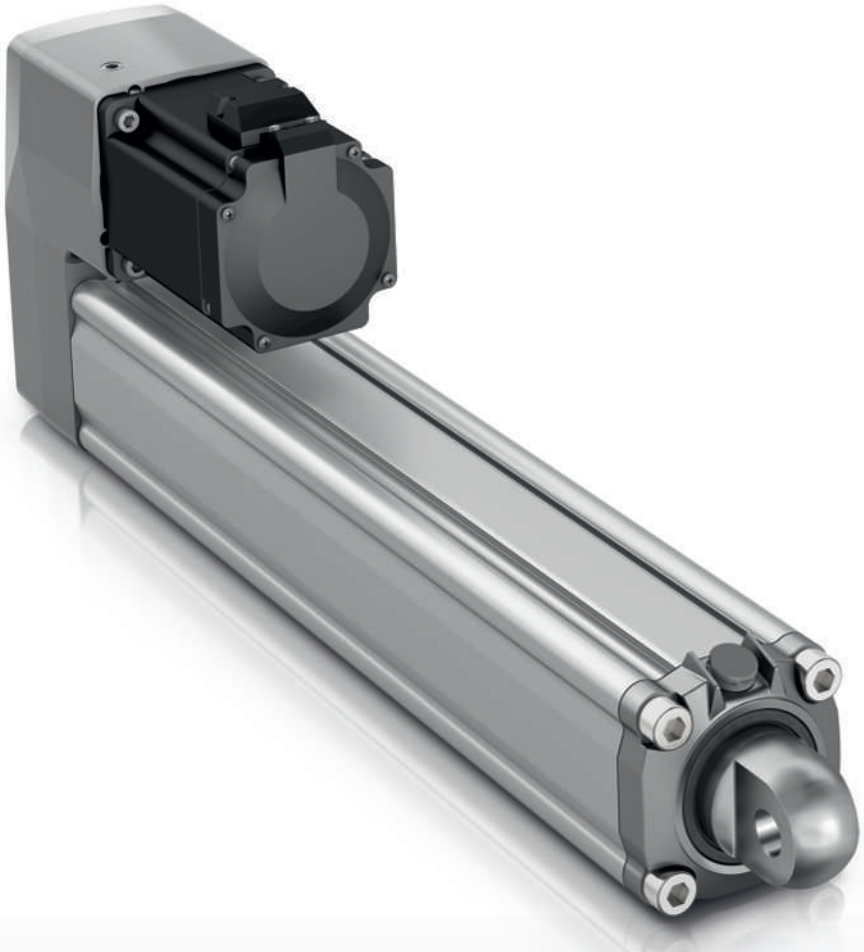


EWELLIX

EWELLIX Linear Actuator EMA-80M

Medical

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 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 slight injury may occur.
NOTICE	In case of non-compliance, damage or malfunctions in the product or the adjacent construction may occur.

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 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.

1.5 Availability

A current version of this manual is available at:
https://www.schaeffler.de/std/2217

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.

1.6 Images

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

2 General safety regulations

2.1 Intended Use

The linear actuator has been developed and manufactured exclusively for the purpose described in this user manual.

The authorized use of the linear actuator is the dynamic central push-loaded stroke or pull-loaded stroke. The manufacturer cannot be held responsible for damage resulting from use of the linear actuator in a manner other than that cited here.

It is only intended for indoor use and is implemented in medical devices as well as in industrial technology and construction technology.

Any use that goes beyond the intended use or deviates from the above described is considered misuse and can lead to potentially dangerous situations. Please note:

- Strictly observe all safety precautions and instructions in this user manual.
- Do not expose the linear actuator to weathering, strong UV radiation, corrosive or explosive air media or other aggressive media.
- Do not change the structural assembly or individual components of the linear actuator.
- Never use the device outside of its technical application limits and operational limits.

2.2 Non-intended Use

Any use other than intended use shall be deemed unauthorized without the written consent of the manufacturer. Operation beyond the technical limits is also not authorized.

The technical operating limits are listed in the technical information and on the type plate on the linear actuator ➤24|10.

The device is suitable for indoor use only and must not be subjected to weathering, strong UV radiation or explosive atmospheric media.

Excluded applications:

- applications with a flammable mixture of anesthetics and air
- applications with a flammable mixture of anesthetics and oxygen or nitrous oxide
- applications in places with increased radiation.

2.3 Applicable documents

Safe and proper operation is only possible if this user manual and the following information are heeded:

- user manual for other components supplied
- regulations applicable at the place of use, according to the machine into which the linear actuator is integrated and the prevailing environmental conditions
- regulations of the supervisory authorities (UVV accident prevention regulations)
- recognized technical rules for safe and professional work
- local laws and regulations
- environmental protection regulations
- other applicable regulations

2.4 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

2.5 Safety regulations

2.5.1 Commissioning

Only qualified personnel may start up the system.

Disconnect the power supply to the linear actuator before performing installation or maintenance work.

Ensure that the linear actuator is not under load or voltage before installation or maintenance work is performed.

Use suitable safety equipment when installing or maintaining the linear actuator.

The power supply must comply with the technical specifications ➤24|10

2.5.2 Operation

Exceeding the load limits of the linear actuator is prohibited. This can lead to serious injuries and material damage. The load limits specified in the technical information must be observed ➤24|10

If possible, do not move the linear actuator to the mechanical end position. Repeatedly moving the drive to the mechanical end position can damage it or shorten its operating life.

The motor and surrounding components can become hot under high loads and during a high duty cycle.

2.5.3 Maintenance and Repairs

Maintenance work and repairs may only be carried out by qualified personnel.

Disconnect the power supply to the linear actuator before performing installation or maintenance work.

Ensure that the linear actuator is not under load and that the power supply is disconnected before installation or maintenance work is performed.

Use suitable safety equipment when installing or maintaining the linear actuator.

3 Scope of delivery

The scope of delivery comprises:

- linear actuator
- user manual

3.1 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.

3.2 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

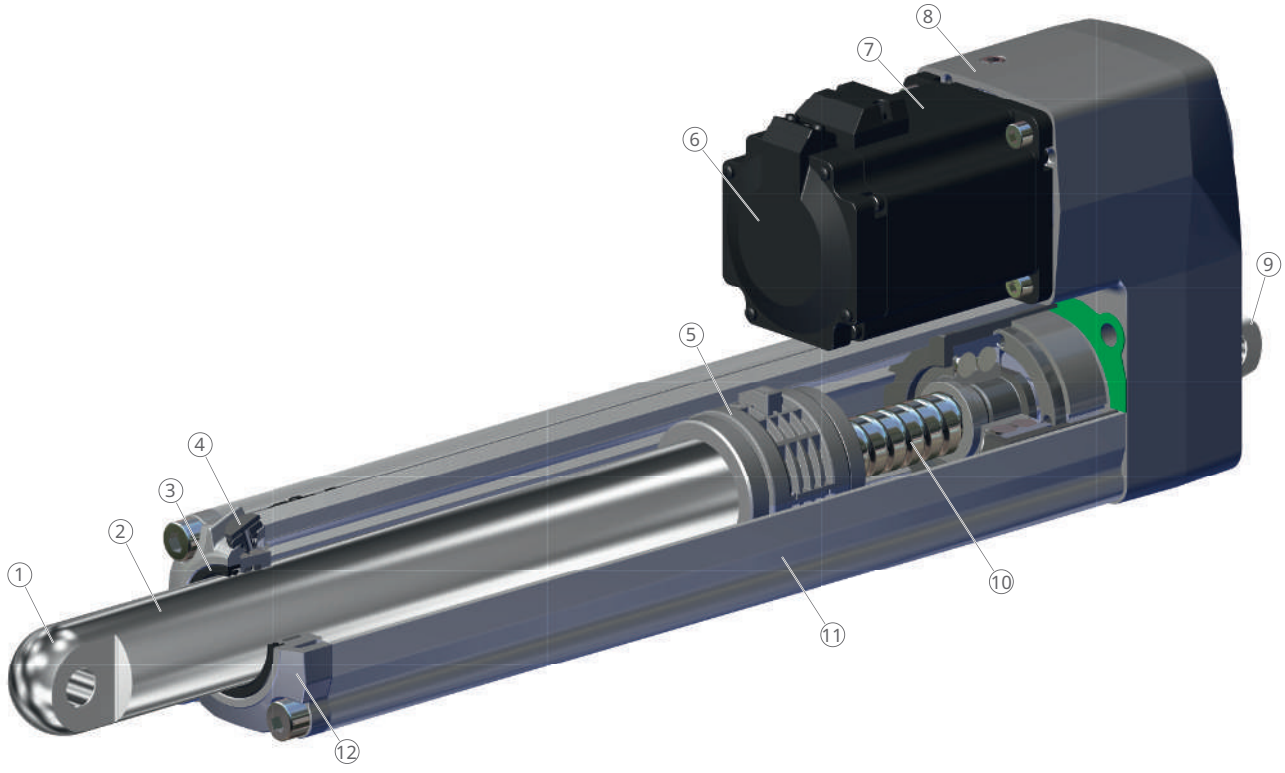
The EWELLIX linear actuator EMA-80M is a modular electromechanical linear actuator that has been specially developed for use in medical applications. It replaces hydraulic applications in medical imaging patient tables, offering a compact, energy-efficient, and maintenance-free alternative for demanding motion tasks.

The following features enable reliable and safe use in medical technology:

- Linear unit
  - push tube with front attachment
  - ball screw drive with back-up nut
  - precise positioning thanks to encoder
  - sealing system conforms to degree of protection IP65M
- Gearbox
  - three-stage helical gearbox with gear ratio i = 15:1
  - manual override for emergency adjustment in the event of a power failure
- Motor
  - either with DC-motor or AC-motor
  - magnetic, optical or mechanical encoder

Product assembly

1 Assembly of the linear actuator



1	Front attachment	2	Push tube
3	Sealing	4	Vent plug
5	Threaded nut with back-up nut and magnet	6	Encoder
7	Motor	8	Gearbox
9	Rear attachment	10	Ball screw drive
11	Protection tube	12	Front cover

The interfaces and assemblies have the following functions:

- Front attachment:
  - mechanical connection between the push tube of the drive and the moving part of the application
  - Standard attachment with rod end
- Rear attachment:
  - mechanical connection between the gearbox of the linear actuator and the moving part of the application
  - Standard attachment with rod end
- Encoder:
  - precise motion control and operation monitoring

Screw drive

The linear actuator is equipped with a ball screw drive.

The screw drive converts the rotary motion of the motor into precise and efficient linear motion, ensuring a high load carrying capacity and long lifetime.

Back-up nut

The back-up nut is additionally integrated into the main nut as standard. During normal operation, the back-up nut is not in contact with the ball screw drive. The back-up nut prevents the linear actuator from collapsing if the threaded nut fails. If the back-up nut engages, the linear actuator can no longer be moved.

Once the back-up nut is engaged, the linear actuator must be replaced.

The function of the back-up nut is designed for both load directions.

5 Transport and storage

Safety instructions

⚠ CAUTION

Damage due to improper transport

- Proceed with caution when unloading the packaged goods, during delivery and during transport to the destination.
- Observe the symbols and instructions on the packaging.
- Do not remove the device from the packaging until immediately before assembly.
- Observe the ambient conditions in accordance with this manual.

Observe the safety regulations for transport.

Observe the safety regulations for the storage.

6 Mounting

The linear actuator is mounted via the two rod ends only. The pins and brackets for transferring the forces must be suitable for the purpose intended and be matched to the dimensions of the attachment fittings.

The force exerted on the attachments must be centered on the push tube axis. The actuator must be free of other mechanical stresses when installed.

6.1 Mounting location

Good preparation is part of efficient installation and startup. This includes, among other things, the decision about the installation site and the provision of a power source.

Take the technical information into account according to the operating conditions ➤24|10.

Install the device in a location that meets the ambient conditions ➤6|2.1.

6.2 Orientations

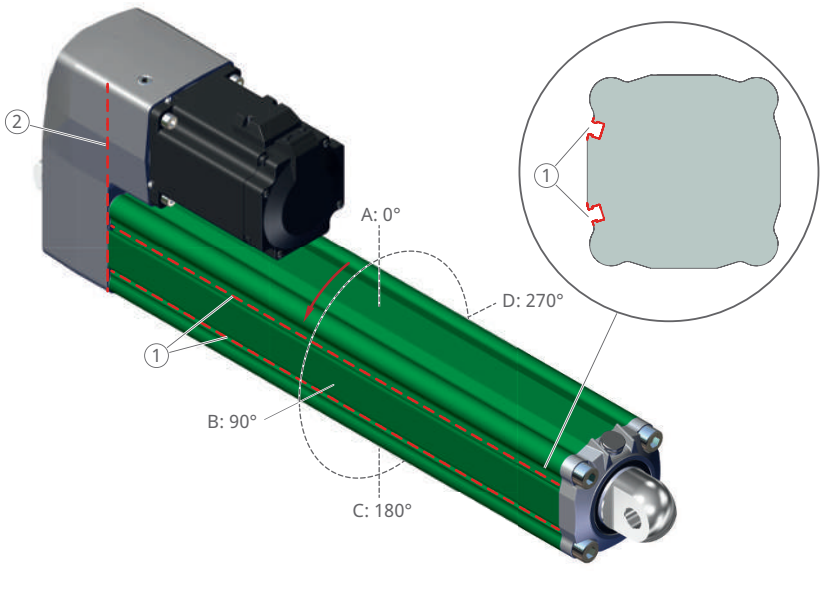
All orientations are possible, with the exception of the motor being in the 180° position.

6.2.1 0° reference for the linear unit

The 0° reference for the linear unit is the gearbox.

The linear unit can be rotated in 90° increments.

2 Possible orientation of the linear unit

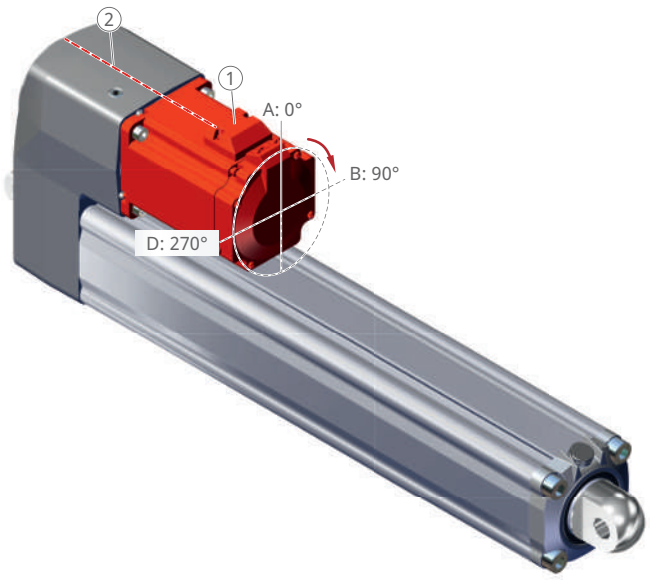


1	Position of the slot	2	Position of the gearbox

6.2.2 0° reference for the motor

The 0° reference for the motor is the gearbox position. The motor can be rotated to the 0° position, 90° position or 270° position. The motor cannot be positioned at 180° due to the location of the connectors.

3 Possible orientation of the motor



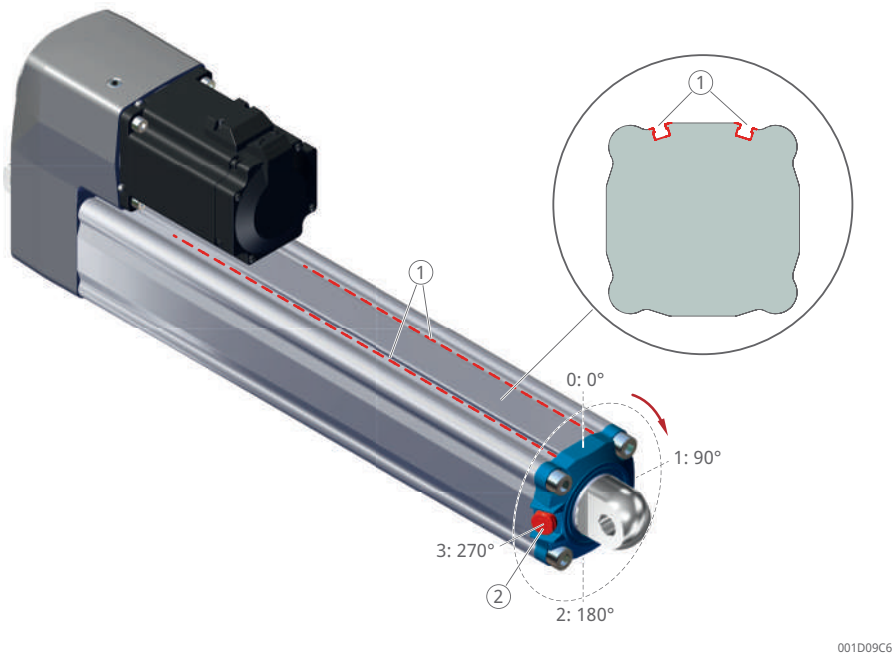
1	Position of the connectors	2	Position of the gearbox

6.2.3 0° reference for front cover with vent plug

The 0° reference for the front cover with vent plug is the slot. The front cover with vent plug can be rotated in 90° increments.

The front cover with vent plug must be protected against water accumulation. The orientation must be selected accordingly.

4 Possible orientation of the front cover with vent plug



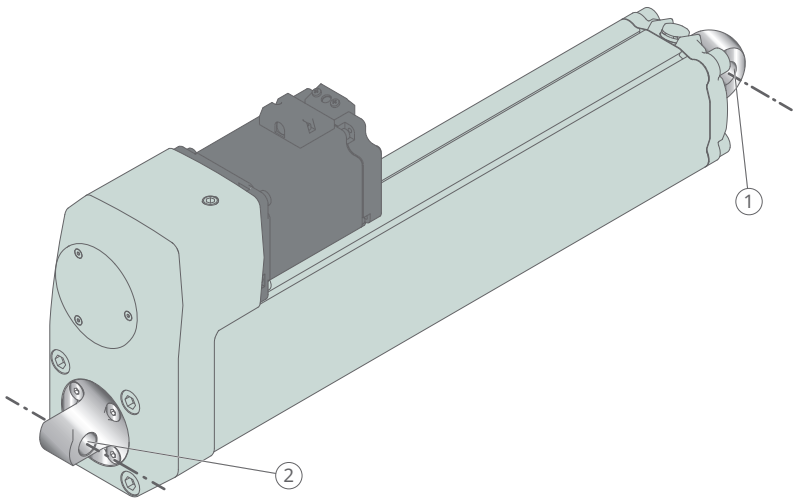
1	Position of the slot	2	Position of the vent plug

6.3 Mounting options

The linear actuator is designed for various applications and is connected to the adjacent construction via rod ends:

- Rod end on the push tube
  The push tube can be rotated for positioning on the adjacent construction.
- Rod end on the gearbox

5 Mounting options for the EMA-80M



1	Rod end on the push tube	2	Rod end on the gearbox

6.4 Installation

Notes on connecting the linear actuator to the adjacent construction

⚠ WARNING

Inadequate fastening

Risk of personal injury and damage to property

- Use fastening bolts only.
- Properly secure the fastening bolts.
- Do not use screws for assembly.
- Never loosen or manipulate screws on linear actuators or options.

1. Ensure that the applied force F is always centered on the linear actuator, with the maximum offset being 1°.

⚠ WARNING

Side impacts during assembly

Personal injury due to incorrect assembly of the device

- Do not expose the device to side impacts during assembly.

NOTICE

Side impacts during assembly

Damage to property due to incorrect assembly of the device

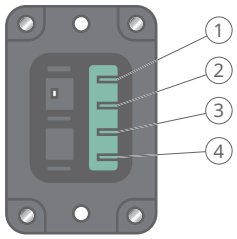
- Do not expose the device to side impacts during assembly.

2. Ensure that the linear actuator is not affected in its movement over the entire stroke area. Consider application collision tests.
3. Ensure that the motor cable cannot be crushed, trapped or pulled.
4. Connect the linear actuator to the control unit provided (not included in the scope of delivery). Observe other applicable documents.
5. Connect the linear actuator to the operating element provided (not included in the scope of delivery). Observe other applicable documents.
6. Connect the control unit to the power supply.
7. Ensure that the mains plug is accessible at all times.
8. Ensure that none of the supply wires or control wires are pinched by the application's sequence of movements or during extension and retraction of the linear actuator.
9. Ensure that the installation requirements of the options are met.
10. If necessary, attach prohibition signs and warning signs for use on the linear actuator.

6.5 Electrical installation

- Depending on the model, connect the motor cable and the control cable to the control unit.

6 220 V motor: pin assignment of the power supply



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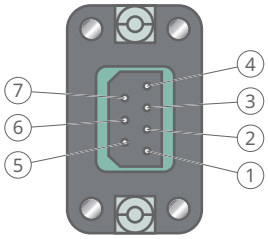
1	U (black)	2	V (white)
3	W (red)	4	PE (yellow/green)

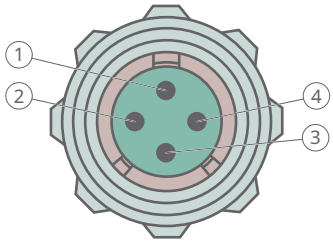
7 220 V motor: pin assignment of the encoder



001D091B

1	PE (shielding)	2	5 V (red)
3	0 V (black)	4	SD+ (blue)
5	SD– (yellow)	6	Batt+ (brown)
7	Batt– (white)		

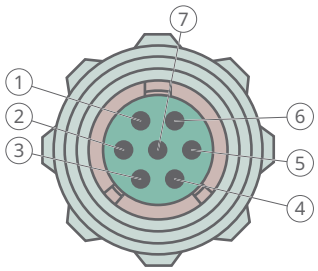
8 48 V motor: pin assignment of the power supply



001D091D

1	U (red)	2	V (blue)
3	W (black)	4	PE (yellow/green)

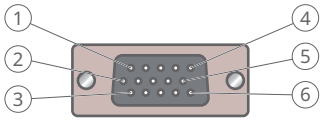
9 48 V motor, magnetic: pin assignment of the encoder



001D0919

1	PE (shielding)	2	+5 V (white)
3	0 V (black)	4	SD+ (blue)
5	SD– (violet)	6	Batt+ (red)
7	Batt- (yellow)		

10 48 V motor, encoder: pin assignment of the encoder



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1	A+	2	B+
3	0 V	4	W+
5	U+	6	FG
7	Z+	8	Z–
9	V+	10	V–
11	A–	12	B–
13	+5 V	14	W–
15	U–		

7 Operation

7.1 Manual emergency operation

In emergency operation, the emergency adjustment mechanism enables the linear actuator to be moved manually in the event of an electrical or control-related failure (e.g. in the event of a power failure or system fault).

Required tools:

- hexagon socket wrench, 6 mm
- torque wrench

Notes on manual emergency operation

- Disconnect the linear actuator power supply before manually activating the emergency mode.
- No electrical control commands may be present during manual override.
- The emergency adjustment must not be used during regular operation. The manual override is not suitable for continuous operation.

DANGER

Live components

Serious injury or death from touching live electrical components

- ▸ Switch off the power supply before carrying out any work.

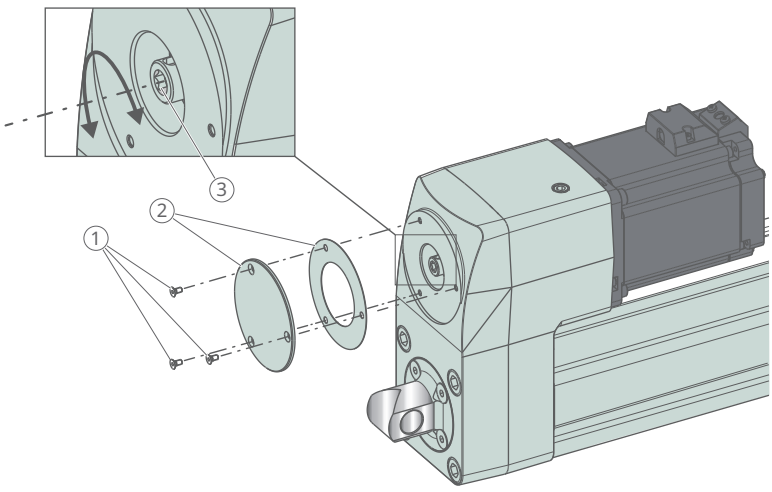
Removing the cover on the gearbox

The cover protects access to the emergency adjustment.

1. Remove the three indicated M3 screws on the rear side of the gearbox.
2. Carefully remove the round cover plate.

» A drive shaft with a hexagon socket take-up is visible.

11 Manual movement of the linear actuator



1	Fastening screws	2	Cover plate
3	Drive shaft with hexagon socket		

NOTICE

Risk of damage

If the torque is too high, the gearbox or the motor may be damaged. The emergency adjustment mechanism must only be actuated by hand. Do not use electrical aids, e.g. a cordless screwdriver.

- ▸ Observe the specified torque.

Manual movement of the actuator

1. Insert the hexagon socket wrench into the take-up.
2. Turn the hexagon socket wrench by hand or using a torque wrench in the desired direction to move the linear actuator.
   Maximum torque: 3 Nm

Assembling the cover

1. Reassemble the cover plate and secure with the M3 screws.
2. Check that the cover is seated correctly.

8 Maintenance

NOTICE

Risk of damage due to improper cleaning

Improper cleaning can result in damage to the device.

- Do not use any aggressive cleaning agents. Washing water, including chemical additives, must be pH-neutral.
- Only use cleaning agents specified by the manufacturer.
- Do not use steam jets or high-pressure cleaners for cleaning.
- Other cleaning agents or cleaning devices may only be used with the manufacturer's approval.
- Ensure that no liquids are allowed to penetrate the connections.

Maintenance work and repairs may only be carried out by qualified personnel.

Manual cleaning using a cloth moistened with water is permitted. Isopropyl alcohol may be added to the water and used for cleaning purposes.

Do not use solvents. These can damage the linear actuator or impair its function.

The linear actuator is lubricated with Schaeffler-approved lubricants and is maintenance-free for a service life of 50 km.

The rod ends, protection tube, gearbox housing and push tube must be checked for mechanical damage (e.g. cracks) every 6 months.

9 Disposal

Observe the local regulations for disposal.

10 Technical data

The technical and geometric information listed apply depending on the variant ordered.

The linear actuator has 2 interfaces for mounting:

- on the push tube
- on the gearbox

Both interfaces are equipped with a rod end as standard for attachment.

10.1 Performance overview

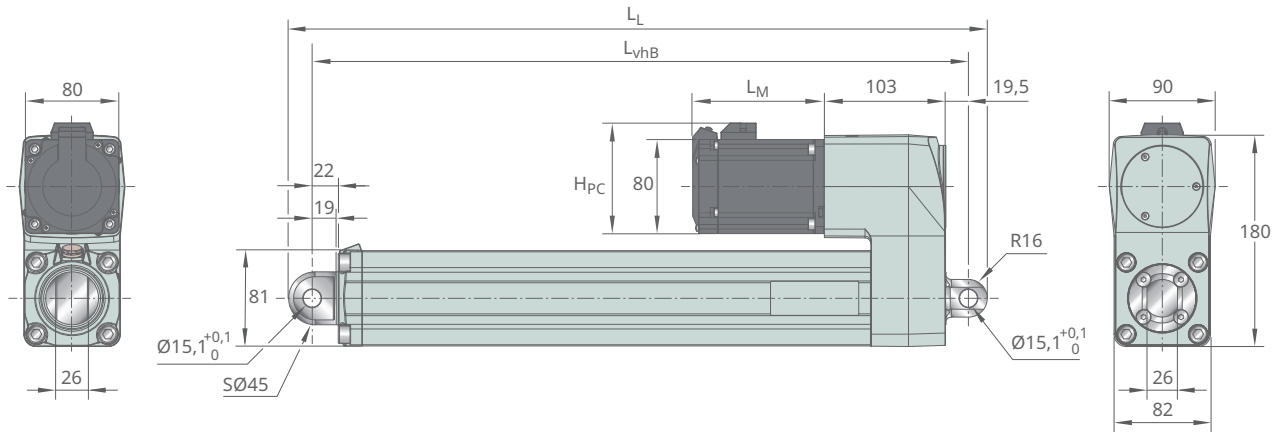
The following table shows the performance data and the mechanical characteristic values of the linear actuator.

2 Performance overview of the EWELLIX linear actuator EMA-80M

Characteristic	Symbol	Unit	Variant DC	Variant AC
Performance data				
max. linear speed	v_{max}	mm/s	25	25
Duty cycle	ED_L	%	20	20
Voltage	–	V	48	220
Power consumption	–	W	750	750
Current consumption	–	A	18.7	5.5
Mechanical data				
Rated push force	–	kN	20	20
Rated pull force	–	kN	20	20
Stroke	S	mm	50 ... 700	50 ... 700
Mass	m	kg	13.2	13.2
Ambient data				
Ambient temperature	–	°C	+10 ... +40	+10 ... +40
Load capacity safety factor	–	–	4	4
Protection code (IP)	–	–	IP65M	IP65M
Medical standard	–	–	IEC 60601-1 ed 3.2	IEC 60601-1 ed 3.2

10.2 Geometric data

12 Linear actuator dimensions



3 Dimensions of linear actuator

Characteristic	Variant DC	Variant AC
H_{PC}	93	89
L_M	90.9 ±1	90.9 ±1
L_{vhB}	H_0 + 258	H_0 + 258
L_L	L_{vhB} + 36	L_{vhB} + 36

H_0	mm	nominal stroke
H_{PC}	mm	Height of connector
L_L	mm	Length from front attachment to rear attachment
L_M	mm	Length of motor
L_{vhB}	mm	Retracted length

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