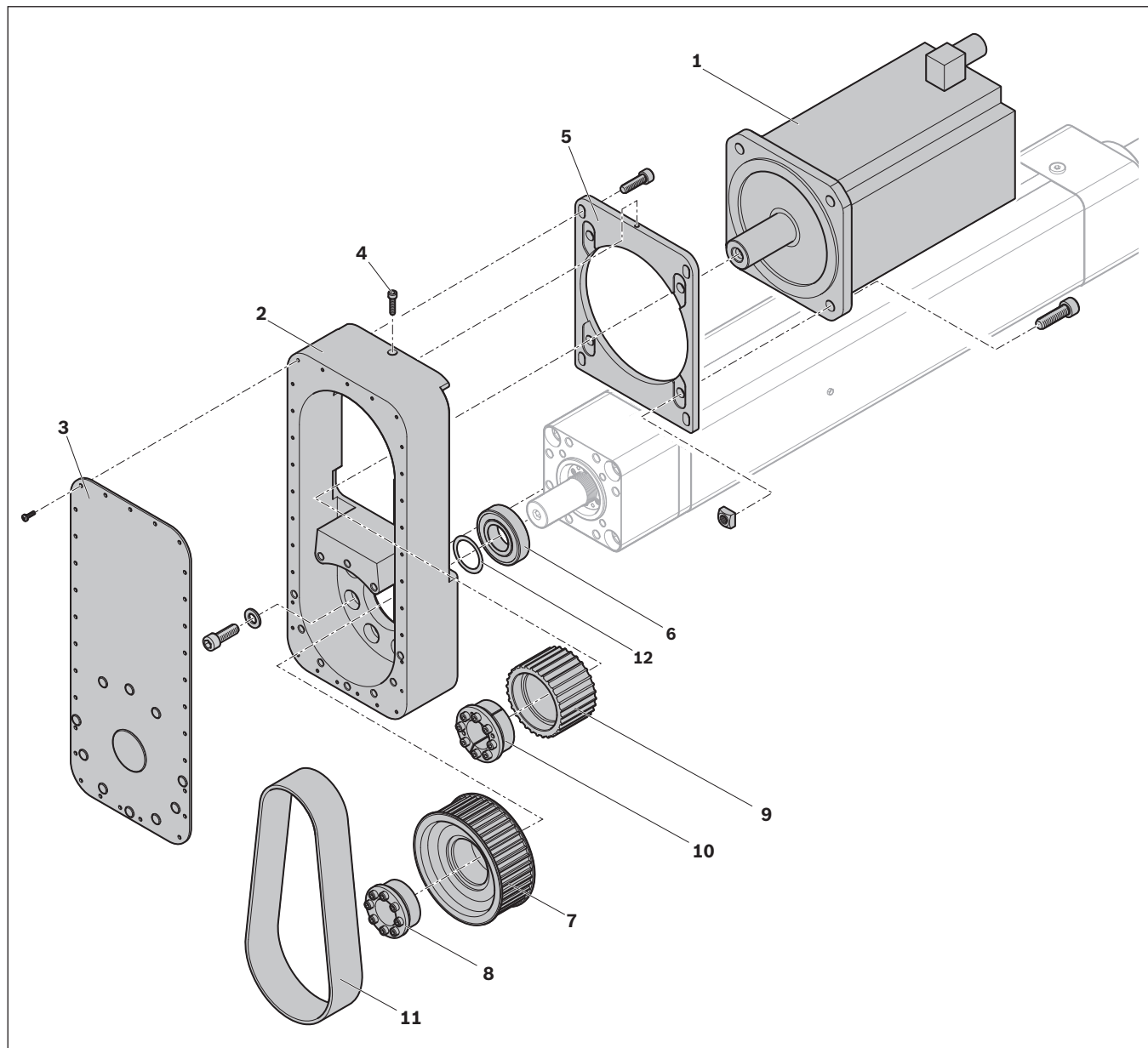


Fig. 19: Mounting the timing belt side drive and motor on the EMC-HP

- | | | |
|--------------------------|------------------------------------|-----------------------------------|
| 1 Motor | 5 Adapter plate | 9 Belt pulley (motor-side) |
| 2 Housing | 6 Bearing (in the housing) | 10 Tensioning unit |
| 3 Housing cover | 7 Belt pulley (system-side) | 11 Toothed belt |
| 4 Adjusting screw | 8 Tensioning unit | 12 Washer |

i When mounting, all screws that are not coated with threadlocking adhesive on delivery should be secured with medium-strength threadlocking adhesive.

Mounting the housing and system-side belt pulley

1. Push the bearing (6) onto the screw end.
2. Align the housing (2) to the bearing.
3. Screw on the housing (2) of the timing belt side drive to the EMC-HP. Observe the mounting orientation and the specified tightening torques ➔ Table 20 on page 40.
4. Push the washer (12) onto the screw end. Push the system-side belt pulley (7) with fitted toothed belt (11) and tensioning unit (9) onto the journal of the EMC-HP until it reaches the stop. ➔ Fig. 19 on page 22.
5. Push the tensioning unit (8) into the belt pulley (7) up to the stop.
6. Evenly tighten the screws (13) cross-wise in several stages to the specified tightening torques ➔ Fig. 21 on page 23.

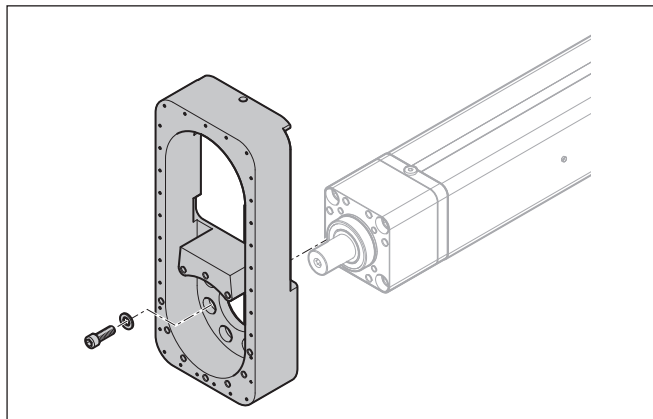


Fig. 20: Mounting the housing

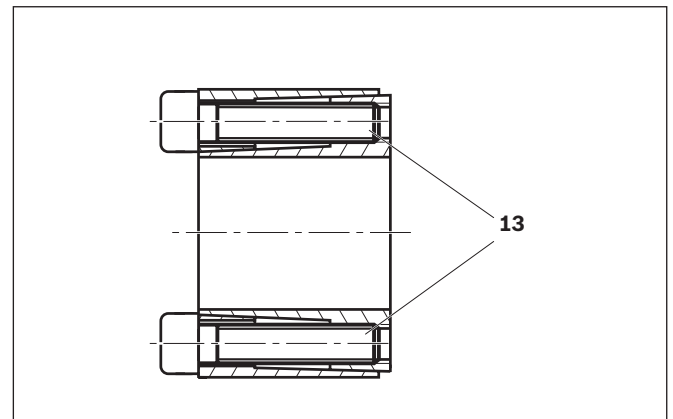


Fig. 21: Tensioning unit

Table 13: Tightening torque for the tensioning units

 $\mu = 0.125$	M6	M8	M10
$\odot M_A$ (Nm)	17	41	83

Mounting the motor-side belt pulley and motor/gear unit.

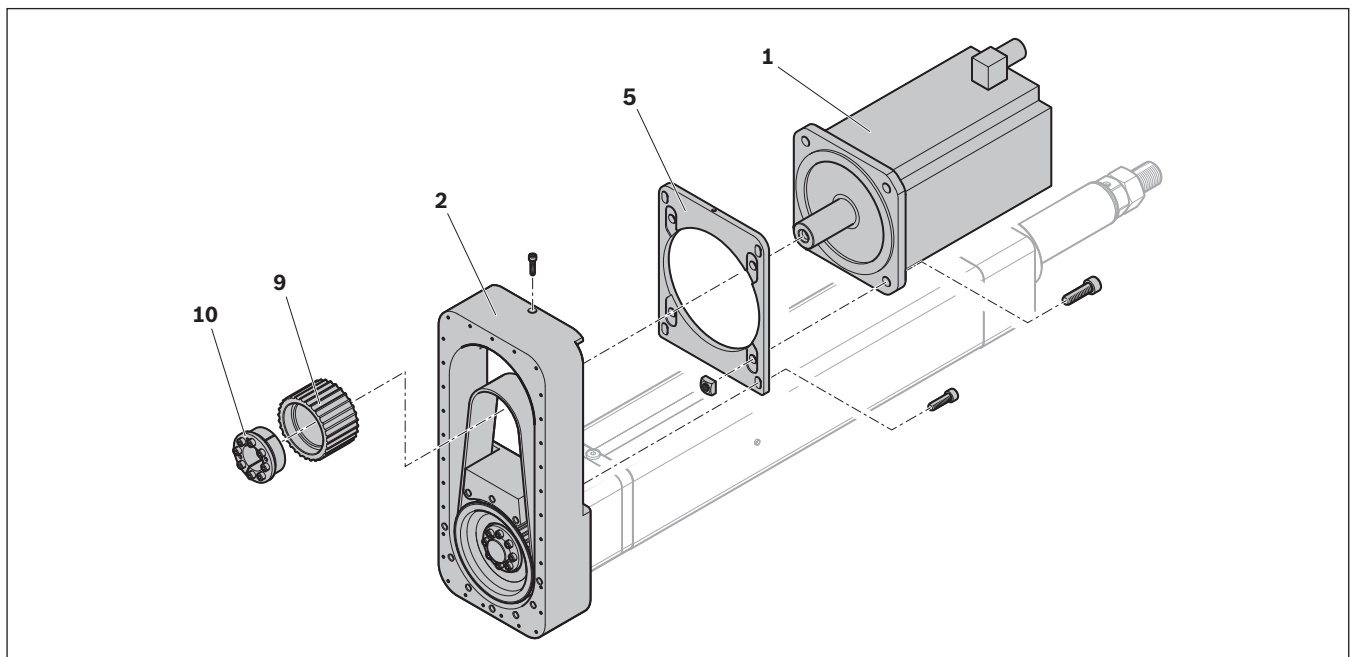


Fig. 22: Mounting the adapter plate

1. Mount the adapter plate (5) on the motor (1) or gear unit.
2. Pre-mount the motor or gear unit with adapter plate (5) on the housing (2) so that the adapter plate can still be adjusted.
3. Attach the belt pulley (9) and tensioning unit (10) to the motor journal and guide into the toothed belt (11).
4. Push the tensioning unit into the belt pulley right up to the stop.
5. Set a clearance of 2.5 (± 0.2) mm between belt pulley and cover plate.
6. Evenly tighten the screws (13) cross-wise in several stages to the specified tightening torques ➡ "Tightening torques" on page 40.
7. Centrally align the toothed belt on the belt pulley.
8. Screw down the adjusting screw (4) through the housing into the adapter plate.
9. Adjust the belt frequency using a frequency gauge and adjusting screw (4) (for the table refer to the cover inside of the belt side drive).
10. Tighten the screws in the adapter plate ➡ Table 20 on page 40.
11. Check the belt frequency and adjust again if necessary.
12. Mount the cover (3) on the housing.
13. Mount the motor (1) at the gear unit (if available).
14. Perform a functional check.

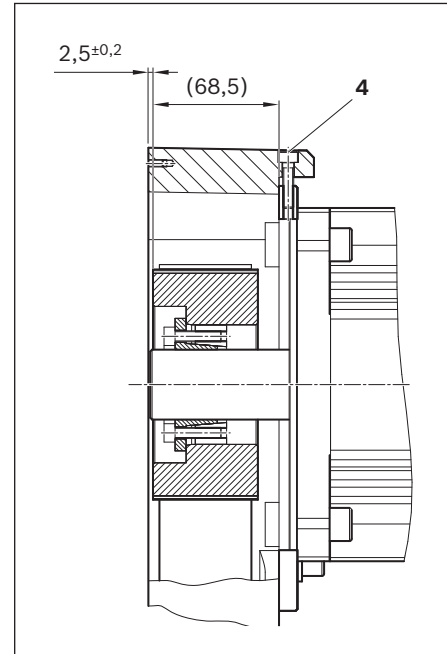


Fig. 23: Belt pulley clearance

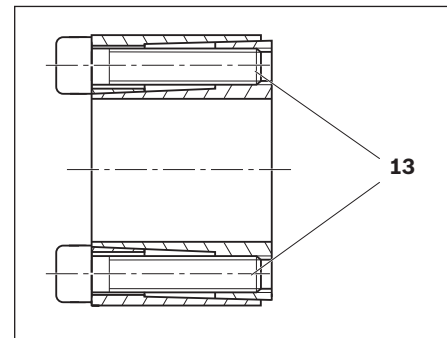


Fig. 24: Tensioning unit

6.8 Mounting the switching system

NOTICE

Risk of collision due to incorrect mounting of the switching system!

Damage to the EMC-HP, adjoining structure and workpieces.

6.8.3 Mounting the switches



The switches can be inserted into either or both of the two T-slots.

1. Insert the switches (magnetic field sensors) **(1)** in the T-slot of the housing **(2)** in such a way that the clamping screw **(3)** points outwards ➡ Fig. 25.
2. Move the switches into the desired switch activation point.
Take care to ensure that the active zone of the switch is between $L_{0\ 1Mag}$ and $L_{smax\ 1Mag}$. ➡ Fig. 26 on page 26 and Table 14 on page 26.

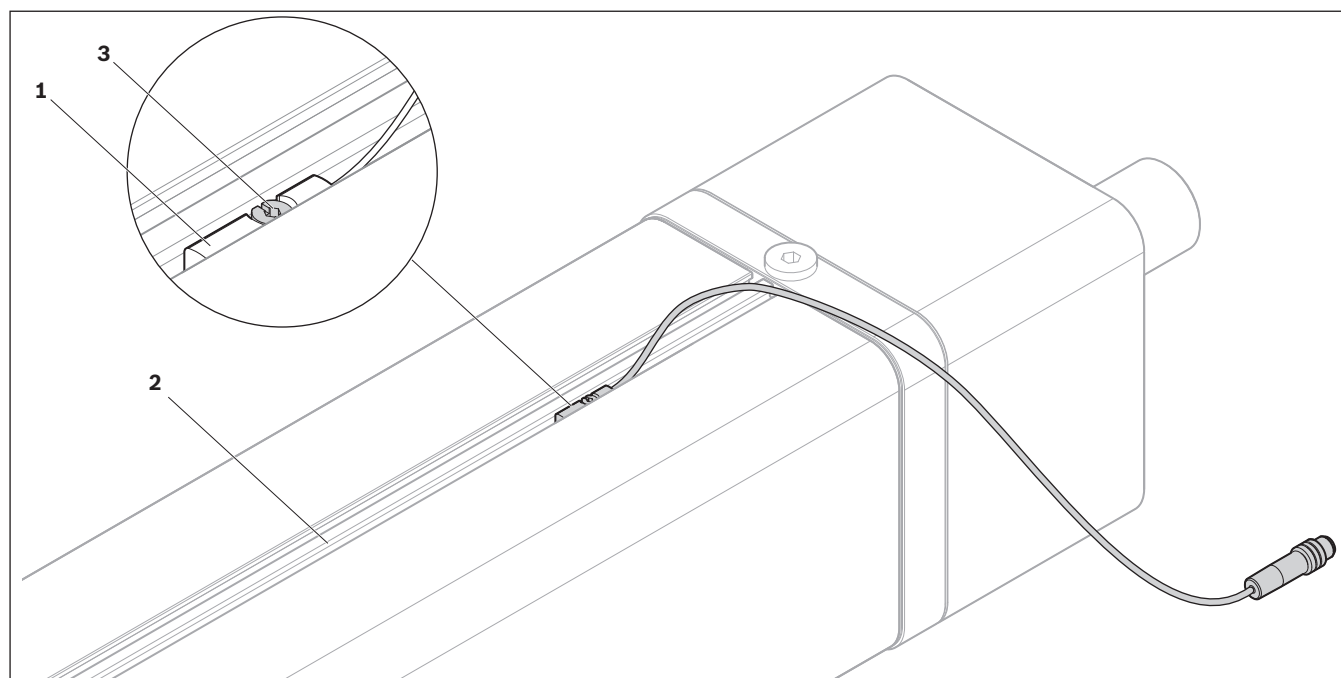


Fig. 25: Mounting the switches

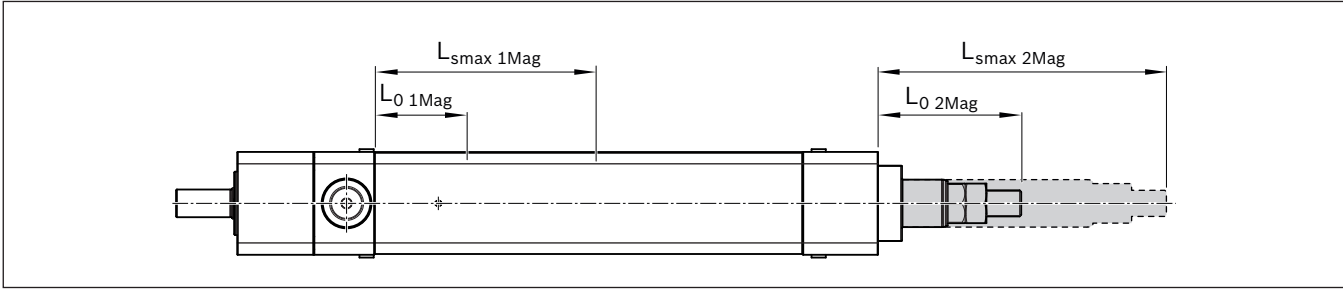


Fig. 26: Setting the switching points

Table 14: Setting the switching points

Size	Dimensions (mm)		At travel range s_{max} mm	
	At travel range 0 mm			
	L_0 1Mag	L_0 2Mag	L_{smax} 1Mag	L_{smax} 2Mag
EMC-115-HP	106.1	139	$106.1 + s_{max}$	$139 + s_{max}$
EMC-130-HP	118.1	155	$118.1 + s_{max}$	$155 + s_{max}$
EMC-160-HP	145.1	176	$145.1 + s_{max}$	$176 + s_{max}$

 The dimensions in the table indicate the position of the magnet as a function of the maximum travel range s_{max} .

1. Fix by turning the clamping screw **(1)** ➡ Fig. 25 on page 25. Tighten the screw by hand and check the switch is secure.

Mount the cover for T-slot for switches.

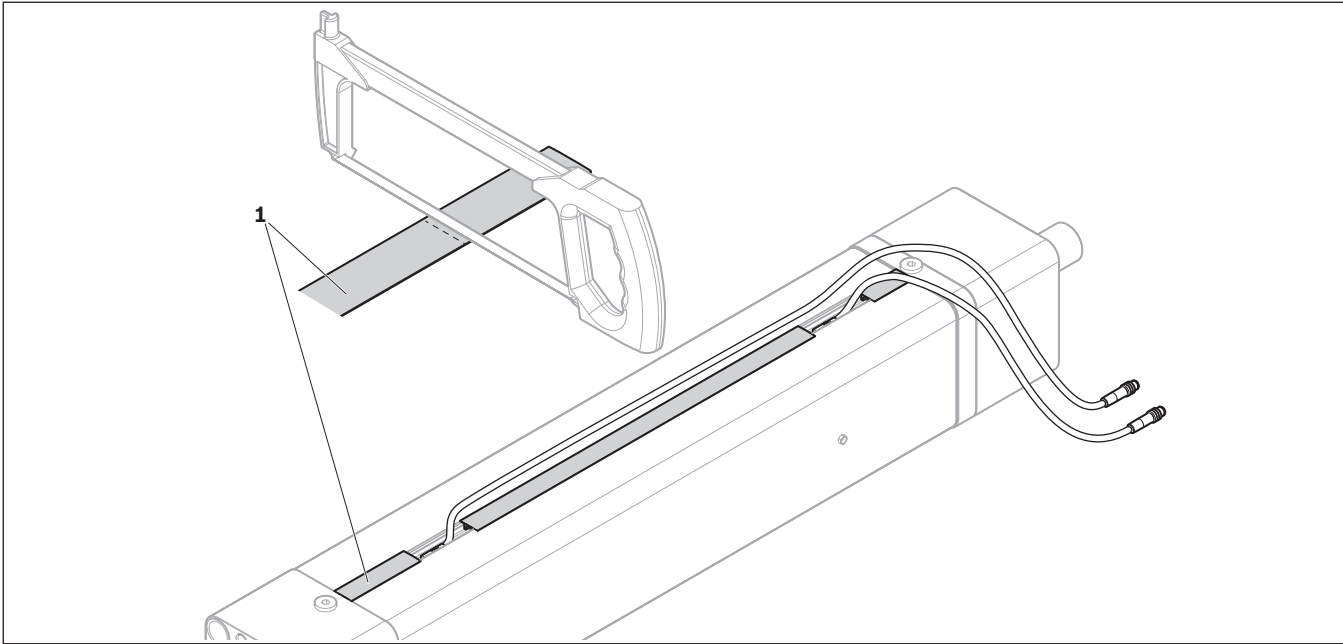


Fig. 27: Mounting the cover for T-slot for switches

2. Shorten the cover for T-slot for switches **(1)**
3. Press the cover for T-slot for switches into the profile. Leave out the switches.

6.8.4 Connecting the switches

1. Connect the switches as illustrated in the drawing.
2. After connection, allow the cylinder to travel slowly while you check the switching points. Adjust if necessary.

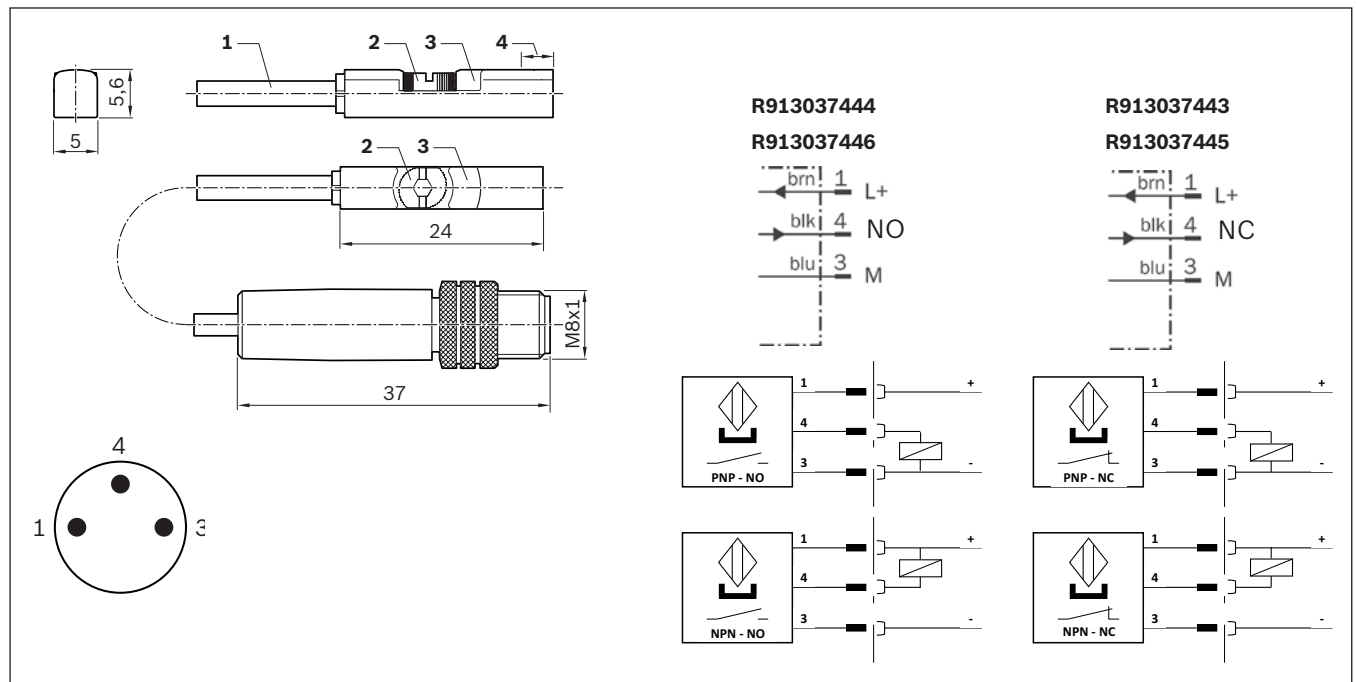


Fig. 28: Connecting the switches

- 1 Connection
- 2 Clamping screw
- 3 LED display
- 4 Position of sensor element: 2.0 mm

NOTICE

Collision of PLSA nut with cover or base!

Damage to product, adjoining structure and workpieces.

- Take care not to overshoot the positions shown in Table 14 on page 26.



For further technical data relating to the switches ➡ Product catalog.

6.9 Connecting the electrical power supply to the EMC-HP

⚠ WARNING

Risk of electric shock due to contact with live parts!

Death or severe injury.

- ▶ Before working on the electrical equipment, switch off the power supply and secure it against being switched on again.
- ▶ Follow the safety instructions given in the documentation for the controller used.
- ▶ Observe the safety regulations for working with high-voltage equipment!
- ▶ Consult the documentation for the motor/controller used.
- ▶ Lay the motor cable (1) at a distance from the encoder cables (2)!

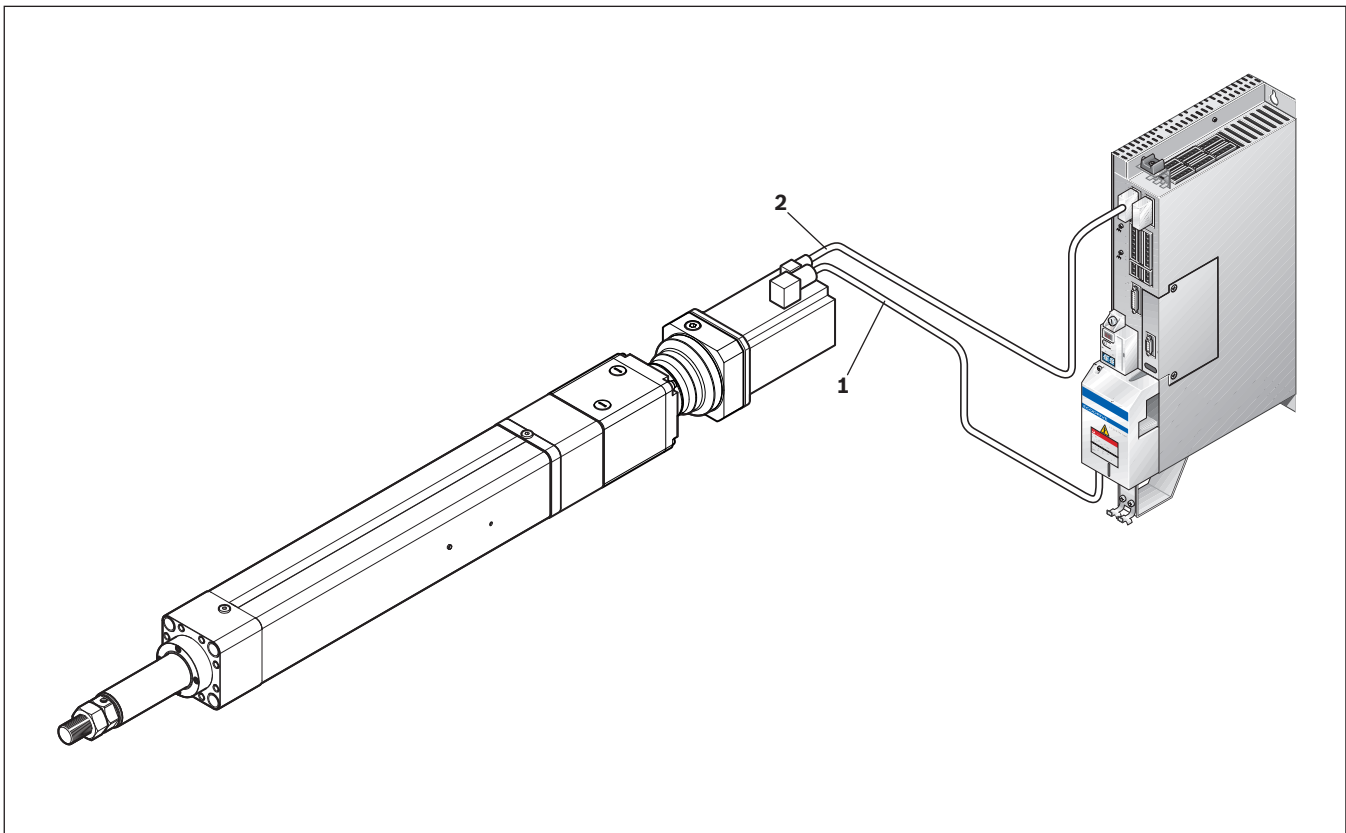


Fig. 29: Connecting the electrical power supply to the switch EMC-HP

7 Commissioning

- ▶ The EMC-HP must not be put into service until it has been verified that the final product (for example, a machine or system) into which the Rexroth product has been installed complies with the country-specific requirements, safety regulations and standards for the application.

! WARNING

Risk of injury due to moving parts (e.g. piston rod)!

Crushing.

- ▶ Do not reach into moving parts while the system is in operation.
- ▶ Do not stand in the hazard zone in front of the piston rod.
- ▶ Make sure that no one is in front of the piston rod before start-up.

NOTICE

Risk of liquid or humidity penetration due to insufficient impermeability!

Motor damage, short circuit.

- ▶ Before start-up, make sure all plug-and-socket connections have been correctly plugged in.
- ▶ Before start-up, make sure all seals and plug-and-socket connections are tight.

Risk of collisions due to overshooting end positions!

Damage to the product.

- ▶ Do not allow the product to collide with a stop.
- ▶ If required by the application, the piston rod may be moved to the stop in the end position for referencing. In doing so, do not exceed the maximum approach speed of 0.01 m/s or the maximum starting force of 5% (F_{max} EMC-HP).
- ▶ Observe the max. travel range s_{max} of the EMC-HP.
- ▶ In all installation orientations, make sure there is a sufficient safety margin (excess travel s_e) on two sides of the stroke.

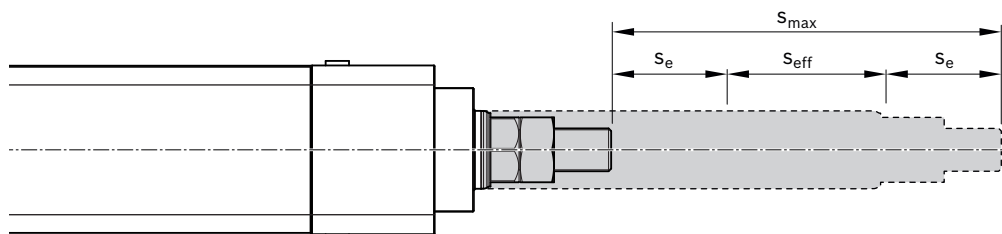


Fig. 30: Excess travel s_e EMC-HP



For safe operation, the excess travel must exceed the braking distance. The acceleration travel can be adopted as the guideline value for the braking distance.

The following is sufficient in most cases: Excess travel $s_e = 2 \cdot \text{screw lead (P)}$

7.1 Nameplate with parameters for easy start-up

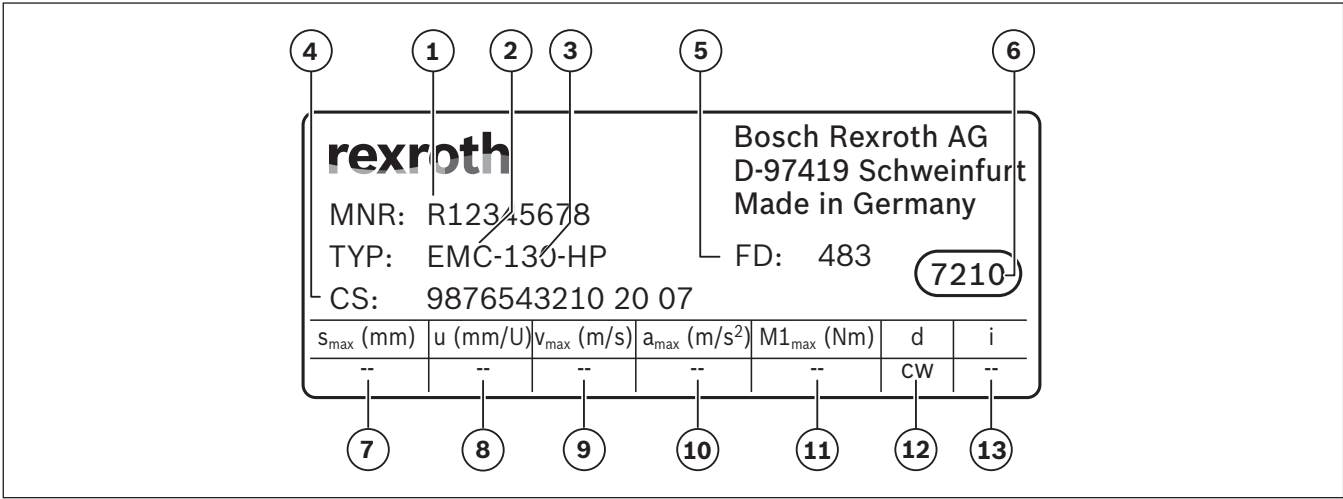


Fig. 31: Nameplate

- 1

Material number
- 2

Short product name
- 3

Size
- 4

Customer information
- 5

Date of manufacture
- 6

Manufacturing location
- 7

s_{max} – max. travel range (mm)
- 8

u – lead constant without motor attachment (mm/rev)
- 9

v_{max} – max. speed (m/s)
- 10

a_{max} – max. acceleration (m/s²)
- 11

$M1_{max}$ – max. drive torque at motor journal (Nm)
- 12

d – direction of rotation of the motor for travel in positive direction
- 13

i – gear ratio

The values given describe the mechanical limit values of the axle.

7.2 Checking the operating conditions

- Observe the ambient temperature, load, rotary speed of the screw drive (PLSA), travel speed, and maximum travel range ➔ 14 on page 40 and catalog "Electromechanical Cylinders EMC-HP".
- For special operating conditions, please contact us.

7.3 Initial commissioning

NOTICE

Risk of collisions due to overshooting end positions!

Damage to the product.

- Do not exceed the max. travel range of the EMC-HP.
- For all installation positions, comply with the safety distance (excess travel) on two sides.
- Before start-up, check the direction of rotation for retracting/extending the piston rod.
- Only allow the piston rod to travel very slowly.
- Make sure that the travel area is unobstructed.

1. Make sure that the travel area is unobstructed. The piston rod is fully retracted on delivery.
2. To position the piston rod to stroke 0 mm, adjust to dimension as per catalog ("Dimension Drawings" chapter) or actuate the reference switch. To this end, extend the piston rod by at least 100 mm, then retract it again until the reference switch is actuated.
3. If required by the application, the piston rod may be moved without force to a specific stop in the end position for referencing. In doing so, do not exceed the maximum approach speed of 0.01 m/s. Stroke 0 mm is 5 mm before the end position.

7.4 Recommissioning after removal

- When recommissioning the unit again, proceed as described in the chapter "Initial start-up" ➔ 7.3 on page 30.

7.5 Test run, running in

! CAUTION

Motor becomes very hot during operation!

Risk of burns.

- During running in or operation, do not touch the motor or only when wearing suitable protective equipment (e.g. heat-resistant gloves).
- The EMC-HP may only be put into service after running successful trials under near-real production conditions.
- Move at low speed over the entire travel range. While doing so, be sure to check the settings and the function of the limit switches.
- If necessary, optimize the interaction of the mechanical equipment and the electronics.

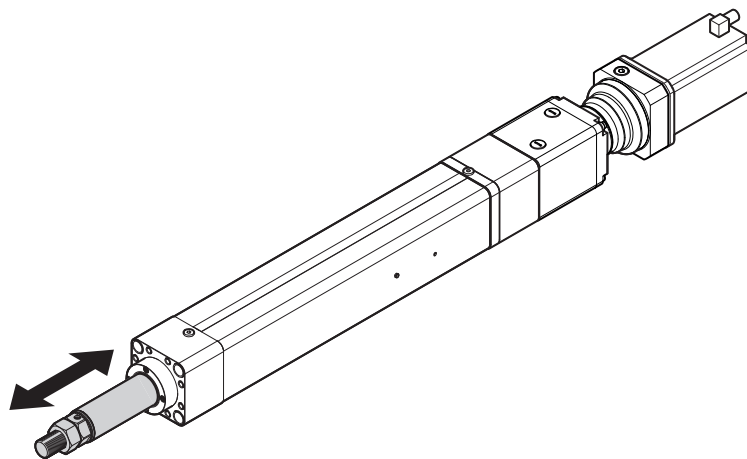


Fig. 32: Moving the EMC-HP

8 Operation

⚠ WARNING

Risk of electric shock due to contact with live parts!

Death or severe injury.

- ▶ Before working on the electrical equipment, switch off the power supply and secure it against being switched on again.

Risk of injury due to moving parts (e.g. piston rod)!

Crushing.

- ▶ Do not reach into moving parts while the system is in operation.
- ▶ Do not stand in the hazard zone in front of the piston rod.
- ▶ Make sure that no one is in front of the piston rod before start-up.

⚠ CAUTION

Motor becomes very hot during operation!

Risk of burns.

- ▶ During operation, do not touch the motor or only when wearing suitable protective equipment (e.g. heat-resistant gloves).

NOTICE

Risk of collisions due to overshooting end positions!

Damage to the product.

- ▶ Do not allow the product to collide with a stop.
- ▶ Observe the max. travel range $s_{\max}$ of the EMC-HP.
- ▶ In all installation orientations, make sure there is a sufficient safety margin (excess travel s_e) on two sides of the stroke.

Lubricant may escape!

Environmental contamination.

- ▶ Due to the stroke movement of the piston rod, a certain amount of lubricant is discharged.

Risk of motor overheating when overloaded!

Risk of fire.

- ▶ During operation, be sure to comply with technical data such as load rating, torques, maximum rotary speeds, motor data, etc. ➡ Product catalog.

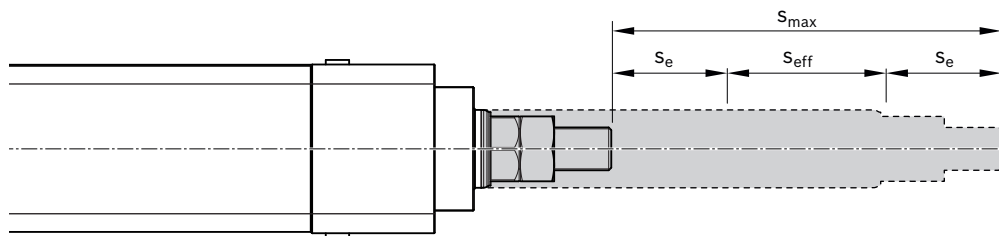


Fig. 33: Excess travel s_e EMC-HP

9 Cleaning and care

NOTICE

Risk of damage due to improper cleaning, e.g. use of solvents and high-pressure jets!

Degradation of seals and functional failure of the product.

- ▶ Do not use high-pressure cleaning equipment.
- ▶ For cleaning, use only water and, if necessary, a mild detergent.

- ▶ Before cleaning, seal all holes with suitable protective caps/devices.

10 Maintenance and repair

The only maintenance required is lubrication of the screw drive using a commercially available manual grease gun. Basic lubrication is carried out by the manufacturer.

The end bearings of the screw drive are greased for life and will not require relubrication under normal operating conditions.

10.1 Lubrication

- ▶ Before using lubricants, read and observe the appropriate safety data sheets.

NOTICE

Risk of property damage due to insufficient lubrication!

Loss of performance and corrosion.

- ▶ Lubricate when the travel range has been covered.

Risk of insufficient lubrication due to use of improper lubricants!

Damage to the EMC-HP, reduced relubrication intervals, loss of performance in short stroke applications and under load; possible chemical interactions between plastic materials and lubricants.

- ▶ Do not use lubricants containing solid particles (e.g. graphite or MoS₂)!
- ▶ Use only the recommended lubricants ➞ Table 15 on page 34

Reduced lubrication intervals in special environmental conditions (contamination, vibrations, impact loads, etc.)!

Inadequate lubrication.

- ▶ Reduce the recommended relubrication intervals to suit the given environmental conditions.
- ▶ Even under normal operating conditions, the system must be relubricated **at least every 2 years** due to aging of the grease.

Performance altered by special operating conditions!

Damage to the EMC-HP.

- ▶ Before commissioning the EMC-HP under special operating conditions (➞ 14 on page 40), please consult Bosch Rexroth AG. This applies especially to environments with glass fiber or wood dust, solvents, short stroke and extreme temperatures.

10.1.1 Lubrication intervals

Always when the specified travel range has been covered.

- ▶ For special operating conditions (e.g., special type of end fixity, dust, solvents, etc.), the lubricants must be adapted to the application.
- ▶ Under normal operating conditions, the system must be relubricated **at least every 2 years** (aging of grease), or when the specified travel range has been covered.

Conditions:

- Load (PLSA) ≤ 0.3 C
- $n_{\min}$ 100 min⁻¹
- Any installation position
- Temperature ≤ 60 °C
- Mode of operation: No short stroke (short stroke = stroke < $s_{\min}$)



Short stroke is defined as when the travel range in the application is less than $s_{\min}$ ➔ 14 on page 40.

In the case of continuous short-stroke operation, adequate lubricant distribution in the screw drive nut is not ensured and premature wear may occur.

It is recommended to reduce the lubrication interval and to regularly perform lubricating strokes $\geq s_{\min}$.

PLSA

- ▶ With short stroke (travel range < $s_{\min}$): divide the relubrication interval and relubrication quantity by three (only valid for distances > 3 x P). For distances < 3 x P please contact Bosch Rexroth.
P = screw lead

For short stroke (stroke < $s_{\min}$) a reduction must be taken into consideration for the life expectancy calculation.
Lubricant

Do not use greases containing solid particles (e.g., graphite or MoS₂)!

Recommended lithium soap greases:

Table 15: Recommended lubricant

Fett		Low-temperature grease
Consistency class NLGI 2 in accordance with DIN 51818 We recommend Dynalub 510 (Bosch Rexroth) Cartridge (400 g) R341603700 Bucket (5 kg) R341603500	Consistency class NLGI 00 in accordance with DIN 51818 We recommend Dynalub 520 (Bosch Rexroth) Cartridge (400 g) R341604300 Bucket (5 kg) R341604200	Klüber BEM 34-132
Can also be used	Can also be used	
Elkalub GLS 135 / N2 (Chemie-Technik) Tribol GR 100-2PD (Castrol)	Elkalub GLS 135 / N00 (Chemie-Technik) Tribol GR 100-00PD (Castrol)	

- ▶ For normal operating conditions, lubricate according to the table.
- ▶ For special operating conditions, please contact us.

Liquid grease



When using liquid grease, the recommended lubrication interval is 75% of the specified value (with the same lubricant quantity)!

Low-temperature grease

Table 16: Low-temperature grease

Fett	Temperature range	Material number
Klüber BEM 34-132	-30 to +50 °C	R341603600 Cartridge (400 g)



When using the low-temperature grease Klüber BEM 34-132, the friction torque at -30 °C will increase by a factor of 3. The lubrication interval is halved with the same lubricant quantity!

Oil bath lubrication

If the "oil bath lubrication" option is selected, the EMC-HP is maintenance-free.

The following prerequisites apply:

- normal operating conditions (⇒ "14 Operating conditions" on page 40)
- $F_m/C \leq 0.05$
- $V_m \geq 0.05$ m/s
- Travel life **L** up to 15,000 km
- **T** = -20 °C to 50 °C

An oil with 220 viscosity is used by default (e.g. Shell Tonna 220)

10.1.2 Relubricating the EMC-HP



When using liquid grease, the recommended lubrication interval is 75% of the specified values (with the same lubricant quantity)!

The lube nipples (**1** and **2**) are located on the housing.

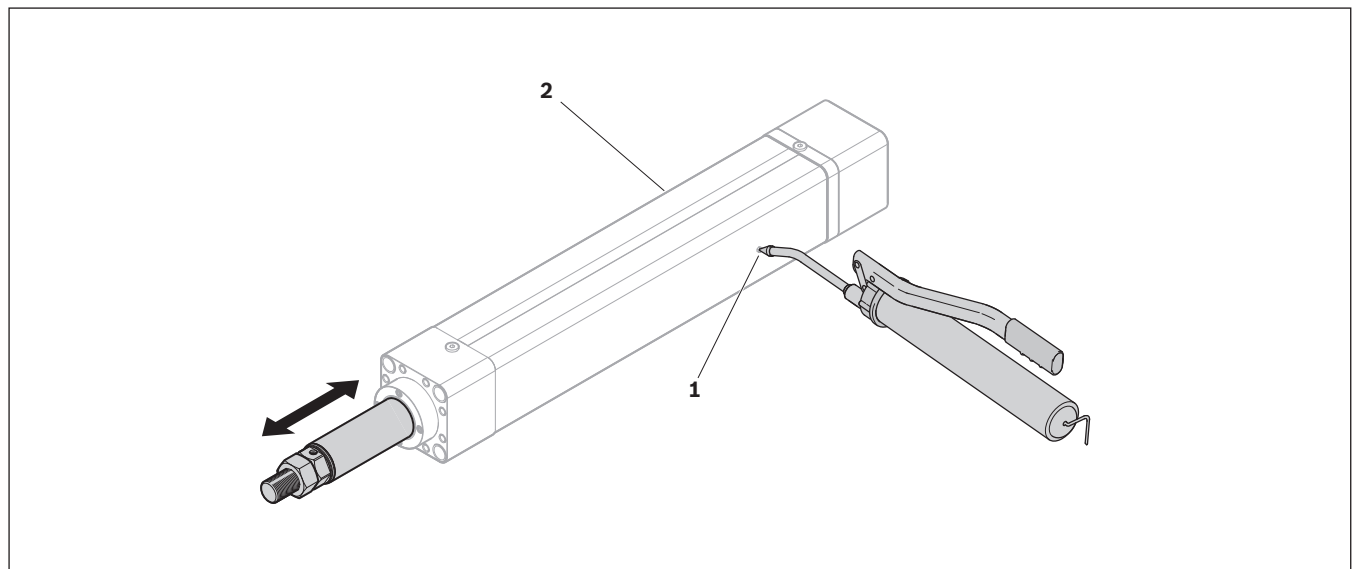


Fig. 34: Lubricating the EMC-HP



Funnel-type lube nipple DIN 3405-A M6, screw-in depth max. 6 mm

- 1. Check that the operating conditions are normal ➡ "14 Operating conditions" on page 40.
- 2. There are 2 options for reaching the lubrication position:
(Deviation of the lubrication position by ± 1 mm permissible)
 - a) Move the piston rod to stroke position **S₂** (reference position) see figure
 - b) Without limit switch, extend from the rear end position by **S₁ + 5 mm**.

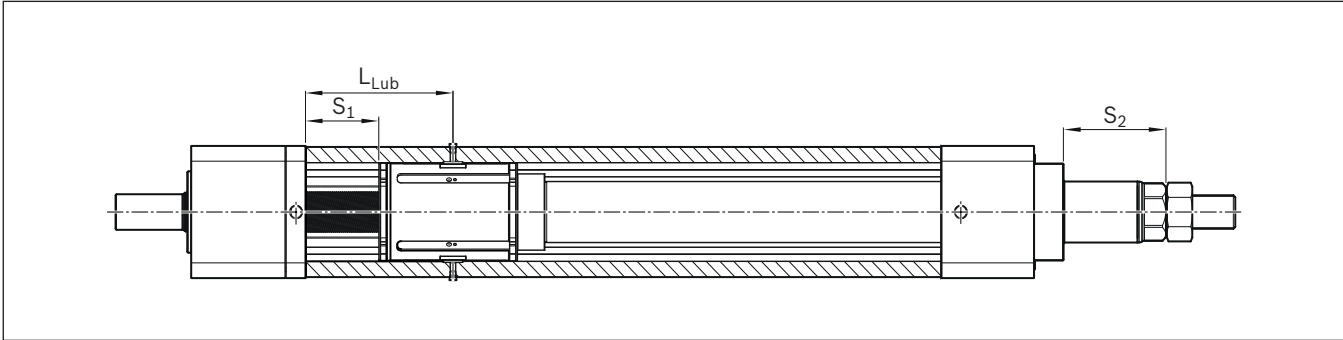


Fig. 35: Lubrication positions

Table 17: Lubrication positions

Size	Dimensions (mm)		
	L_{Lub}	S₁	S₂
EMC-115-HP	143.5	75	101
EMC-130-HP	151.0	75	105
EMC-160-HP	164.5	75	108

- 3. Apply grease to the screw drive via the lube nipple **(1)** or **(2)** ➡ Fig. 34 on page 35. Apply the grease in several partial amounts. Travel over the entire stroke between lubricating procedures.

Table 18: Lubricant quantity for screw drives in the EMC-HP

Size	Grease relubrication quantity (cm ³)
EMC-115-HP	15 + s _{max} /37
EMC-130-HP	35 + s _{max} /30
EMC-160-HP	37 + s _{max} /25

s_{max} = maximum travel range (mm) of the EMC-HP

PLSA grease lubrication (e.g. Dynalub 510)

Load-dependent relubrication intervals

- $d_0 < \varnothing 60 \text{ mm}$
 - - - $d_0 \geq \varnothing 60 \text{ mm}$

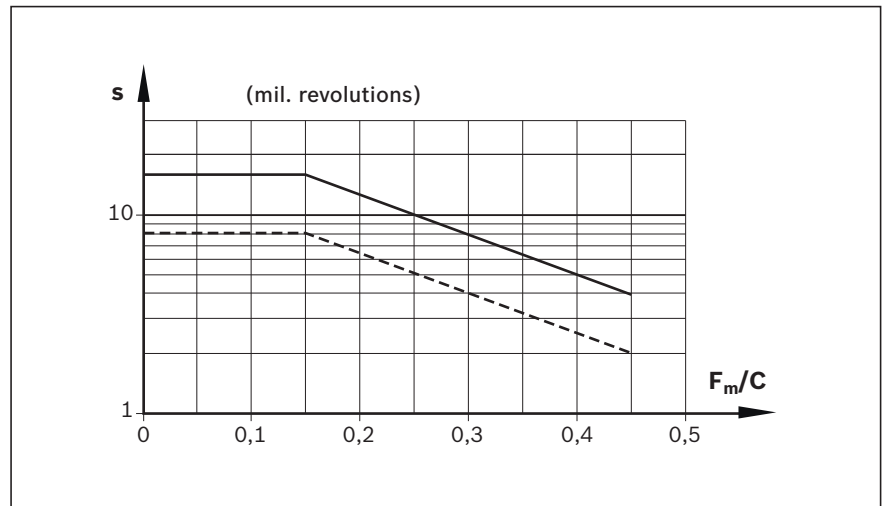


Fig. 36: relubrication intervals

PLSA liquid grease lubrication (e.g. Dynalub 520)

$\frac{1}{2}$ lubrication interval and $\frac{1}{2}$ lubricant quantity of the grease lubrication.

Notes for grease lubrication and liquid grease lubrication (PLSA)

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C

Conversion of lubrication interval s from millions of revolutions to kilometers:

$$s \text{ in kilometers} = \frac{s \text{ in Mio. (Revs)} \cdot \text{lead } P \text{ (mm)}}{10^6}$$

Example:

$$s \text{ in kilometers} = \frac{50 \cdot 10^6 \text{ (revs)} \cdot 16 \text{ (mm)}}{10^6} = 800$$

- | | | |
|-------|--|----------------|
| C | = Dynamic load capacity | (N) |
| d_0 | = Nominal diameter | (mm) |
| F_m | = Average load | (N) |
| s | = Relubrication interval in mil. revolutions | (10^6 revs) |

10.2 Repair

Repairs to the EMC-HP may only be carried out by Bosch Rexroth.

11 Removal and replacement

To assure correct operation of the EMC-HP after the replacement of assemblies (e.g. planetary screw assembly, piston rod, etc.), assemblies may only be dismantled and replaced by Rexroth.

The only exceptions to this rule are the work steps described in this chapter.

⚠ WARNING

Risk of piston rod crashing down in vertical or slanting installations as the unit is not self-locking!

Death or severe injury.

- ▶ If the EMC-HP is installed vertically or on a slant, secure the piston rod against falling before loosening the mounting screws.
- ▶ Do not stand in the fall direction of the piston rod.

Risk of electric shock due to contact with live parts!

Death or severe injury.

- ▶ Before working on the electrical equipment, switch off the power supply and secure it against being switched on again.



Fig. 37: Secure the piston rod in vertical installations

13.1 Removing the drive

1. Removal is carried out in reverse mounting order ➡ "Mounting" on page 10.

CAUTION

Potential uncontrolled motion of the preloaded toothed belt in the belt side drive when loosening the screws!

Risk of injury.

- ▶ Take care when unscrewing the fastening screws on the motor.

12 Disposal

The EMC-HP contains a number of different materials: Aluminum, steel, plastics, grease and oils, possibly electronic components.

NOTICE

Environmentally hazardous materials can pollute the environment if not disposed of properly.

Environmental pollution.

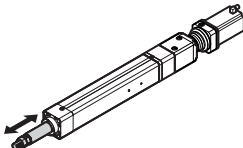
- ▶ Collect any leaking lubricants and oils and dispose of it correctly.
- ▶ The EMC-HP and its components must be disposed of correctly and in compliance with all applicable national and international guidelines and regulations.

13 Technical data

Technical data ➡ Catalog "Electromechanical Cylinders EMC-HP".

14 Operating conditions

Table 19: Operating conditions

Operating conditions			Value	Symbol
Ambient temperature, cylinder with Rexroth servo motor			0 °C ... 40 °C, loss of performance at 40 °C or higher	
Ambient temperature Cylinder mechanics			−10 °C ... +50 °C (up to +60 °C with low duty cycle and power)	
Ambient temperature Cylinder mechanics with PLSA and low-temperature grease			−30 °C ... +50 °C (up to +60 °C with low duty cycle and power)	
Travel range s _{min}	EMC-115-HP	30 x 5	85 mm	
		30 x 10	85 mm	
	EMC-130-HP	39 x 5	110 mm	
		39 x 10	110 mm	
	EMC-160-HP	48 x 5	130 mm	
		48 x 10	130 mm	
Load			PLSA ≤ 0.3 C	
Oil bath lubrication			−30 °C ... +60 °C	

14.1 Tightening torques

Table 20: Tightening torques

 8.8	M6	M8	M10	M12	M14	M16	M20	M24	M30	M36
⌀ M_A (Nm) $\mu = 0.125$	9.5	23	46	80	127	194	392	675	1350	2350

 10.9	M6	M8	M10	M12	M14	M16	M20	M24	M30	M36
⌀ M_A (Nm) $\mu = 0.125$	14	34	68	116	186	285	558	960	1920	3340

14.2 Service and support

- ▶ When ordering spare parts, please specify all the data on the nameplate ➡ 4.3 on page 8.
- ▶ To order spare parts, please contact your local Bosch Rexroth AG sales partner. You can find this on the Internet under www.boschrexroth.com/contact

In urgent cases, our Bosch Rexroth Customer Service help desk and hotline staff will be happy to assist you in any way they can.

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Email: servicelt@boschrexroth.de

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Subject to modifications

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Printed in Germany
R320103219/2021-11