EWELLIX

Electromechanical EWELLIX Linear Actuator

EMA-100

User Manual

We pioneer motion

SCHAEFFLER

Contents

1 About the manual

1.1 Information in this user manual

This manual provides important information on how to work with the device safely and efficiently.

The manual is part of the device, must always be kept in the device's direct proximity and should be available for personnel to read at any time. All personnel working with the device must read and understand this manual before starting any work. Strict compliance with all specified safety notes and instructions is a basic requirement for safety at work.

Moreover, the accident prevention guidelines and general safety regulations applicable at the place of use of the device must also be complied with.

1.2 Availability

A current version of this manual is available at:

BA 108 | Electromechanical EWELLIX Linear Actuator | https://www.schaeffler.de/std/2028

Ensure that this manual is always complete and legible and is available to all persons engaged in transporting, fitting, dismantling, commissioning, operating, or maintaining the product.

Keep the manual in a safe place for immediate reference.

1.3 Legal notices

The information in this manual reflects the status at the time of publication.

Unauthorized modifications to or improper use of the product are not permitted. Schaeffler accepts no liability in these cases.

1.4 Symbols

Safety precautions are identified by symbols and signal words as shown. The signal words indicate the severity of the hazard and the chance it could occur. Follow these safety precautions and act cautiously in order to avoid accidents, personal injury and damage to property.

The warning and hazard symbols are defined in accordance with ANSI Z535.6-2011.

1 Warning and hazard symbols

Signs and descriptions	
⚠ DANGER	In case of non-compliance, death or serious injury will occur.
⚠ WARNING	In case of non-compliance, death or serious injury may occur.
⚠ CAUTION	In case of non-compliance, minor or moderate injury may occur.
NOTICE	In case of non-compliance, damage or malfunctions in the product or the adjacent construction may occur.

1.5 Signs

The warning, prohibition, and mandatory signs are defined in accordance with DIN EN ISO 7010 or DIN 4844-2.

2 Warning, prohibition, and mandatory signs

Signs and descriptions	
	General warning
	Electrical voltage warning
	Hot surface warning
	Crush warning
	Hand injury warning
	Observe the manual
	Wear protective gloves
	Wear safety shoes
	Wear eye protection
	Wear ear protection
	Wear head protection
	General mandatory sign

1.6 Images

The images in this manual may be schematic representations and may differ from the delivered device.

1.7 Liability

In any case, the owner or the operator of the device is liable for its proper functioning if the device is improperly installed, maintained or repaired by persons who are not part of the Schaeffler Service department, or if the device is used in a manner that does not correspond to its intended use.

Schaeffler shall not be liable for any damage resulting from failure to observe these instructions. These instructions are not to be considered as an extension of the warranty conditions and liability conditions set out in Schaeffler's Terms and Conditions of Sale and Delivery.

The product is not subject to labeling requirements according to CE Directives or EMC Directives. The required EMC measures must be implemented on the end product by the manufacturer of the end product, taking into account the installation conditions, wiring and control, and must be checked in accordance with the intended use.

Compliance with these regulations is the responsibility of the manufacturer of the machine or system.

2 General safety regulations

2.1 Intended use

Electromechanical actuators are based on screw drivers that convert rotary motion into linear motion. The device is designed to provide linear motion in machines.

The device may only be used in accordance with the technical information.

Ensure that all safety instructions, warnings and user manuals on the device are maintained in a legible condition at all times. Replace any damaged or illegible signs or stickers on the device immediately.

Observe the safety data sheets for any hazardous substances used.

Only use original spare parts and accessories supplied by Schaeffler.

Intended use also includes the following:

- compliance with all information in the user manual
- adherence to all safety instructions
- observance of maintenance and service regulations

Unauthorized structural modifications to the device are not permitted. We accept no liability for any resulting damage to machines and persons.

2.2 Unintended use

Unintended use includes the following:

- Modifications to the device
- Operation of the device contrary to the specifications of this user manual
- Use in potentially explosive atmospheres

Unintended use can result in injury to persons and damage to the device.

If you have any questions regarding this, please contact Schaeffler.

2.3 Qualified personnel

Operator duties:

- Ensure that only qualified and authorized personnel carry out the activities described in these instructions.
- Ensure that personal protective equipment is used.

Qualified personnel meet the following criteria:

- Product knowledge, e.g. by receiving training on how to use the product
- are fully familiar with the contents of this manual and, in particular, with all of the safety instructions
- are familiar with the relevant country-specific regulations

2.4 Protective devices

⚠ WARNING

Danger due to non-functioning protective devices

Safe operation can only be guaranteed if all devices are in proper condition.

- ▸ Always check the functionality of the safety equipment in accordance with the maintenance plan.
- ▸ Never turn off the protective devices.
- ▸ Protective devices may never be bypassed or modified.

Use of an emergency stop system (if necessary)

The device is intended exclusively for installation in a system. It does not have its own operating elements or emergency stop system. Install the device in such a way that it is integrated in an emergency stop system and can be stopped if necessary.

The emergency stop system must be connected in such a way that an interruption of the power supply or the reactivation of the power supply after a power failure cannot pose a risk of damage or injury. The emergency stop system must be directly accessible at all times.

It is up to the operator to decide whether the installation of an emergency stop system is necessary.

2.5 Specific hazards

The following section lists the residual risks determined by a risk assessment.

The manufacturer has constructively, and with protective actions, minimized the impacts of existing hazards. Observe the residual hazards described and possible counter actions, as well as the warnings in the following sections.

⚠ DANGER

Serious or fatal injuries or damage to property

Moving, heated and energized components if the information and precautions contained in this EMA-100 User Manual are not followed.

- All activities associated with transport, installation/assembly (mechanical and electrical), commissioning, maintenance or storage are carried out by qualified personnel in compliance with relevant guidelines.

⚠ DANGER

Serious or fatal injuries due to electric shock

Hazardous voltages may be present on some parts of the actuator during and after operation. There is a risk of electric shock and serious or fatal injuries.

- Pay close attention to the safety instructions in this document and in the documents provided with accessories.
- Do not disconnect any connectors from the motor without first switching off the power supply to the associated servoamplifier.
- First disconnect the signal connector and then the power supply. Turning the motor may generate voltage. Do not touch the connector pins.

⚠ DANGER

Danger because of illegible symbols

Over time, stickers and decals may become dirty or otherwise illegible.

- Always keep all safety labels, warning labels, and operating labels in a legible condition.
- Replace damaged decals or stickers immediately.

⚠ DANGER

Risk of crushing

While driving onto solid objects, the force of the device may cause injuries.

- Ensure that there are no persons in the stroke area of the device while in operation.
- Observe the maximum permissible operating parameters of the device.
- Do not touch the elements that are connected to the device while the device is in operation.

⚠ WARNING

Risk of injury

Moving parts (rotary and/or linear motion) can cause serious injuries.

- Work may not be carried out in the vicinity of moving parts and hands, arms or other parts of the body must be kept away from moving parts.

⚠ WARNING

Risk of crushing

Risk of serious or fatal injuries from crushing due to unintentional activation of the device.

- Before carrying out any work on the actuator, disconnect the motor, the brake and the fan (if installed) from the mains.
- Secure against unintentional restart.

⚠ WARNING

Risk of burns or fire

During operation, the device can reach very high temperatures.

- Allow the device to cool down before you start work.

⚠ CAUTION

Risk of injury

If any part of the actuator fails (breakage of the screw, loss of input torque), the working mass decreases.

- Additional safety precautions must be in place to protect the workplace.
- When there is no input torque, the push tube can be moved manually or by gravity. A motor with fail-safe brake is strongly recommended, particularly for vertical applications.
- Check the drive regularly for signs of excessive wear.

⚠ CAUTION

Noise hazard

There is a risk of noise.

- Wear ear defenders.

⚠ CAUTION

Property damage and injuries due to overheating

Overheating of the device can cause damage.

- Use only the thermal switch integrated in the control system.

NOTICE

Material damage due to a static and dynamic overload of the device

Static and dynamic overload can lead to damage and failure of device.

- Observe the maximum permissible operating parameters of the device.
- Never exceed the nominal load

NOTICE

Observe the information provided by the manufacturer

Components included in the scope of delivery are standard parts and purchased parts. These components are not developed or manufactured by Schaeffler. The user is responsible for reading the manufacturer's user manual for these components before commencing installation or use of the product.

NOTICE

Damage due to contamination

Contamination of the devices can cause serious damage.

- Clean dirty parts immediately after they have become dirty.

NOTICE

Damage to the drive due to lateral loads

The actuator is not intended for use with lateral loads. If lateral loads occur, this can lead to a shortened service life or structural damage to the drive.

- Lateral loads must be prevented by means of suitable guides and assembly.

3 Scope of delivery

3.1 Product and options

The following components are included in the scope of delivery of the linear actuator:

- Linear unit
- Option: Gearbox
- Option: Motor adapter
- Option: Motor
- Option: Screw drive
- Option: Fixings

Options for the gearbox include the following components:

- Gearbox
- Rear plain bushing
- Rear cross tube
- Centrifugal brake

Options for the attachments include the following components:

- Proximity sensor
- Foot mounting kit
- External trunnion mount (pair)
- Centric trunnion holder (pair)
- Eccentric trunnion holder (pair)
- Front plate
- Rod spherical plain bearing
- Rod clevis

3.2 Check for damage during transit

1. Check the product immediately upon delivery for any damage during transit.
2. Do not accept delivery, or only accept it with reservation, if transport damage is found.
3. Record the extent of damage on the transport documents or the carrier's delivery note.
4. Report any damage during transit promptly as a complaint to the carrier.

Report any damage as soon as it is discovered. Claims for damages can only be made within the applicable claim period stipulated by the transport company.

3.3 Check for defects

1. Check the product immediately upon delivery for any visible defects.
2. Check the product for completeness immediately upon delivery.
3. Report any defects promptly to the distributor of the product.
4. Do not put damaged products into operation.

4 Product description

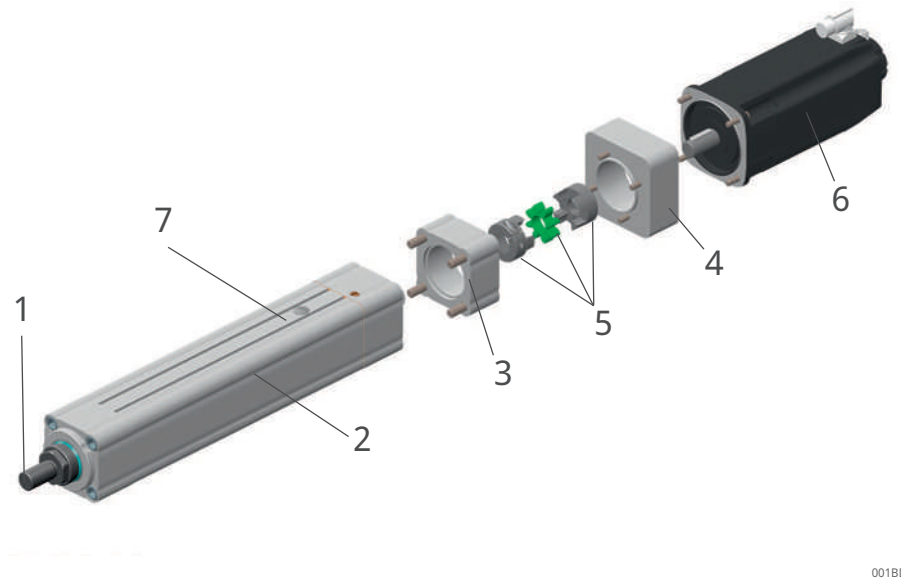
4.1 Brief description

The EWELLIX EMA-100 linear actuator is a mechanical drive for automation technology. The drive is only suitable for central tension and compression strokes.

The linear unit is driven by a motor via a coupling. The motor controls either a roller screw drive or a ball screw drive as a direct drive. The screw drive converts the rotational movement of the motor into the linear movement of the linear actuator.

The push tube and other accessories transmit the actuator power into the application.

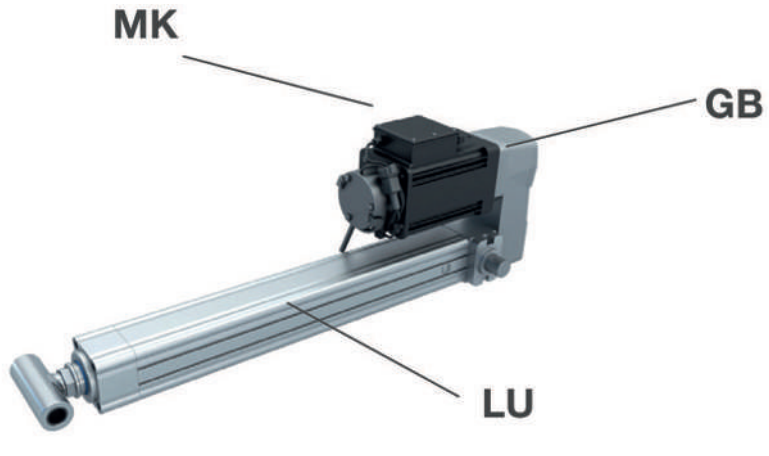
1 Linear actuator assembly



1	Push tube with front end	2	Protection tube
3	Inline gearbox (optional)	4	Motor flange (optional)
5	Coupling (optional)	6	Siemens motor 1FK7 (optional)
7	Linear unit		

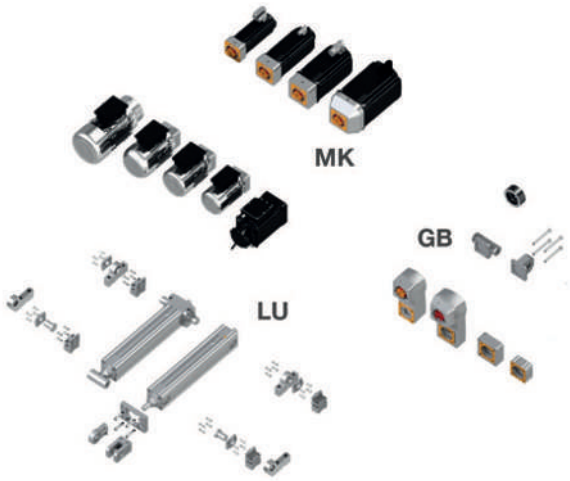
4.2 Product overview and options overview

2 Product overview, EMA-100



MK	Motor kit	GB	Gearbox
LU	Linear unit		

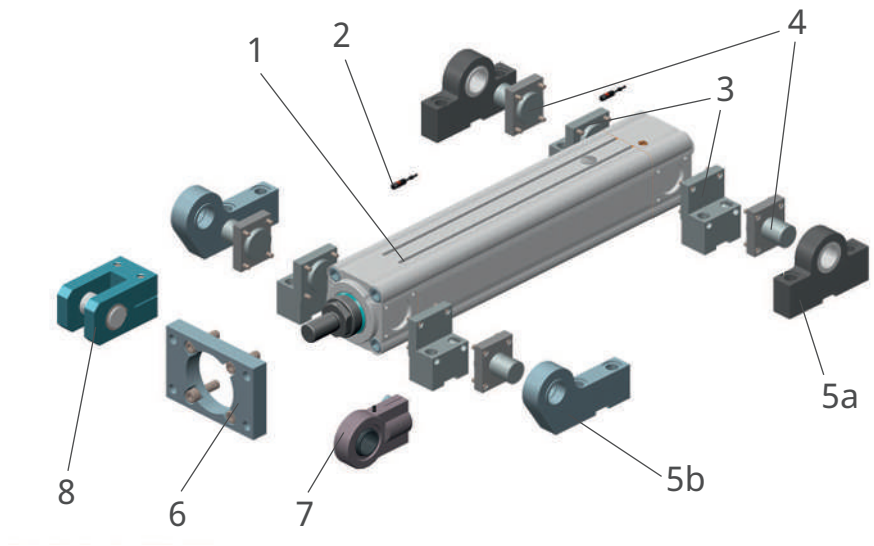
3 Options overview



MK	Motor kit options	GB	Gearbox options
LU	Linear unit options		

4.2.1 Overview of mounting options

4 Overview of options



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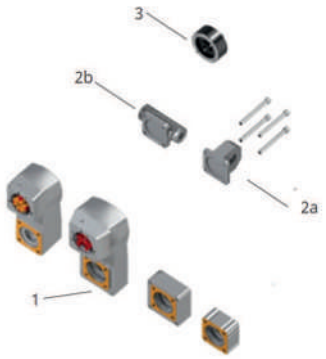
1	Linear unit	2	Proximity sensor
3	Foot mounting kit	4	External trunnion mount
5a	Centric trunnion holder (pair)	5b	Eccentric trunnion holder (pair)
6	Front plate mounting kit	7	Rod spherical plain bearing
8	Rod clevis		

4.2.2 Overview of gearbox options

5 Gearbox options



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1	Gearbox	2a	Rear plain bushing
2b	Rear cross tube	3	Centrifugal brake

5 Transport and storage

5.1 Packaging

The individual packaged pieces have been packaged appropriately according to the expected transport conditions.

The packaging is intended to protect the individual components from transport damage, corrosion and other damage prior to installation. Do not, therefore, destroy the packaging and only remove it shortly before installation. Keep the packaging in case of return shipment to the manufacturer.

5.2 Storage

Pack the actuator in its original packaging for storage.

- Do not store outside and protect from UV radiation.
- Always store in a dry and dust-free environment.
- Keep away from all aggressive media.
- Avoid mechanical vibrations.
- Storage temperature: –40 °C to 50 °C
- Relative humidity: max. 95 % without the formation of condensation
- If you plan to store the product for more than 3 months, check the general condition of all parts of the packaging monthly. If necessary, refresh or renew the conservation.
- Relubricate the actuator if it has been stored for more than 3 years.
- It is possible that there are notices on the packaging concerning storage that go beyond the requirements listed here. If so, follow these notices.

5.3 Handling

Handle the actuator in a safe manner to prevent injury or damage to material and the environment. For long actuators, use appropriate tools to lift and move the actuator, such as safety ropes and cranes, due to the heavier weight.

If the drive is ordered with a motor adapter, it is equipped with an M12 thread for handling. It is recommended to use an eye bolt and a rod clevis to secure the lifting device with a safety cord.

6 Preparation for mounting

6.1 Before initial commissioning

Ensure that there are no persons or objects in the stroke area of the device.

Before initial commissioning, a professional electrician must perform and document the following tests and measurements:

1. Check the visual condition.
2. Carry out functional checks of the operating features and safety features.

6.2 Installation location

- Install the actuator in a location where it will not be exposed to strong UV radiation and corrosive or explosive air media.

6.3 Direction of rotation of the motor when the actuator is extended

6 Inline gearbox

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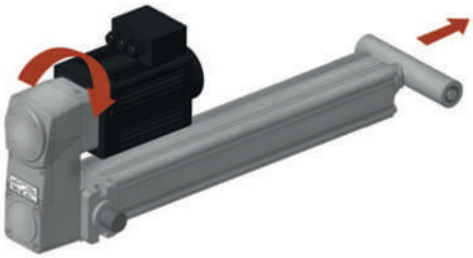
7 Spur gearbox



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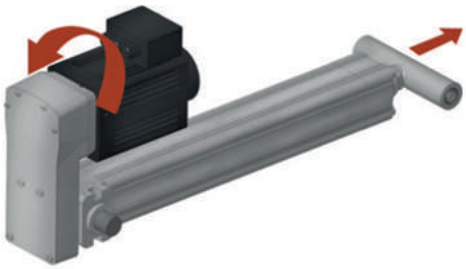
8 Belt gearbox



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6.4 Installation

⚠ CAUTION

Risk of damage and injury due to improper installation of accessories

There is a risk of damage and injury due to improper installation of accessories.

- Optional components and devices must only be installed in accordance with the instructions.

⚠ CAUTION

Risk of injury and material damage due to loosening or removal of the screws on the device

Removal or loosening of the screws on the linear unit may lead to injuries and material damage during operation.

- Never loosen or remove screws on the linear unit.

⚠ CAUTION

Risk of injury and property damage

There is a risk of injury and property damage due to inadequate fastening.

- Only use fastening bolts and secure them sufficiently.
- Do not use screws for assembly.
- Never loosen or remove screws on the actuator.

⚠ CAUTION

Risk of injury and property damage

There is a risk of injury and property damage due to improper installation.

- During installation, do not subject the actuator to side impact or to turning forces.

NOTICE

Material damage to the drive

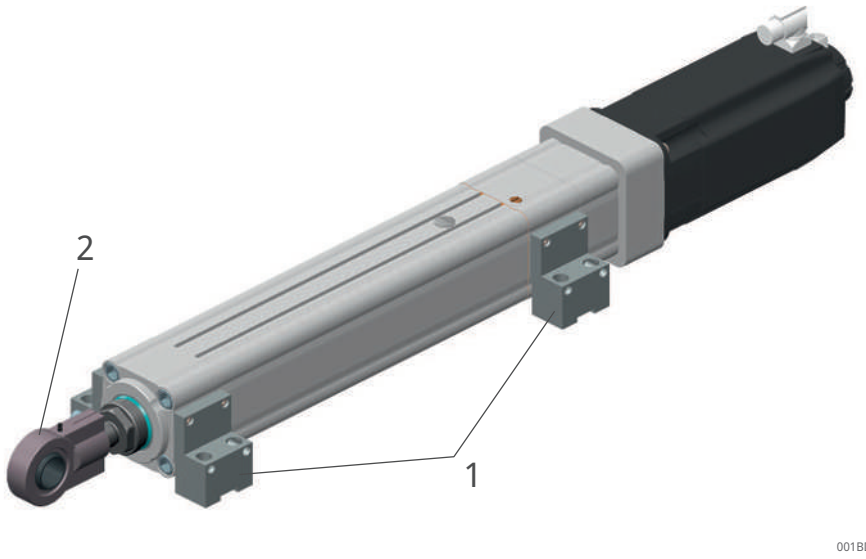
Exceeding the mechanical limits leads to irreversible damage to the drive.

- Do not reach the mechanical limit of the drive during operation.

The linear actuator is attached to two elements via the push tube (primary attachment) and the mounting kit (secondary attachment).

1. Mount the gearbox and motor on the linear unit if the product is not pre-assembled ➤18|7.1.
2. Screw the rod clevis or primary attachment (2) onto the push tube and tighten the two screws.
3. Screw the mounting kit to the actuator if it is not pre-assembled.
4. Secure the elements of the application in which the linear actuator is to be installed.
5. Connect the primary attachment (2) and the mounting kit (1) to the elements of the application using the fastening bolts.
6. When mounting, make sure that the applied force is always directed towards the center of the actuator.
7. Ensure that the linear actuator is not impacted in its movement over the entire stroke area. Take into account collision testing for the application.
8. Ensure that the installation requirements for options have been met.
9. Affix prohibition and warning signs to the machine where required by the application.
10. Preferably, the actuator is manually driven for end position detection. If this is not possible, the speed and torque of the screw must be less than 125 mm/s or 20 Nm (input torque on the linear unit). Higher speeds or torques can cause damage to the drive.

9 Installing mounting accessories



1	Mounting accessories	2	Primary attachment

7 Mounting

7.1 Mounting the motor

7.1.1 Motor adapter

The motor adapter is used to mount a motor with an axial shaft to the linear unit.

7.1.2 Recommended motors

The Siemens motors have a differential resolver or multiturn encoder, a shaft end with keyway (1FK7044 without) and a holding brake. They are also equipped with a Drive-CLiQ interface and a rotatable plug adapter.

3 Motor types

Characteristic	Unit	1FK7044-4CH71-1U	1FK7064-4CF71-1RB0	1FK7086-4CF71-1RB0	1FK7105-2AF71-1RB0
Rated power (100 K)	kW	1.4	2.5	3.75	8.2
Nominal Speed	min^{-1}	4500	3000	3000	3000
Rated current	A	3.9	7.6	5.7	18
Rated torque (100 K)	Nm	3	8	6.5	26
Static torque (100 K)	Nm	4.5	12	28	48
Peak torque	Nm	13	32	105	150
Mass inertia with brake	$10^{-4}kg \cdot m^2$	1.62	8.5	25.5	162
Mass with brake	kg	8	16.8	26	43.5

7.1.3 Mounting the coupling

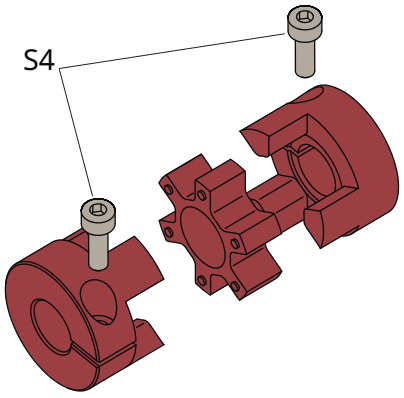
NOTICE

Ingress protection class and lubrication during mounting

- In order to ensure the required Ingress protection class, the appropriate sealing must always be attached between all components.
- Use PU-compatible grease such as petroleum jelly to lubricate the elastomer insert of the coupling. A light coating of oil on the shaft is recommended to facilitate mounting and does not affect the clamping force of the hub.

1. Slide the first coupling hub with spline as far as possible onto the screw shaft of the linear unit.
2. Slide the coupling hub onto the motor shaft and align the coupling bore with the end of the motor shaft.
3. Tighten the screws (S4). Tightening torque can be found at inline assembly ➤20|7.1.4.1 or parallel assembly ➤21|7.1.4.2.

10 Mounting the coupling



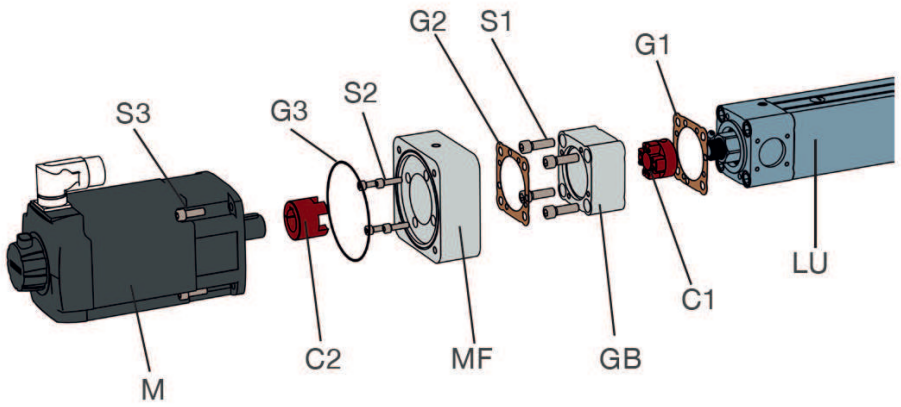
S4	Coupling half screws

7.1.4 Mounting the synchronous servo motor

7.1.4.1 Inline assembly

1. Attach the coupling (C1) to the linear unit (LU) with the screw (S4).
2. Mount the inline gearbox (GB) on the linear unit (LU) by inserting the gasket (G1) between the two components and tightening the housing with four screws (S1).
3. First, place the gasket (G2) on the inline gearbox (GB), then attach the motor flange (MF) to the inline gearbox (GB) and tighten the screws (S2).
4. Attach the coupling (C2) to the motor (M) with the screw (S4).
5. Place the seal (G3) in the groove in the motor flange (MF) and tighten the screws (S3) to secure the motor (M) to the motor flange (MF).

11 Inline assembly of the synchronous servo motor



S1	Gearbox screw	S2	Adapter kit screw
S3	Motor screw	G1	Gasket
G2	Gasket	G3	Seal
M	Motor	MF	Motor flange
GB	Inline gearbox	LU	Linear unit
C1	Coupling half LU	C2	Coupling half M

4 Screws and torques (inline)

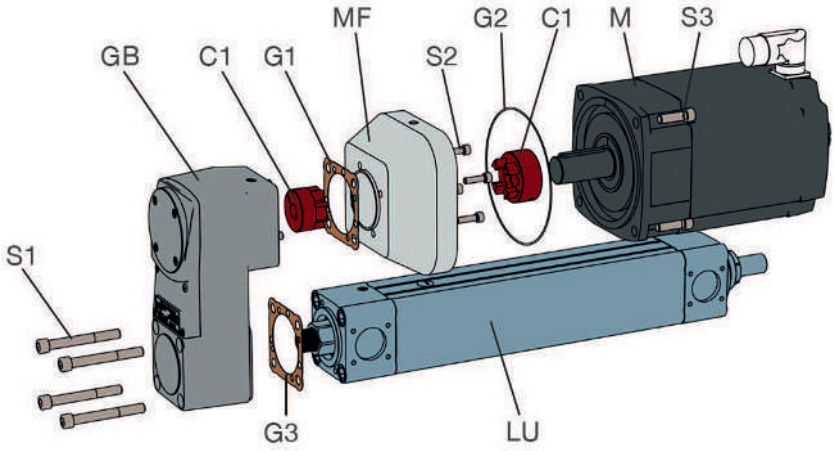
Motor type	S1 (gearbox)		S2 (motor adapter)		S4 (coupling)		S3 (motor)	
	Screws	M	Screws	M	Screws	M	Screws	M
	–	Nm	–	Nm	–	Nm	–	Nm
1FK704X	M12×40	75	M8×30	20	M6×20	15	M6×30	10
1FK706X	M12×40	75	M8×30	20	M6×20	15	M8×30	20
1FK708X	M12×40	75	M8×30	20	M6×20	15	M10×30	40
1FK710X	M12×40	75	M8×30	20	M6×20	15	M10×40	75

M	Nm	Tightening torque

7.1.4.2 Parallel assembly

1. Mount the linear unit (LU) on the gearbox (GB) by inserting the gasket (G3) between the two components and tightening the screws (S1).
2. Attach the coupling (C1) to the motor (M) with the screw (S4).
3. Mount the motor flange (MF) on the gearbox (GB) by inserting the gasket (G1) between the two components and tightening the screws (S2).
4. Place the seal (G2) in the recess in the motor flange (MF) and tighten the flange with four screws (S3).

12 Parallel assembly of the gear drive servo motor



S1	Gearbox screw	S2	Adapter kit screw
S3	Motor screw	G1	Gasket
G2	Seal	G3	Gasket
M	Motor	MF	Motor flange
GB	Parallel gearbox	LU	Linear unit
C1	Coupling half LU	C2	Coupling half M

5 Screws and torques (parallel)

Motor type	S1 (gearbox)		S2 (motor adapter)		S4 (coupling)		S3 (motor)	
	Screws	M	Screws	M	Screws	M	Screws	M
	–	Nm	–	Nm	–	Nm	–	Nm
1FK704X	M12×110	40	M8×30	20	M6×20	15	M6×30	10
	M12×140 [1)]	75						
1FK706X	M12×110	40	M8×30	20	M6×20	15	M8×30	20
	M12×140 [1)]	75						
1FK708X	M12×110	40	M8×30	20	M6×20	15	M10×30	40
	M12×140 [1)]	75						
1FK710X	M12×110	40	M8×30	20	M6×20	15	M12×40	75
	M12×140 [1)]	75						

1) Screw and tightening torque when using the rear attachment

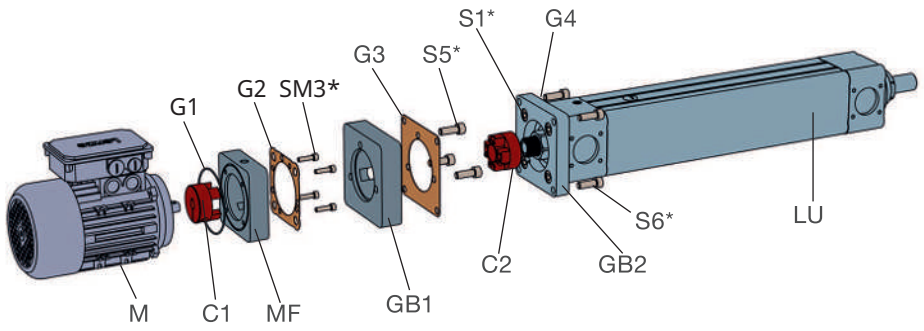
M	Nm	Tightening torque

7.1.5 Mounting the induction motor

7.1.5.1 Inline assembly

1. Attach the coupling (C1) to the motor (M) with the screw (S4).
2. Insert the seal (G1) into the groove of the motor flange (MF) and tighten the flange with four screws (SM3).
3. Mount the inline gearbox (GB1) on the motor flange (MF) by inserting the gasket (G2) between the two components and tighten the screws (S5).
4. Attach the coupling (C2) to the linear unit (LU) with the screw (S4).
5. Mount the inline gearbox (GB2) on the linear unit (LU) by inserting the gasket (G4) between the two components and tightening the screws (S1).
6. Screw the linear unit (LU) and the inline gearbox (GB2) together with the inline gearbox (GB1) and the gasket (G3) with the four screws (S6).

13 Inline assembly of the induction motor



S1	Screw	SM3	Screw
S5	Screw	S6	Screw
G1	Seal	G2	Gasket
G3	Gasket	G4	Gasket
M	Motor	MF	Motor flange
GB1	1st Inline gearbox	GB2	2nd Inline gearbox
LU	Linear unit	C1	Coupling half LU
C2	Coupling half M		

6 Screws and torques (inline)

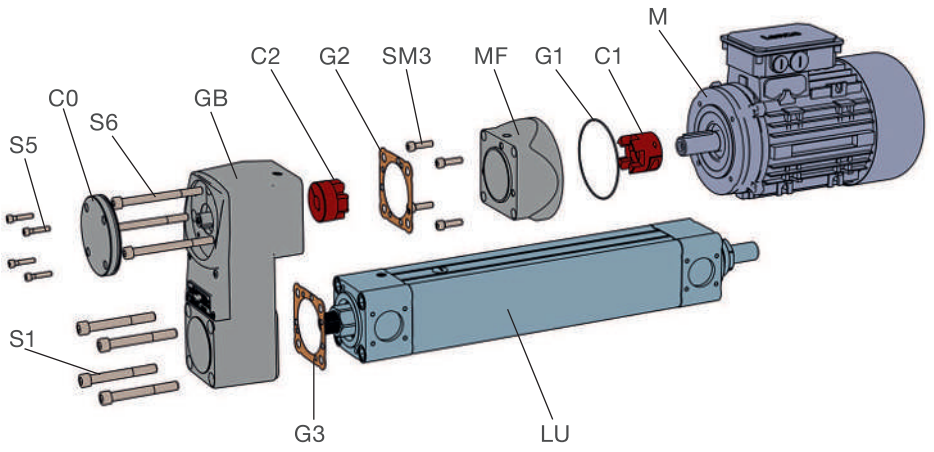
Interface	S1		SM3		S5		S6	
Type	Screws	M	Screws	M	Screws	M	Screws	M
	–	Nm	–	Nm	–	Nm	–	Nm
AC71 / B14	M12×40	75	M6	10	M10×30	40	M10×30	40
AC80 / B14	M12×40	75	M6	10	M10×30	40	M10×30	40
AC90 / B14	M12×40	75	M8	20	M10×30	40	M10×30	40
AC100 / B14	M12×40	75	M8	20	M10×30	40	M10×30	40

M Nm Tightening torque

7.1.5.2 Parallel assembly

1. Attach the coupling (C1) to the motor (M) with the screw (S4).
2. Insert the seal (G1) into the groove of the motor flange (MF) and tighten the flange with 4 screws (SM3).
3. Mount the linear unit (LU) on the gearbox (GB) by inserting the gasket (G3) between the two components and tightening the screws (S1).
4. Mount the motor flange (MF) with the motor (M) on the gearbox (GB) by inserting the gasket (G2) between the two components and tightening the screws (S6).
5. Place the cover (CO) on the gearbox (MF) and tighten the screws (S5).

14 Parallel assembly of the induction motor



S1	Screw	SM3	Screw
S5	Screw	S6	Screw
G1	Seal	G2	Gasket
G3	Gasket	M	Motor
MF	Motor flange	GB	Parallel gearbox
LU	Linear unit	C1	Coupling half LU
C2	Coupling half M	CO	Cover

7 Screws and torques (parallel)

Interface	S1		SM3		S5		S6	
Type	Screws	M	Screws	M	Screws	M	Screws	M
	–	Nm	–	Nm	–	Nm	–	Nm
AC71 / B14	M12×110	40	M6	10	M6×25	6	M10×130	40
	M12×140 [1)]	75						
AC80 / B14	M12×110	40	M6	10	M6×25	6	M10×130	40
	M12×140 [1)]	75						
AC90 / B14	M12×110	40	M8	20	M6×25	6	M10×130	40
	M12×140 [1)]	75						
AC100 / B14	M12×110	40	M8	20	M6×25	6	M10×130	40
	M12×140 [1)]	75						
N11	M12×110	40	-	-	M6×25	6	M10×130	40
	M12×140 [1)]	75						

[1)] Screw and tightening torque when using the rear attachment

M	Nm	Tightening torque

7.2 Mounting the belt gearbox

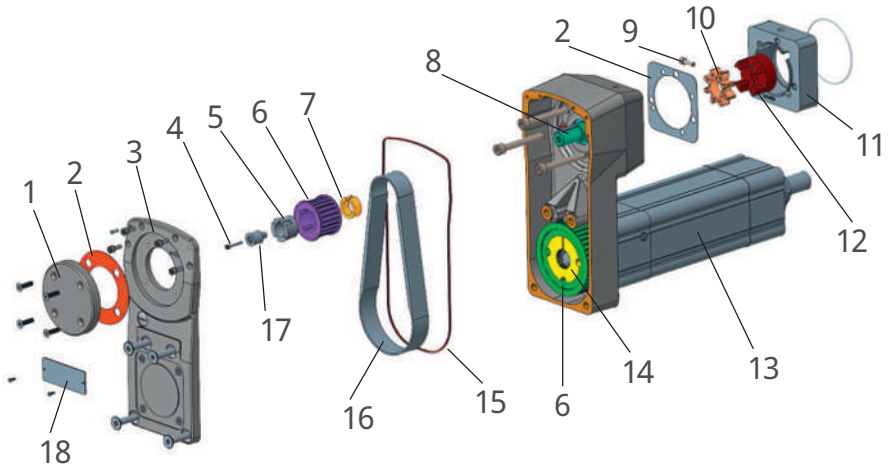
7.2.1 Mounting according to scope of delivery

The belt gearbox is available with the following scopes of delivery:

- Complete drive with mounted belt gearbox with linear unit, with motor adapter kit and without motor ➤28|7.2.2.3
- Belt gearbox without linear unit, without motor adapter kit and without motor ➤26|7.2.2.2
- Belt gearbox without linear unit, with motor adapter kit and without motor ➤26|7.2.2.2

Scope of delivery: Complete drive with mounted belt gearbox and without motor

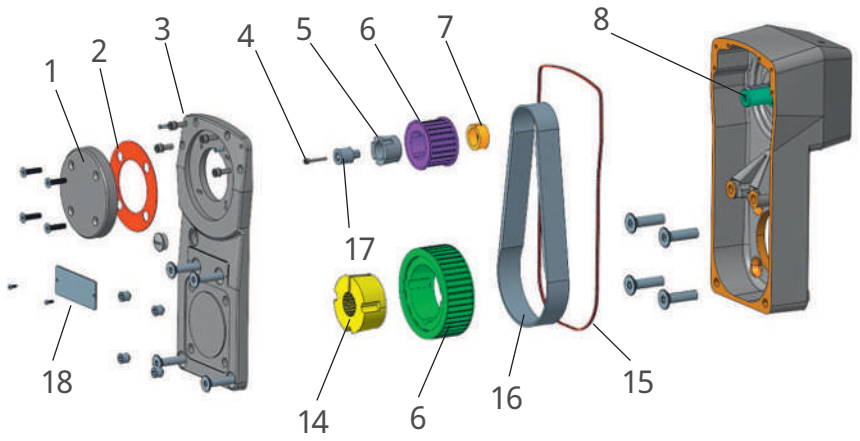
15 Belt gearbox with linear unit, with motor adapter kit, without motor



1	Cover	2	Gasket
3	Rear Cover	4	Screw
5	Taper lock bushing	6	Belt pulley
7	Sleeve	8	Shaft
9	Coupling screw	10	Spider element
11	Motor flange	12	Coupling
13	Linear unit	14	Taper lock bushing with spline
15	Seal	16	Belt
17	Adapter	18	Label plate

Scope of delivery: Belt gearbox only

16 Belt gearbox without linear unit, without motor adapter kit, without motor

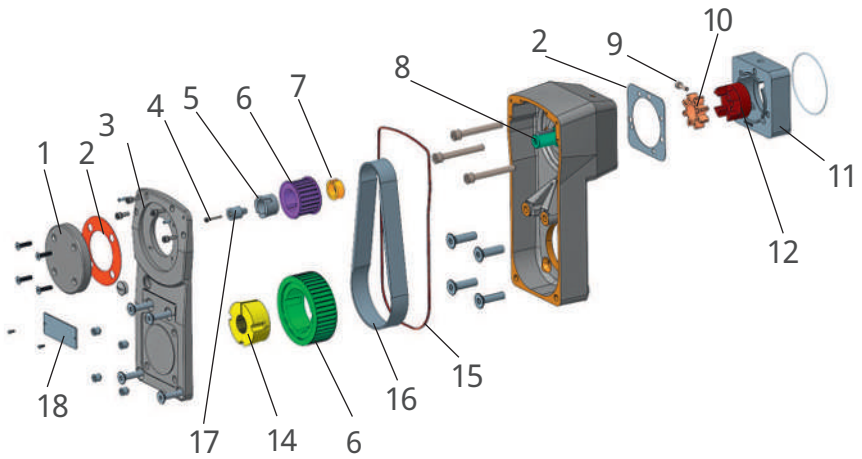


001BDA59

1	Cover	2	Gasket
3	Rear Cover	4	Screw
5	Taper lock bushing	6	Belt pulley
7	Sleeve	8	Shaft
14	Taper lock bushing with spline	15	Seal
16	Belt	17	Adapter
18	Label plate		

Scope of delivery: Belt gearbox with motor adapter kit and without motor

17 Belt gearbox without linear unit, with motor adapter kit, without motor



001BDA56

1	Cover	2	Gasket
3	Rear Cover	4	Screw
5	Taper lock bushing	6	Belt pulley
7	Sleeve	8	Shaft
9	Coupling screw	10	Spider element
11	Motor flange	12	Coupling
14	Taper lock bushing with spline	15	Seal
16	Belt	17	Adapter
18	Label plate		

7.2.2 Mounting instruction

Below you will find mounting instructions on how to assemble the belt gearbox, the linear unit, the motor adapter and the motor.

Depending on the scope of delivery, all or some components may already be assembled and the steps for these components can then be skipped.

7.2.2.1 Required tools

Not included in the motor adapter kit:

- Torque wrench 0 Nm to 81 Nm with hex socket inserts 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 10 mm
- T10 Torx
- Hex key 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 10 mm
- Flat-head screwdriver 5 mm to 10 mm
- Plastic mallet or rubber mallet
- Loctite 243 and Loctite 574

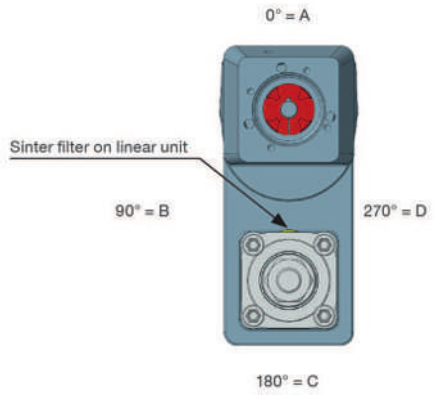
Included in the motor adapter kit:

- Tool for mounting the taper bushings
- Tool for locking the pulley

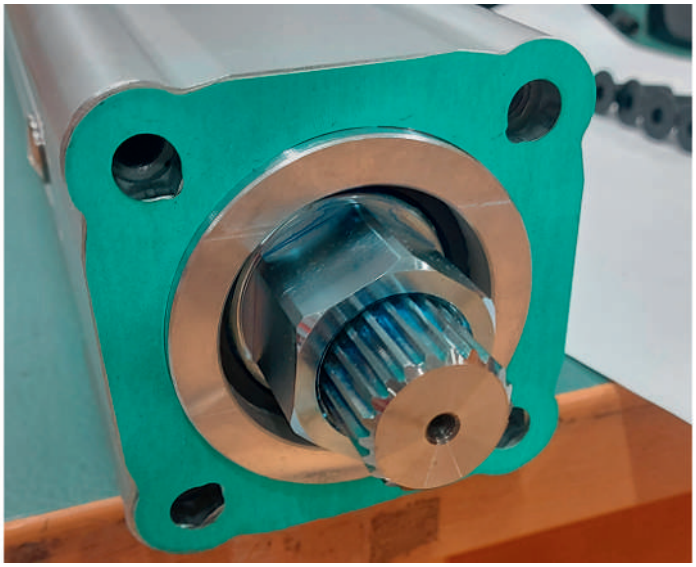
7.2.2.2 Mounting the belt gearbox housing on the linear unit

1. Check the position of the letter that concerns the rotation of the linear unit in the ordering key:
   EMA-100-#-XX-0100-AXXXXXX-XXXX00-GB-CXX-XX-MA-XX-XXX-**A**X-000
2. Check the sinter filter on the linear unit and align it with the belt according to the letter in the ordering key.
3. Place the linear unit on the table with the toothed end suspended.
4. Place the gasket on the linear unit.
5. Mount the belt gearbox housing on the linear unit with 4 screws M12×45. Apply Loctite 243 all around the first 10 threads of the screws.
6. Tighten the screws crosswise and tighten the screws to 81 Nm with a torque wrench.
7. Check that the belt gearbox housing is correctly aligned in accordance with the ordering key.

18 Alignment of the sinter filter on the linear unit



19 Linear unit with the toothed end suspended



001D16B6

20 Belt gearbox housing on the linear unit

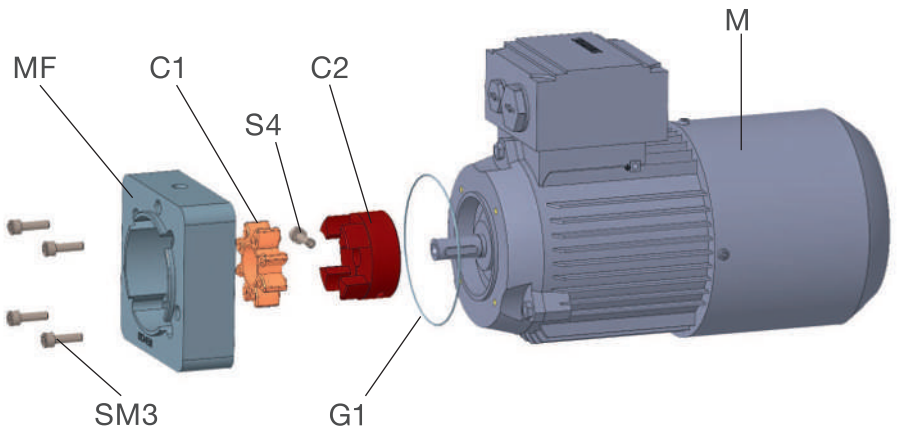
001D16C6

7.2.2.3 Mounting the motor adapter kit, AC motor

✓ Applies only to AC motors. For servo motors, continue with the steps under ➤29|7.2.2.5.

1. Insert the spider element (C1) into the coupling (C2).
2. Mount the coupling on the motor (M).
3. Tighten the coupling screw (S4) (M6×20) to attach the coupling to the motor shaft and also tighten the coupling screw to 15 Nm.
4. Place the seal (G1) between the motor flange and the motor.
5. Apply Loctite 243 around the motor screws (SM3).
6. Mount the motor flange (MF) on the motor with the motor screws and tighten the screws.

21 motor adapter kit, AC motor



MF	Motor flange	C1	Spider element
C2	Coupling	SM3	Motor screw
S4	Coupling screw	G1	Seal
M	Motor		

8 Torques for motor adapter kit and motor flange, AC motor

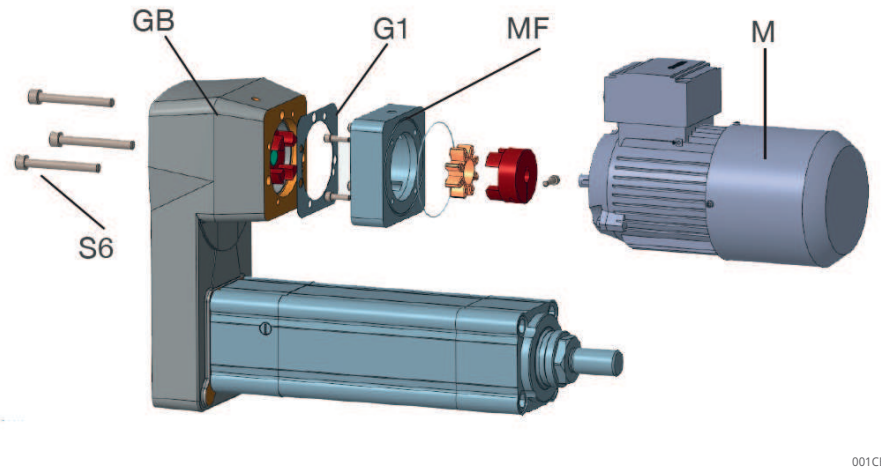
Interface	SM3 screw	Torque	S6 screw	Torque
AC71 / B14	M6	10 Nm	M10×80	40 Nm
AC80 / B14	M6	10 Nm	M10×80	40 Nm
AC90 / B14	M8	20 Nm	M10×80	40 Nm
AC100 / B14	M8	10 Nm	M10×80	40 Nm
N11	–	–	M10×80	40 Nm

7.2.2.4 Mounting the motor flange, AC motor

✓ Applies only to AC motor 4.

1. Mount the motor adapter kit on the belt gearbox housing. The kit contains the screws (S6), flange (MF) and gasket (G1) needed to mount the flange.
2. Place the gasket (G1) on the belt gearbox housing (GB).
3. If the flange (MF) has an opening for a lifting device, orient it upwards as shown in the figure.
4. Apply Loctite 243 to the first 10 threads of the screws (S6) used to fix the flange (MF).
5. Tighten the screws to the torque specified in the motor adapter kit.

22 Motor flange



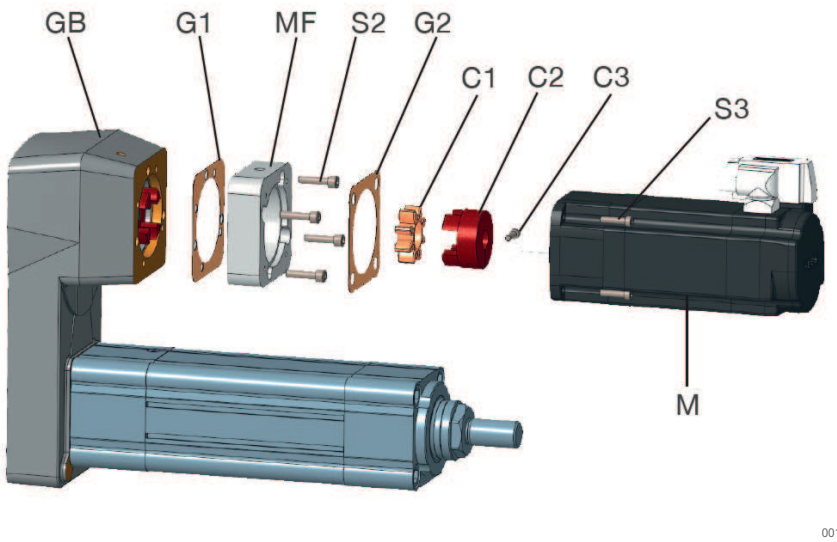
S6	Screw	GB	Belt gearbox
G1	Gasket	MF	Motor flange
M	Motor		

7.2.2.5 Mounting the servo motor

✓ Applies only to servo motors.

1. Install the spider element (C1) in the coupling (C2).
2. Attach the coupling (C2) to the motor (M) with the coupling screw (M6×20) (C3) and tighten the screw to 15 Nm.
3. Place the gasket (G1) between the motor flange (MF) and the belt gearbox housing (GB).
4. Attach the motor flange to the housing using the flange screws (S2).
5. Tighten the screws to the torque specified in the motor adapter kit.
6. Place the gasket (G2) between the motor and the motor flange.
7. Attach the motor to the motor flange using the motor screws (S3) and tighten the motor screws to the ➤30 | 9 with the specified torque.

23 Servomotor



C1	Spider element	C2	Coupling
C3	Coupling screw	G1	Gasket
G2	Gasket	GB	Belt gearbox
M	Motor	MF	Motor flange
S2	Flange screw	S3	Screw

9 Servo motor torques

Interface	S3 screw	Torque	S2 screw	Torque
1FK704X	M6×30	10 Nm	M8×30	20 Nm
1FK706X	M8×30	20 Nm	M8×30	20 Nm
1FK708X	M10×30	40 Nm	M8×30	20 Nm
1FK710X	M12×40	75 Nm	M8×30	20 Nm

7.2.2.6 Mounting the pulley and taper bushing on the linear unit

1. Place the belt pulley without side plates around the spline shaft. The pulley will only fit one way.
2. Mount the taper bushing with the spline all the way up against the spline of the linear unit and the screw nut.
3. Set screws included in the taper bushing with spline. Remove these set screws and degrease the screws with Loctite SF 7063.
4. Perform a control measurement and measure the distance between the end of the taper lock bushing with spline and the spline shaft. Write down the measurement for comparison with later steps.
5. Apply Loctite 243 to the set screws.

24 Control measurement

001D16D6

25 Loctite 243 on set screw

001D16E6

26 Pulley and taper bushing on the linear unit

001D16F6

7.2.2.7 Fixing the taper lock bushing to the linear unit

1. Insert the pulley locking tool between the pulley and the belt gearbox housing.
2. Fasten the pulley with the set screws by first tightening the adjusting screws hand-tight.
3. Be sure to tighten the screws in several passes and as evenly as possible to avoid vibration of the pulley when turning.
4. Tighten the screws to 30 Nm using a torque wrench.
5. Remove the pulley locking tool.
6. Make sure that the taper bushing with the spline is at the very top of the screw nut by measuring again from the top of the pulley to the top of the spline on the linear unit. The result should be the same as the one measured earlier. The measurement may vary by ± 0.1 mm.

27 Pulley locking tool

001D1706

28 Control measurement

001D1716

7.2.2.8 Mounting the pulley and belts on the shaft

1. Do not mount the sleeve for belt gearbox 1:1. For belt gearbox 2:1, mount the sleeve on the shaft.
2. Place the pulley around the shaft.
3. Place the belt around both pulleys.
4. Take a taper bushing and slide it onto the shaft. Use the taper bushing assembly tool and a plastic mallet to gently tap the bushing all the way onto the shaft.
5. Degrease the set screws of the taper bushing. Set screws included in the taper lock bushing.
6. Apply Loctite 243 to the set screws, the first 5 threads all around.

29 Belt gearbox ratio 1:1

001D1726

30 Belt gearbox ratio 2:1

001D1736

31 Sleeve on shaft

001D1746

32 Belts around both pulleys

001D1D06

33 Belts around both pulleys with taper bushing

001D1D76

34 Taper bushing

7.2.2.9 Attaching the pulley to the shaft

NOTICE

Damage to the linear unit

Turning the Hex key extends and retracts the linear unit.

- Be careful not to drive the actuator all the way to its end points, as this could damage the linear unit.

1. Depending on the type, the bushing has 3 or 4 holes, 2 of which have a thread. Insert the threaded screws into the threaded holes to secure the bushing. The threaded hole in the pulley is used to loosen the bushing.
2. Slide the pulley onto the bushing.
3. Insert the pulley locking tool.
4. Tighten the set screws to secure them to the shaft.
5. Tighten the set screws to 30 Nm for belt gearbox 1:1 and to 5.7 Nm for belt gearbox 2:1.
6. Remove the pulley locking tool

35 Pulley locking tool

001D1D96

36 Tightened set screws

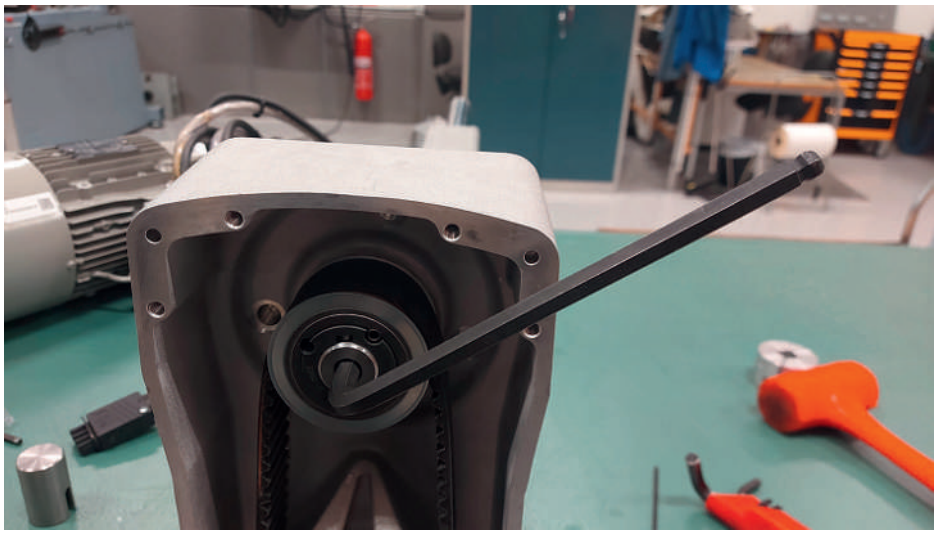
001D1DA6

37 Pulley on shaft

001D1DB6

7. Make sure the belt is correctly mounted and properly tensioned: Insert a hex key 8 mm into the shaft.
8. Turn the pulley unit by hand with the wrench.
9. Check whether the belt is not aligned or the pulleys are wobbling.
10. Make sure that the assembly is easy to turn by hand and that the pulleys do not rub against the belt gearbox housing.

38 Hex key 8 mm in the shaft



001BDA0F

7.2.2.10 Mounting the rear cover interface

✓ Applies only to a thick cover. For a thin cover, continue with ➤49|7.2.2.17.

1. Apply Loctite 243 to the first 10 threads of a screw (M4×25).
2. Insert the adapter into the shaft.
3. Tighten the screw to 2.9 Nm using a torque wrench.

39 Interface adapter

001D1DC6

40 Screw (M4×25)

001D1DD6

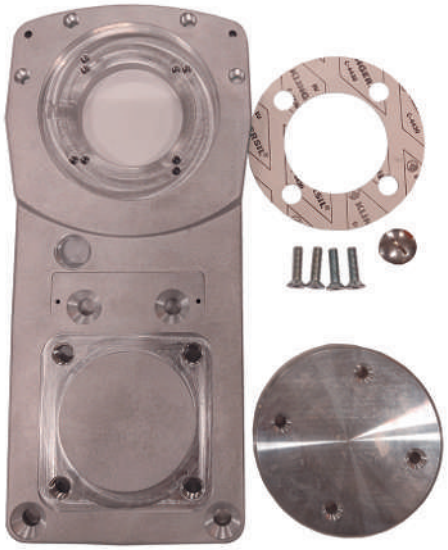
41 Mounted interface adapter

001D1DE6

7.2.2.11 Mounting the rear cover interface on the thick cover

1. Attach the gasket to the cover, making sure that the holes in the cover match the holes in the gasket.
2. Mount the rear cover interface with 4 screws (MF6S 6×25) on the belt gearbox cover. Apply Loctite 243 to the first 5 threads all around and tighten to 10 Nm with a torque wrench.
3. Attach the plug to the cover with a slotted screwdriver and tighten to 1 Nm.

42 Gasket and rear cover interface



001D1DF6

43 Screw (MF6S 6×25)

001D1E06

44 Mounted rear cover interface

001D1E16

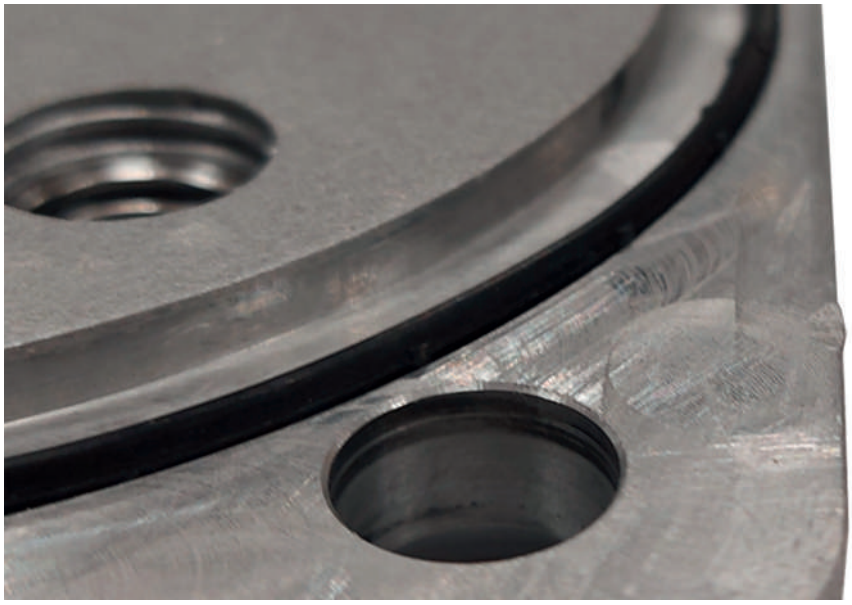
7.2.2.12 Attaching the rubber seal to the thick cover

1. Install the seal in the cover.
2. Align the seal so that the flat part of the seal faces down into the groove as shown in the figure.
3. Make sure that it is in position all around in the groove provided.

45 Thick cover

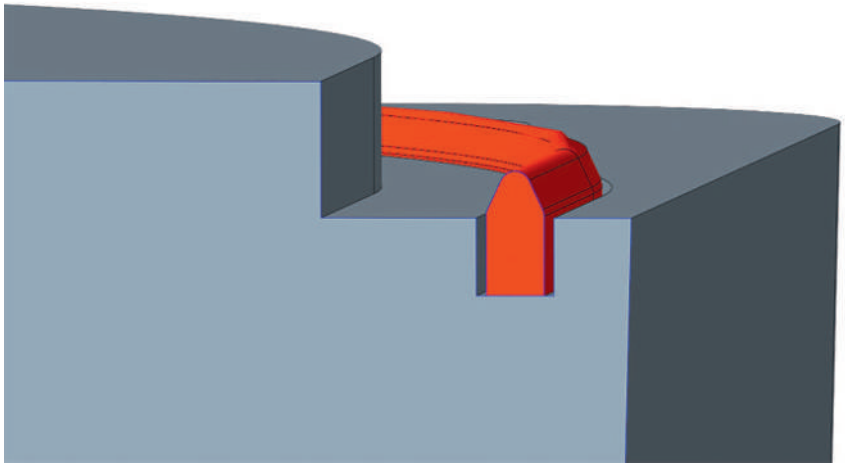
001D1E26

46 Alignment of the rubber seal



001D1E36

47 Seating in the groove



001CE9D4

7.2.2.13 Mounting the threaded screws on the thick cover (no rear attachment available)

✓ Applies only if there is no rear attachment. If there is a rear attachment, proceed with the next step ➤46|7.2.2.14.

1. Check: EMA-100-#-XX-0100-AXXXXXX-XXXX00-GB-CXX-0X-MA-XX-XXX-XX-000 0: no rear attachment, B: 0', C: 90'
2. If the rear attachment is not mounted, plug the mounting holes of the rear attachment with 4 grub screws.
3. Glue the first 5 threads around the grub screw with Loctite 243.
4. Screw in the grub screws so that they lie flat on the inside of the cover. It is important that the grub screws do not protrude through the inside of the cover, otherwise they could bump into the pulley.

48 Grub screws

001D1E46

49 Grub screw in cover

001D1E56

50 Grub screw with Loctite 243

001D16E6

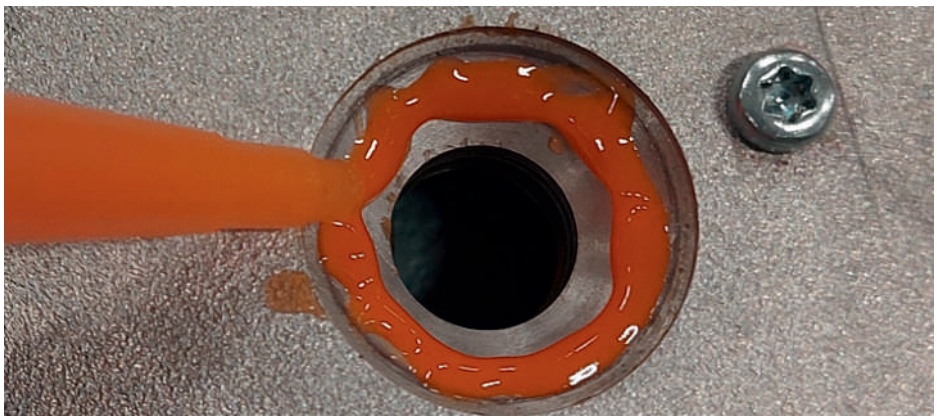
7.2.2.14 Mounting the cast cover

1. Insert 2 pins into the holes in the belt gearbox housing. If the pin is not easy to insert, use a plastic mallet and tap it in gently.
2. Mount the belt cover on the belt housing with 4 washers and 4 screws (MC6S 6×16). Place the washers under the screws. Hand tighten the screws.
3. Apply Loctite 243 to the first 8 to 10 threads of 4 screws (MFT ISO14581 10×45).
4. Apply Loctite 574 around the 4 countersunk holes in the cover.
5. Coat 4 screws (MFT ISO14581 10×45) in the first 8 to 10 threads all around with Loctite 243 and screw them hand-tight.
6. Tighten all screws crosswise with a torque wrench. Tighten the 4 screws (MC6S 6×16) to 10 Nm and the 4 screws (MFT ISO14581 10×45) to 34 Nm.

51 Holes in the belt gearbox housing

001D1DB6

52 Countersunk hole



001D1E66

53 Screw (MFT ISO14581 10×45)

001D1E76

54 Screw (MC6S 6×16)

001D1E96

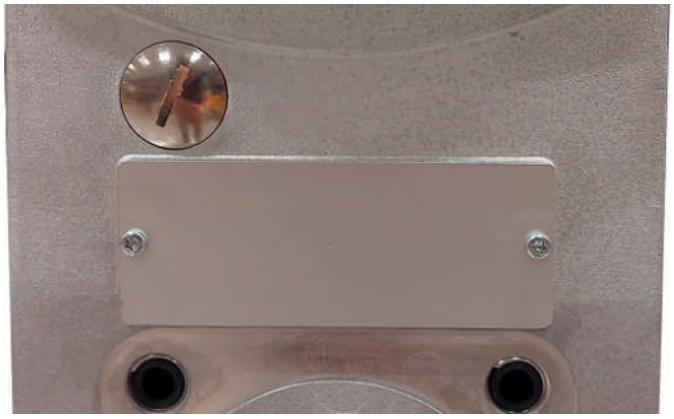
55 Cast cover

001D1EA6

7.2.2.15 Mounting the label plate

1. Attach the type plate to the cast cover with 2 screws M3×8.
2. Tighten the screws to 0.25 Nm with a Torx T10.

56 Label plate



001D1EB6

7.2.2.16 Mounting the rear attachment

1. Apply Loctite 243 to the first 10 threads around 4 screws M12×25.
2. Use the ordering key to check the orientation of the machine.
   EMA-100-#-XX-0100-AXXXXXX-XXXX00-GB-CXX-0X-MA-XX-XXX-XX-000:
   0: no rear attachment, B: 0',C: 90'
3. Mount the rear attachment with 4 screws M12×25.
4. Tighten the screws crosswise to 75 Nm.

57 B 0°

001D1EC6

58 C 90°

001D1ED6

7

7.2.2.17 Mounting the thin cover

1. Mount the thin belt cover on the belt housing with 4 screws (MC6S 6×16). Glue the first 5 to 8 threads all around with Loctite 243 and tighten the screws hand-tight.
2. Apply Loctite 243 to the first 5 threads around 4 screws (MF6S 10×45).
3. Fit 4 screws (MC6SLS 10×30), screw in hand-tight.
4. Tighten all screws crosswise using a torque wrench. Tighten 4 screws (MC6S 6×16) to 10 Nm and 4 screws (MC6SLS 10×30) to 47 Nm .

59 Screw (MC6S 6×16)

001D1EE6

60 Screw (MF6S 10×45)

001D1EF6

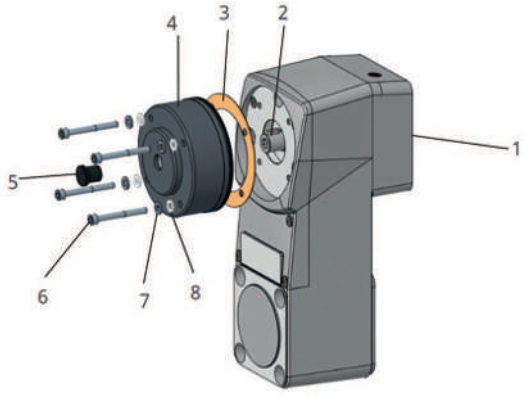
61 Thin cover

001D1F06

7.3 Mounting the centrifugal brake

1. Remove the gearbox cover (1) and insert the key (2) into the groove of the gearbox's input shaft.
2. Place the gasket (3) on the gearbox and place the centrifugal brake (4) on the input shaft of the gearbox.
3. Place a washer (7) and sealing washer (8) under the screw head. Secure the screws (6) with Loctite 241 and attach the centrifugal brake (4) to the gearbox (1). Tighten the screws (6) to 5 Nm.
4. Install the cap (5) in the housing of the centrifugal brake.

62 Centrifugal brake

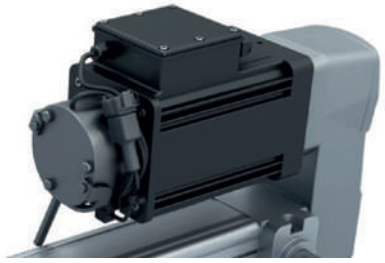


001BDA9F

1	Gearbox cover	2	Key
3	Gasket	4	Centrifugal brake
5	Cap	6	Screw
7	Washer	8	Sealing washer

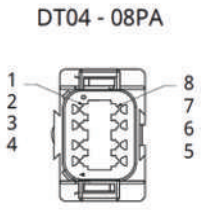
7.4 Connecting the motor N11 plug and pinnings

63 Motor N11 plug and pinning



001BDA78

64 Motor N11 plug assignment



001BDAA0

1	power supply 4.5 - 18V	2	channel A
3	channel B	4	ground
5	PT1000 (+5V)	6	PT1000 (ground)
7	brake (+24V)	8	brake (ground)

The matching plug housing is DT06-08SA from TE Connectivity.

DANGER

Electric shock

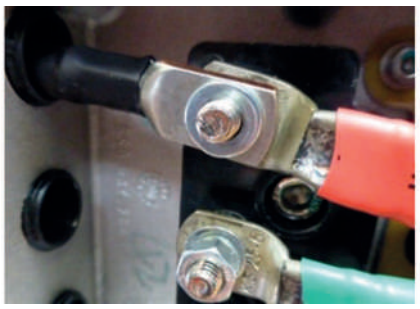
When connecting the cable to the motor, there is a risk of electric shock.

- Make sure all cables are unplugged and free of charge.

Sequence for mounting washers, spring washer and M6 screw nut:

1. Install the UVW power cable and washer.
2. Install the spring washer.
3. Install the screw nut.

65 U V W power cable and washer



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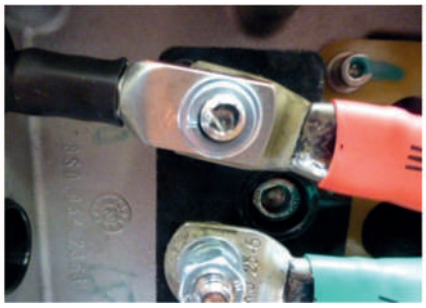
66 Spring washer



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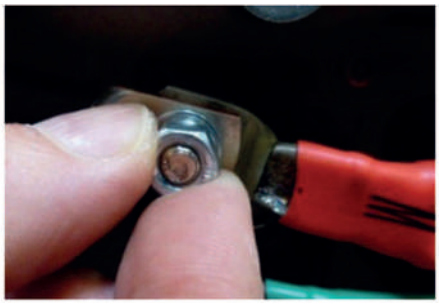
67 Nut



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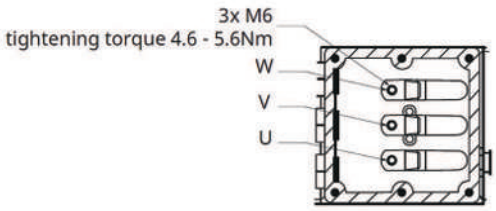
68 UVW cable torque



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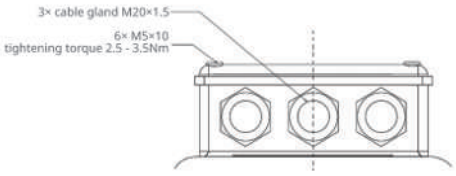
69 UVW cable motor N11 plug torque



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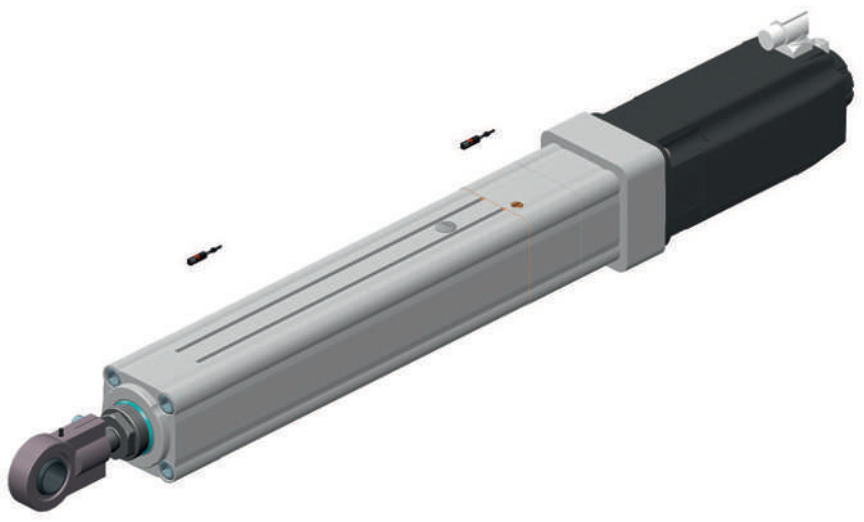
7.5 End limit switches

Preferably, the actuator for end position detection is driven manually. If this is not possible, the speed and torque of the screw must be less than 125 mm/s or 20 Nm (input torque on the linear unit). Higher speeds or torques can cause damage to the actuator.

- ✓ When installing limit switches, a safety distance to the mechanical end stops should be taken into account in order to enable sufficient overtravel.
- ✓ Since the mechanical end stops of the linear unit are not designed to withstand shocks during regular use, the limit switches must be attached in such a way that the end stops are not impacted during regular use.

1. The sensor can be inserted into two slots on the linear actuator.
2. Installation of the sensors: The sensors can be inserted into the slots from above. The cable ends should face the drive direction. Slide the sensors into their approximate position in the slots of the actuator body. Lightly tighten the limit switch mounting screws and guide the cable along the profile grooves.

70 End limit switches



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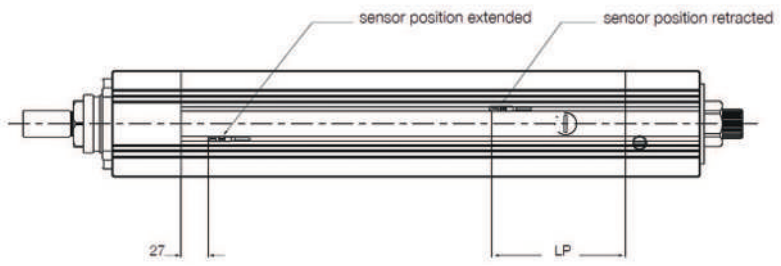
71 Sensor



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This sensor arrangement allows for a usable sensor field of 40 mm (+20 mm to −20 mm) from the center of the sensor field and leaves 10 mm unused at both ends for covering tolerance stack peaks.

10 Sensor position

Type	Comments	LP
EMA-100-1-XX-...	All screw types	156.5
EMA-100-1-CB-...	with back up nut	170.5

7.6 Screw with back-up nut

⚠ CAUTION

Risk of breakdown

The back-up nut is not designed for continuous operation. Prolonged use may cause the linear actuator to break down.

- Limit the motor torque or motor current.
- Make sure that the back-up nut does not engage.

The following position in the ordering key defines the screw with back-up nut: EMA-100-CB-####-....

The back-up nut is an additional function to the main nut. It does not come into contact with the spindle during normal operation and prevents the linear actuator from breaking down if the main nut fails. The back-up nut can be used to safely retract the linear actuator, but it creates a high level of friction on the screw.

Precautions must be taken to detect engagement of the back-up nut, e.g. by limiting the motor torque or motor current.

Once the back-up nut is engaged, the linear actuator must be replaced. The back-up nut only works under compressive load.

8 Operation

The device does not have its own operating elements to turn it on or off. The operation takes place through separate operating element.

8.1 Manual operation

The parallel gearbox has integrated manual operation. The gearbox can be rotated manually via a hex socket located on the geared motor axis. Access to it is covered as standard.

An opening for direct access can be provided on request. The standard cover does not have an opening.

Manual operation can be used as a safety function in the event of a power failure or for manual adjustment of the drive.

When using manual operation, the electromechanical motor brake must be released.

9 Troubleshooting

The following chapter describes potential causes for failures and the work that is necessary to restore operation. In the event of more frequent malfunctions, shorten the maintenance Intervals.

1. In the event of a failure that may pose an immediate danger to persons or property, switch off the drive.
2. Determine the cause of the malfunction.
3. Depending on the type of failure, have it repaired by qualified personnel. Contact the manufacturer concerning failures which are not solved by the repair suggestions.
4. Report the failure to the responsible person on site.

11 Fault messages

Failure	Possible cause	Repair malfunction
Linear actuator does not move.	Obstacle in the stroke area of the linear actuator	Remove all obstacles from the stroke area.
	Incorrect load	Measure the static and dynamic load and compare it with the information on the product label. If the load capacity is exceeded, check the nominal load and install a stronger actuator if necessary.
	Device service life exceeded.	See the performance diagram in the user manual for the linear actuator.
	The linear actuator cannot be set in motion by any of the above measures.	Replace the device.
	The belt is torn in the belt gearbox. The motor rotates, but the linear unit does not move.	Order a spare part kit for the belt and replace the belt in the gearbox housing.
The linear actuator cannot be lifted.	Obstacle in the stroke area of the linear actuator	Remove all obstacles from the stroke area.
	Incorrect load	Remove all loads on the elements.
	Defective screw nut	Replace the device.
	Engaged back-up nut	Replace the device.
Significantly reduced speed	Obstacle in the stroke area of the linear actuator	Remove all obstacles from the stroke area.
	Incorrect load	Remove all loads on the elements.
	Motor, gearbox or spindle nut defective	Replace the device.
Significant increase in noise during operation	Obstacle in the stroke area of the linear actuator	Remove all obstacles from the stroke area.
	Incorrect load	Remove all loads on the elements.
	Motor, gearbox, or ball screw nut defective	Replace the device.

Once the malfunction has been corrected, follow the steps to set up and restart ➤16|6.4.

10 Maintenance

10.1 Maintenance plan

The maintenance tasks required for optimal and trouble-free operation are described in the following sections. If increased wear is detected during regular inspections, shorten the maintenance intervals according to the actual signs of wear.

If the linear actuator is used outside of the environmental conditions specified in this manual, check these components once a month for any changes such as oxidation or sedimentation.

12 Maintenance plan for the linear actuator

Interval	Maintenance work
Daily	Inspect the drive for visible damage ➤58|10.2.3.
	If necessary, remove dust and dirt ➤57|10.2.1.
Monthly	Check the tight fit of the rod and the options, correct if necessary. Then check for tight fit.
	Check the relubrication interval ➤59|10.2.4.
Every six months	Check for visible damage ➤58|10.2.3.
	Check the relubrication interval ➤59|10.2.4.
Annually	Check stickers and warnings for legibility and replace them if necessary.
	Check gaskets for damage ➤58|10.2.2.
	Check the relubrication interval ➤59|10.2.4.
	Inspect the belt for visible damage ➤58|10.2.3.

13 Maintenance plan for the belt gearbox

Interval	Maintenance work
Every 6 years	Replacing the belt in the belt gearbox

10.2 Maintenance work

10.2.1 Cleaning

NOTICE

Damage due to improper cleaning

Improper cleaning of the device can damage it.

- Do not use any aggressive cleaning agents. The water used for cleaning, including any chemical additives, must be pH-neutral.
- When retracting and extending, no liquids must touch the drive.
- Use only the permitted tools.
- No steam jets or high-pressure cleaners may be used for cleaning.
- Other cleaning agents or cleaning devices may only be used with the manufacturer's approval.

- Clean soiled parts with a damp cloth.

10.2.2 Checking the gasket

NOTICE

Risk of property damage due to damaged or incorrect sealing

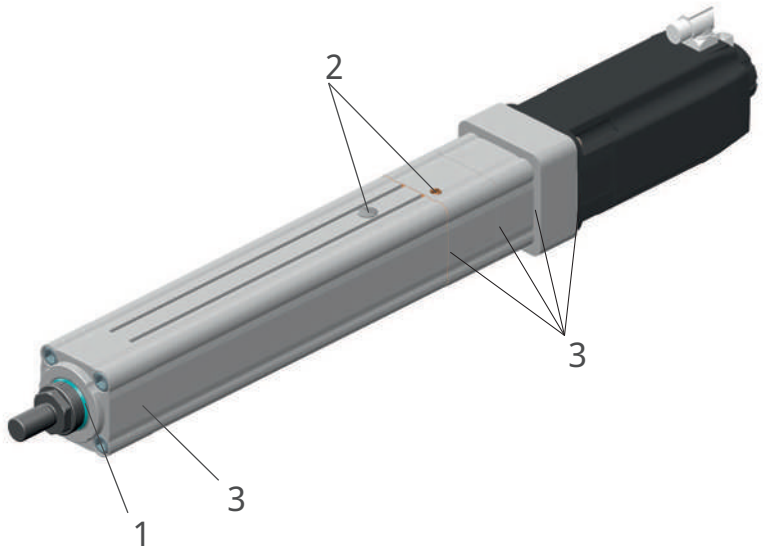
Damaged or incorrect sealing cannot ensure protection according to IP54S or higher.

- Contact the manufacturer to replace damaged gaskets or seals immediately.

✓ The device must be switched off and secured.

1. Check gaskets for damage. (1)
2. Check the connection for damage. (2)
3. Check the flat gasket for damage. (3)
4. Check the linear actuator for leaks. If no damage is detected, the device can be put back into operation.

72 Sealing function

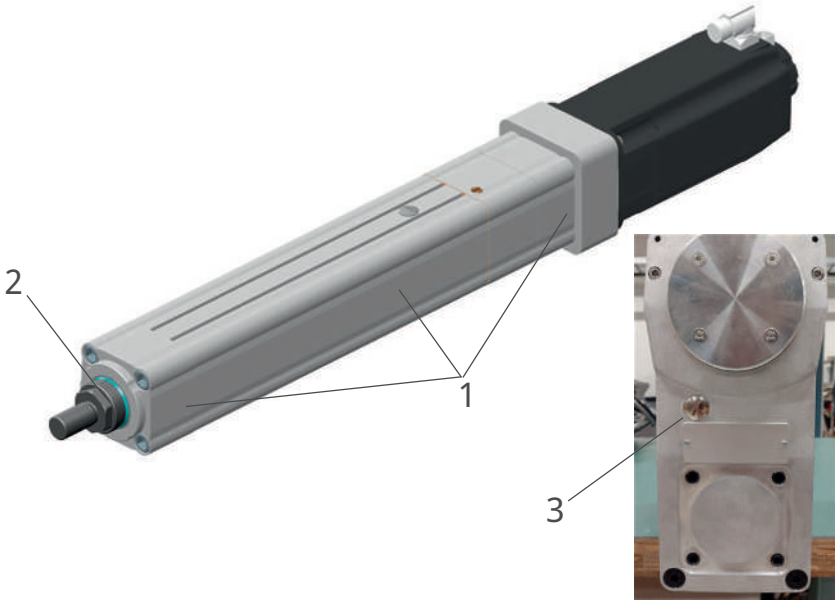


1	Seal	2	Filter and plug
3	Gasket		

10.2.3 Visual inspection

1. Separate device from the energy supply.
2. Check the following components for visible external damage.
3. Check the profile and housing (1) for cracks and gaps
4. Check the housing of the centrifugal brake for damage.
5. If the coating layer on the centrifugal brake is damaged, replace the centrifugal brake
6. Check the push tube (2) for scratches and indentations
7. Check the belt for excessive wear and tear by opening the plug in the housing (3).
8. Notify the manufacturer of the original equipment or actuator if there is any damage.
9. If there is no damage, reconnect the device to the power supply.

73 Visual inspection



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1	Housing	2	Push tube
3	Plug in the housing		

10.2.4 Relubrication interval

Use the following lubricating greases for relubrication:

- for type BA, BB, CB and BC lubricating grease BERUTOX FH 28 EPK / II Manufacturer: Bechem
- for type RA lubricating grease STABUTHERM GH 461. Manufacturer: Klueber

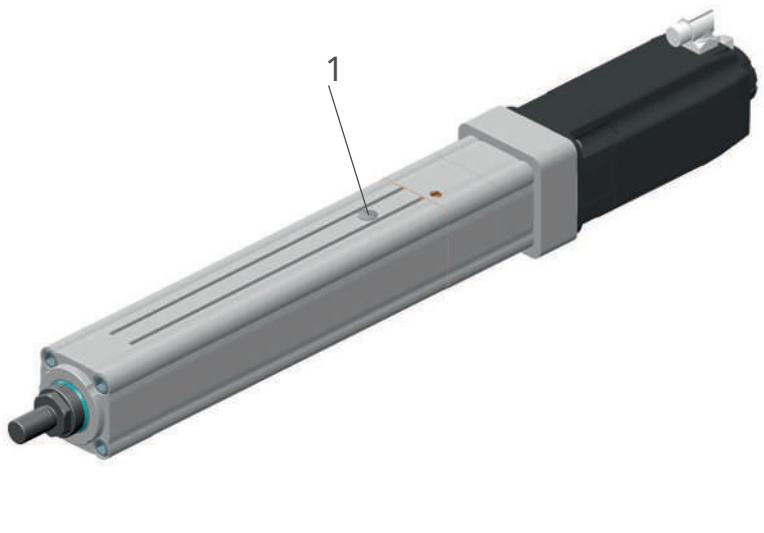
⚠ WARNING

Risk of damage and injury

- The relubrication port may only be opened when the device is stationary and de-energized.

1. The relubrication device is optional: Check whether the linear actuator is equipped with a relubrication plug on the protection tube (1).
2. Move the actuator to the relubrication position.
3. Stop and secure the actuator/application before restarting and moving.
4. Open the relubrication plug.
5. Relubricate the linear actuator with the specified type and amount of lubricant.
6. Close the relubrication plug.
7. Put the system back into operation.

74 Relubrication interval



1	relubrication port

14 Relubrication interval

Type	Relubrication position		Relubrication interval	Lubricant quantity	Screw type
EMA-100-1-BA	Nominal stroke	40 mm	Every 10 million revolutions or 100 km [1]	8 cm^3	BS 32×10
	From mechanical end stop	43 mm			
EMA-100-1-BB	Nominal stroke	3 mm	Every 10 million revolutions or 100 km [1]	17 cm^3	BS 40×10
	From mechanical end stop	6 mm			
EMA-100-1-CB	Nominal stroke	3 mm	Every 10 million revolutions or 100 km [1]	17 cm^3	BS 40×10
	From mechanical end stop	6 mm			
EMA-100-1-BC	Nominal stroke	3 mm	Every 5 million revolutions or 100 km [1]	7 cm^3	BS 40×20
	From mechanical end stop	6 mm			
EMA-100-1-RA	Nominal stroke	2 mm	Every 20 million revolutions or 200 km [2]	14 cm^3	RS 30×10
	From mechanical end stop	5 mm			

[1] Relubrication of the actuator at least at intervals of 3 years

[2] First relubrication after 100000 revolutions

10.3 Inspection after maintenance

✓ Maintenance work has been completed.

1. Check all screw connections for a tight fit.
2. Ensure that all used tools, materials and other equipment have been removed from the work area.
3. Clean the work area and remove any spilled liquids and processing materials.
4. Ensure that all of the system's safety measures work properly without any problems.
5. Check functions
6. Document the performance of the inspections in the maintenance log.

» The device can now be put back into operation.

10.4 Measurements after maintenance

At each maintenance interval, the following measurements must be performed:

Excessive wear of the ball screw spindle or roller screw spindle can lead to an increase in operating noise and jamming of the drive.

10.5 Belt maintenance

Tools:

- Hex key 3 mm to10 mm
- T10 Torx
- torque wrench
- Tool for mounting the taper bushings included in the belt maintenance kit
- Tool for locking the pulley included in the belt maintenance kit

Consumables:

- Loctite 243 or similar threadlocker
- Loctite 574 or similar sealant

Parts:

- 1x belt maintenance kit

⚠ WARNING

Personal injury

- The linear unit must be removed from the application and must not be placed under load under any circumstances.

The individual steps for implementation are explained in the following sub-sections.

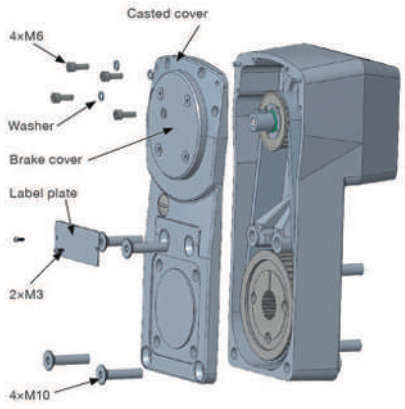
10.5.1 Disassembly of the rear cover of the belt gearbox

1. Remove the two screws that hold the identification plate (2 x M3).
2. Remove any screws that hold the belt cover (4 x M6 and 4 x M10).

› The brake cover does not need to be removed.

3. Remove the belt cover from the belt gearbox housing.

75 Belt cover

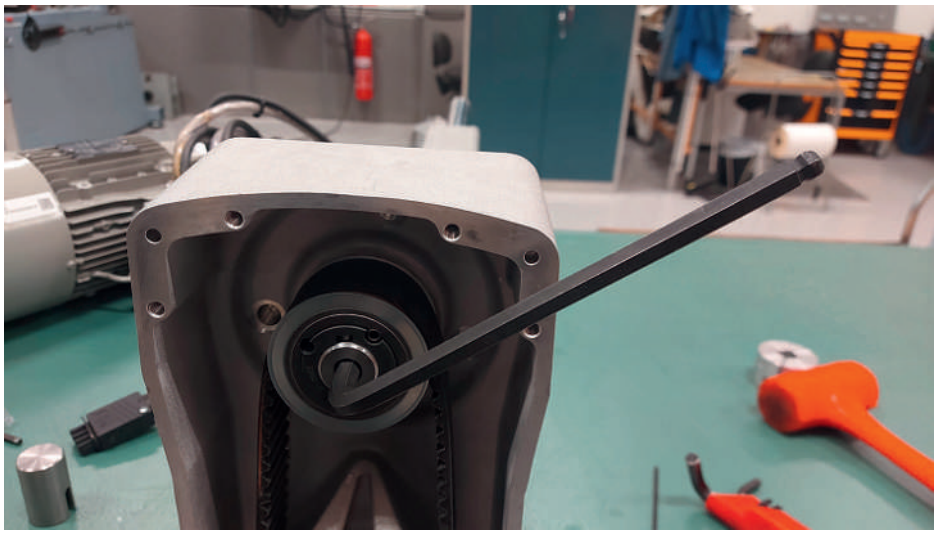


10.5.2 Disassembly of the upper pulley and belt

✓ The rear cover of the belt drive must be disassembled.

1. Insert a hex key 8 mm into the shaft as shown in the figure and hold it in place so that the pulley does not rotate when the set screws are removed.
2. Loosen the two threaded screws on the pulley. The threaded screws are glued with threadlocker (Loctite 243) ex works.
3. To detach the pulley from the taper bushing, take one of the set screws and screw it into the threaded hole of the pulley. When the grub screw is tightened, the pulley detaches from the bushing.
4. Detach the taper bushing from the shaft. If the bushing is not easy to pull out, use a slotted screwdriver and gently push it into the gap in the pulley for easy disassembly.
5. Remove the belt from both pulleys.

76 Hex key in the shaft



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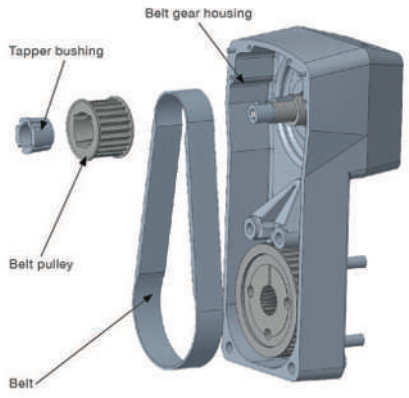
10.5.3 Belt assembly

✓ The upper pulley and belt are disassembled.

1. Place a new belt around the lower pulley.
2. Mount the top pulley on the shaft and put the belt in place.
3. Place the taper bushing on the shaft and make sure that it sits all the way on the shaft. Gently tap the bushing onto the shaft with a mallet and the tool for mounting the taper bushing.
4. Degrease and clean the threaded screws of old threadlocker.
5. Apply threadlocker, e.g. Loctite 243, to the first 5 to 8 threads of the set screws.
6. Insert the two threaded screws into the taper lock bushing. Be sure to use the 2 threaded holes in the bushing.
7. Insert the hex key 8 mm to prevent the shaft from rotating when tightening the threaded screws.
8. Tighten the threaded screws to 30 Nm for 1:1 and to 5.7 Nm for 2:1, making sure that they are tightened evenly.

77 Taper bushing



10.5.4 Mounting the rear cover

✓ The belt is mounted.

1. Install the new screws that come with the kit.
2. Apply Loctite 243 to all new screws and spread the adhesive around the thread, for example on the first 8 to 10 threads.
3. Apply Loctite 574 to the countersunk holes for the screws M10. This is to ensure that the gearbox meets the requirements for IP54 .
4. Tighten the 4 screws M6 to 10 Nm and the 4 screws M10 to 47 Nm.
5. Mount the plate with the 2 screws M3×10 and tighten the screws hand-tight to 0.25 Nm.

11 Dismantling the linear unit

⚠ CAUTION

Danger of injury due to improper dismantling

Stored residual power, sharp-edged components, pins and corners on the individual components or on required tools can cause serious injury.

- Ensure there is ample space for dismantling prior to starting work.
- Be careful when working with open, sharp-edged components.
- Ensure order and cleanliness at the dismantling site! Loosely stacked components or components and tools lying on the floor can be a cause of accidents.
- Dismantle the components professionally, in accordance with applicable local regulations.
- Secure structural components in a way so they would not be able to fall or tip over.
- Contact the manufacturer if you have any questions or concerns.

1. Secure elements of the application such that no loads can impact the fork or the hinge head.
2. Loosen and remove the fastening screws from the trunnion or flange and rods.
3. Separate the linear actuator from application elements.
4. Clean the device
5. Carefully pack the device ready for transport.
6. If the device is to be disposed of, it must be dismantled in accordance with the applicable operation procedure and environmental protection regulations.

12 Disposal

Observe the local regulations for disposal.

13 Appendix

For a complete description of the actuator's performance, please refer to the following document:

TPI 293 | EWELLIX Elektromechanical Linear Actuator EMA-100 | https://www.schaeffler.de/std/202F

For further technical information, please contact Schaeffler. For quick orientation, the most important performance parameters are listed in the following section.

13.1 Linear unit

13.1.1 Degree of protection

The following position in the ordering key defines the degree of protection:
EMA-100-1-##-####-#######-X####-...

Option D requires a hose to be connected to the hose adapter valve supplied. The hose must be connected to clean air so that the drive can breathe during movements.

15 Degree of protection

X	Degree of protection	Shortened service life
B	IP54S	–
C	IP65 if sinter filter is protected	reduced to 100 km
D	IP65	reduced to 100 km

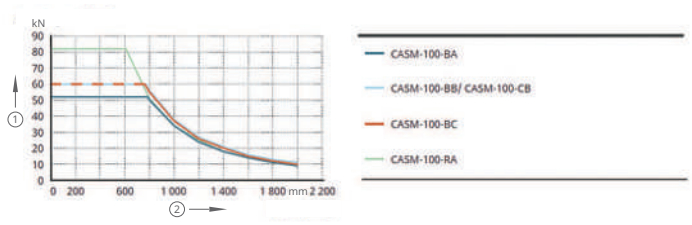
13.1.2 Permissible force

Below is the force limitation in terms of the max. force applicable in both directions (compression and tension) for the linear unit:
EMA-100-1-XX-####-##Y##Z#-...

16 Permissible force

Spindle type (XX)	Screw type	max. dynamic axial force	max. dynamic axial force L10	max. static axial force
BA	32×10 ball screw	23 kN	22 kN	52 kN
BB	40×10 ball screw	57 kN	57 kN	60 kN
CB	40×10 ball screw	57 kN	57 kN	60 kN
BC	40×20 ball screw	60 kN	60 kN	60 kN
RA	30×10 roller screw	82 kN	50 kN	82 kN

78 Buckling load



1	Buckling load	2	Stroke

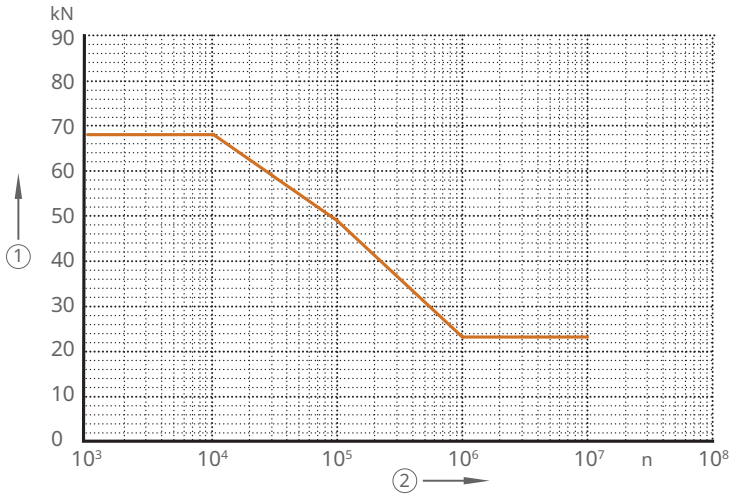
Depending on the front and rear mounting options used, there may be additional restrictions.

17 Additional load restriction

Front attachments (Y)	Rear attachments (Z)	Load
C, D, E ➤67|	Any	see service life for housing attachments
Any	C, D, E ➤67|	see service life for housing attachments

C: Trunnion fixing must be ordered separately, D: Foot fixing 0° mounting position, E: Foot mount 180° , mounting position

79 Service life for housing attachments



1	Load	2	Lifetime
n	Load changes		

13.1.3 Linear speed

The following position in the ordering key defines the linear speed:
EMA-100-1-XX-####-#######-Z#####-...

18 Linear speed

Spindle type (XX)	Degree of protection (Z)	max. linear speed
BA	B - IP54S	260 mm/s
BB	B - IP54S	210 mm/s
CB	B - IP54S	210 mm/s
BC	B - IP54S	750 mm/s
RA	B - IP54S	890 mm/s
any	C or D - IP65	35 mm/s

13.2 Gearbox

13.2.1 Output torque

When a gearbox is selected, the following max. output torques must be maintained:
EMA-100-#-##-####-#######-######-GX-YY#-##-...

19 Output torque

Gearbox type (X)	Gear ratio (YY)	Nominal output torque	Peak output torque
I - Inline	-	75 Nm	150 Nm
S - Spur gear	CB (4:1), CC (10:1), CD (25:1)	100 Nm	300 Nm
B - Belt	CA (1:1)	63 Nm	90 Nm
B - Belt	CE (2:1)	90 Nm	117 Nm

13.2.2 Input speed and power of parallel gearboxes

The following position in the ordering key defines the input speed and power of parallel gearboxes:
EMA-100-#-##-####-#######-######-GX-YY#-##-...

20 Input speed and power of parallel gearboxes

Gearbox type (X)	Gear ratio (YY)	Input speed	Input power
S - Spur gear	BA, CA, DA biodegradable oil	4500 min^{-1}	3000 W
S - Spur gear	BB, CB, DB grease lubrication	4500 min^{-1}	2100 W
B - Belt	AC, AD 1:1	8000 min^{-1}	9500 W
B - Belt	EC, ED 2:1	4500 min^{-1}	6000 W

13

13.2.3 Permissible gear forces

Depending on the gearbox attachments used, there may be restrictions.

The following position in the ordering key defines the permissible force of the gearbox:
EMA-100-#-##-####-#######-######-GX-#YY-##-...

21 Permissible gear forces

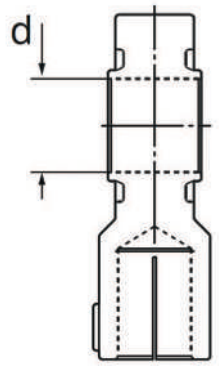
Gearbox type (X)	Rear attachment (YY)	Max. tensile force	Max. compressive force
B - Belt	CB, CC - rear attachment	36 kN	30 kN

13.3 Linear unit accessories

13.3.1 Rod Spherical Plain Bearing

80 Rod Spherical Plain Bearing

81 Rod Spherical Plain Bearing dimensions



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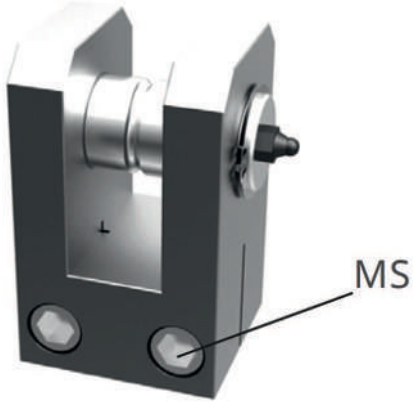
22 Rod Spherical Plain Bearing

Type	Screw MS	Torque	d
ZBE-377900	M10×25	48 Nm	32 H7

13.3.2 Rod clevis

82 Rod clevis



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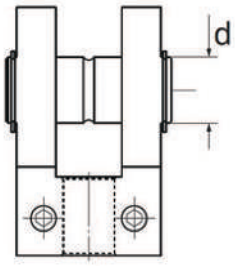
83 Rod clevis dimensions



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23 Rod clevis

Type	Screw MS	Torque	d
ZBE-377917	M12×40 (10.9)	99 Nm	32 f8

13.3.3 Rod T-Bar

84 Rod T-Bar

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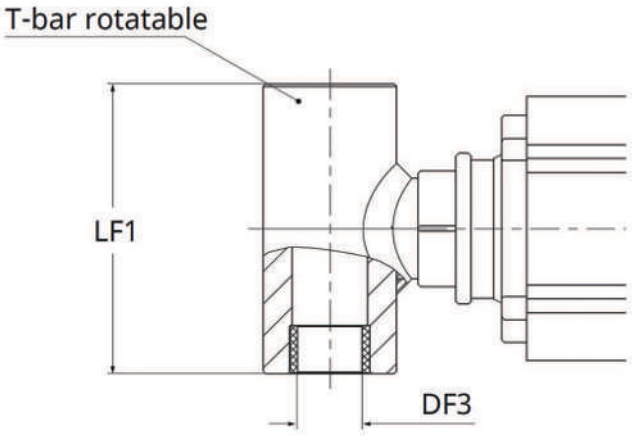
The Rod T-Bar can be rotated to facilitate assembly. The rotation function is intended for assembly purposes only. Constant rotation during normal operation should be avoided.

85 Rod T-Bar dimensions



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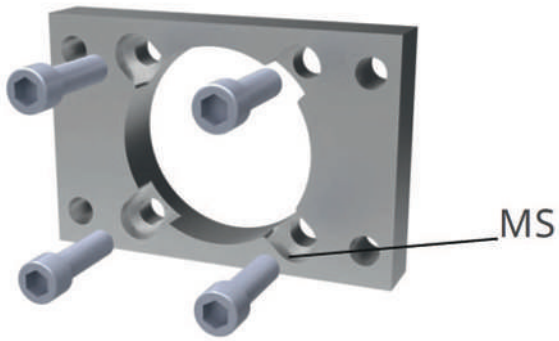
24 Rod T-Bar

Type	LF1	DF3	Recommended shaft diameter
EMA-100-1-xx-xxxx-Cxxxxxx	115 mm ±1 mm	25.53 mm ... 25.73 mm	25.38 mm ... 25.43 mm
EMA-100-1-xx-xxxx-Dxxxxxx	155 mm ±1 mm	25.53 mm ... 25.73 mm	25.38 mm ... 25.43 mm

13.3.4 Front Plate

86 Front Plate

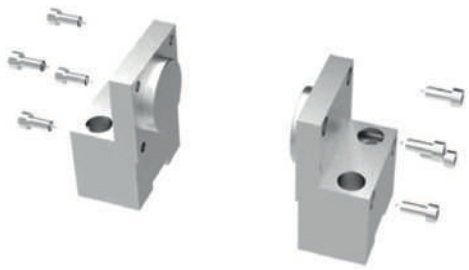


25 Front Plate

Type	Screw MS	Torque
ZBE-377918	M12×40	75 Nm

13.3.5 Foot mounting kit

87 Foot mounting kit

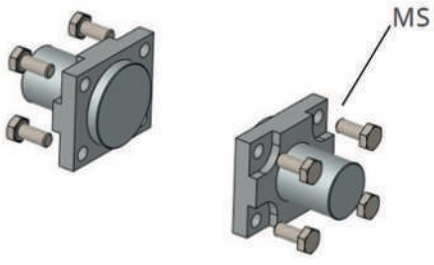


26 Foot mounting kit

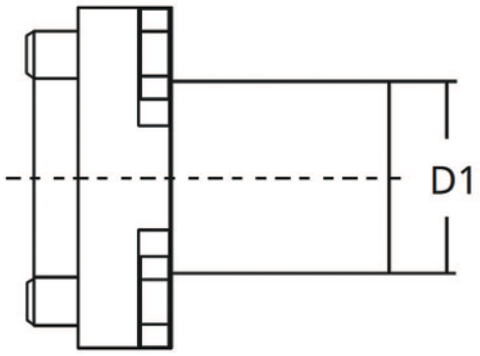
Type	Screw MS	Torque	Fuse
ZBE-377920	M8×18	20 Nm	Loctite 648

13.3.6 External Trunnion Mount

88 External Trunnion Mount



89 Dimensions of trunnion mount



001CE940

27 External Trunnion Mount

Type	Screw MS	Torque	Fuse	D1
ZBE-377919	M8×18	20 Nm	Loctite 648	32 f7

13.3.7 Trunnion housing

90 Trunnion housing

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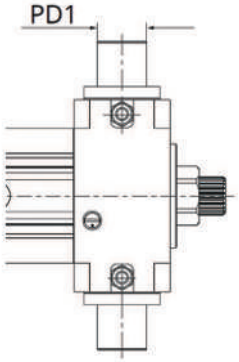
91 Trunnion housing dimensions



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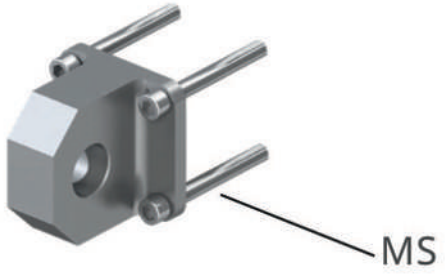
28 Trunnion housing

Type	PD1	Recommended bushing diameter
EMA-100-1-xx-xxxx-xxxE1xx	38.1 mm +0.02 mm/ −0.03 mm	38.23 mm...38.48 mm

13.4 Gearbox accessories

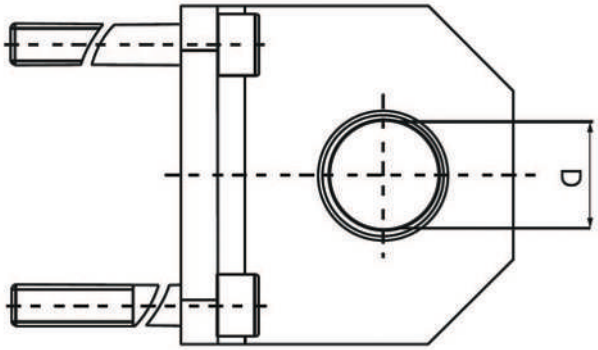
13.4.1 Rear plain bushing attachment

92 Rear plain bushing attachment



001BD9AF

93 Rear plain bushing attachment dimensions



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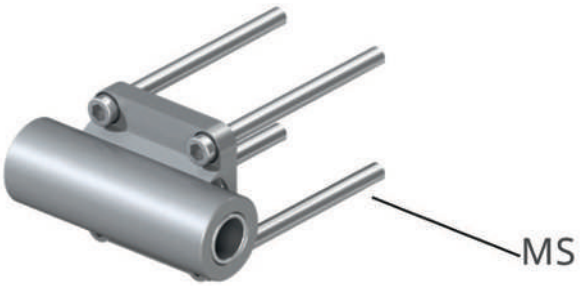
29 Rear plain bushing attachment

Type	Gearbox type	Screw MS	Torque	Fuse	D	Recommended shaft tolerance
ZBE-377921	Spur	M12×140	75 Nm	-	32 mm +0.085 mm/−0.01 mm	f7
ZBE-00521333	Belt	M12×25	75 Nm	Loctite 243	32 mm +0.085 mm/−0.01 mm	f7

13.4.2 Rear cross tube

94 Rear cross tube



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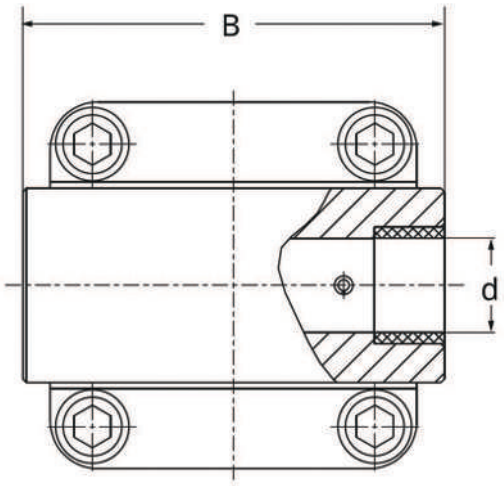
95 Rear cross tube dimensions



30 Rear cross tube

Type	Gearbox type	Screw MS	Torque	B	D	Recommended shaft tolerance
ZBE-377933-0115	Spur	M12×140	75 Nm	115 mm	25.53 mm ...25.73 mm	25.38 mm ...25.43 mm
ZBE-377933-0115	Spur	M12×140	75 Nm	155 mm	25.53 mm ...25.73 mm	25.38 mm ...25.43 mm

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