EWELLIX

EWELLIX Linear Actuator

CAMT20

User Manual

We pioneer motion

SCHAEFFLER

Contents

1 About the manual

This manual is part of the product and contains important information. Read the manual thoroughly prior to use and ensure that the instructions are strictly observed.

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.

All information and instructions in this manual have been compiled in accordance with applicable standards and regulations, the present status of technology, and our many years of knowledge and experience.

Validity

The instructions in this manual apply to EWELLIX CAMT linear actuators with the following identification:

- manufacturer: Schaeffler
- product name: EWELLIX linear actuator
- type designation: CAMT20
- tear of manufacture: from 2017
- CE marking: according to technical documentation

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

1.3 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
	Observe the manual
	Wear safety shoes
	General mandatory sign

1.4 Availability

A current version of this manual is available at:
https://www.schaeffler.de/std/2266

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.

1.5 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.

1.6 Limitation of liability

All information and notes in this manual were compiled with due consideration given to applicable standards and regulations, the present state of technology and our years of knowledge and experience.

The manufacturer is not liable for any damage resulting from:

- disregarding this manual
- unintended use
- employment of untrained personnel
- unauthorized conversions
- technical changes
- manipulation or removal of the screws on the drive
- use of unapproved spare parts.

Where the device has been customized, the actual product delivered may be different from what is described in this manual. In this case, ask Schaeffler for any additional instructions or safety precautions relevant to these devices.

We reserve the right to make technical modifications to the device to improve usability.

1.7 Copyright

This manual is protected by copyright and may be used exclusively by Schaeffler customers for internal purposes.

1.8 Warranty terms

The applicable and valid warranty terms are included in the terms and conditions of sale, as contained in the Schaeffler sales contract that governs this sale.

1.9 Customer service

Schaeffler Customer Service is available at any time to assist with technical information and inquiries. The responsible contact person can be reached by telephone, e-mail, or via the Internet, see manufacturer's address on the back cover. Our employees are also always interested in receiving new information and practical experience. This information and experience helps us improve our products.

1.10 Images

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

2 General safety regulations

This section provides an overview of all essential safety aspects for optimum personal protection as well as safe and trouble-free operation. Failure to observe this manual and the safety instructions contained herein may result in significant hazards and potentially lead to serious injury or death.

2.1 Intended use

The device has been designed and manufactured exclusively for the intended use described in this manual. If the device is used for any purpose other than that specified, the manufacturer cannot be held liable for any resulting damage.

Intended use of the device:

- dynamic centric push load or pull load
- use in indoor environments
- for the movement of medical equipment, particularly treatment chairs, operating tables, and imaging tables
- only for systems with covers to prevent the patient or operator from coming into contact with the device

Observe the permissible operating data, operating limits, and ambient conditions.

2.1.1 Product service life

Linear actuators CAMT are designed for a service life of 10 years in a typical medical application environment.

The service life of the lifting column depends on the stroke and load associated with the application. In accordance with the rating life L_{10} of the device, 60000 double strokes can be achieved under average use (with an average load of 3000 N and an average stroke of 100 mm).

2.2 Unintended use

Any use other than the intended use, or any modification to the device without the manufacturer's written consent, is not permitted. Operation beyond the technical limits is also not permitted.

The technical operating limits can be found in the *Technical data* chapter of this manual and on the device type plate.

The following environments in particular are not suitable for operation:

- explosive environment
- flammable anesthetic gas mixture with air
- flammable anesthetic gas mixture with oxygen or nitrous oxide
- strong radiation fields
- outdoor environments or areas exposed to water (damp rooms)

Any unauthorized use of the device can cause personal injury and property damage. The instructions in this user manual must be observed at all times.

2.3 Responsibility of the owner and processor

The device is intended for use in commercial applications by the owner or processor.

The processor is the contractual partner of the reseller or the manufacturer. The processor installs the device in a complete system (application).

The owner or processor of the system is subject to the requirements of the Occupational Health and Environmental Act.

In addition to the safety instructions in this manual, the owner or processor must observe the following in relation to these safety regulations, accident prevention guidelines, and environmental protection regulations applicable at the system's installation site:

- Familiarize themselves with the applicable occupational health and safety regulations and, by means of a risk assessment, identify any additional hazards arising from the specific working conditions at the device's place of use. Implement the hazard assessment in the form of work instructions for operating the device.
- Confirm that the work instructions created for the system, including the device, comply with current legal requirements, and adapt the instructions accordingly
- Clearly define and assign responsibilities for installation, operation, maintenance, and cleaning.
- Ensure that all personnel handling the device have read and understood this manual..
- Provide personnel with the required protective equipment.
- Train personnel regularly and inform them about the dangers.

In addition, the owner or processors must ensure that the device is in proper working condition. They must do the following:

- Ensure that the maintenance intervals described in this manual are observed.
- Have all safety devices checked regularly to ensure their correct operation and completeness.

2.4 Personnel requirements

Operator duties:

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

Only persons who can be expected to reliably perform their tasks are permitted. Persons whose ability to react is impaired, e.g., due to drugs, alcohol, or medication, are not permitted.

2.4.1 Qualifications

For the various areas of activity described in this manual, the following qualifications are required:

Operator

The operator has been instructed by the customer on the assigned tasks and possible hazards in the event of improper conduct.

Qualified personnel

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

Qualified personnel, on the basis of their technical training, knowledge, and experience as well as familiarity with the applicable standards and regulations, are capable of performing the work assigned to them and of independently recognizing and avoiding potential hazards.

Electrically skilled person

An electrically skilled person, on the basis of their technical training, knowledge, and experience as well as familiarity with the applicable standards and regulations, is capable of performing work on electrical systems and of independently recognizing and avoiding potential hazards.

The electrically skilled person is trained for the specific place of use and is familiar with the applicable standards and regulations.

2.5 Protective equipment

For certain work on the product, suitable protective equipment must be worn. Personal protective equipment consists of:

3 Required personal protective equipment

Personal protective equipment	Mandatory signs in accordance with DIN EN ISO 7010
Protective gloves	
Safety shoes	

2.6 Hazards

The following safety instructions apply to the installation, commissioning, operation, maintenance, and repair of the linear actuator.

The manufacturer has minimized the effects of existing residual hazards through design measures and protective measures. Observe the residual hazards and the possible countermeasures described to eliminate them.

Observe the safety instructions listed here and the warning notices throughout this manual to reduce the risk of personal injury and property damage, and to avoid hazardous situations.

Danger to life from electric current

Touching conductive parts poses an immediate danger to life. Damage to insulation or individual components may pose a danger to life.

- Ensure that cables are not pinched or damaged.
- Check that the supply voltage corresponds to the rated value on the product label.

Danger to life due to residual voltage and unexpected activation

Residual voltage in the system may result in danger to life or product damage.

- Shut down the machine and disconnect it from the power supply.
- Before starting work, ensure that the DC link of the power output module is fully discharged.
- Prevent unauthorized or unintentional activation of the supply voltage (e.g., lock and label switching devices).

Risk of injury due to crushing

Impact against fixed objects may result in injury due to the force exerted.

- Ensure that no persons are present in the hazard area during the stroke movement.
- Ensure that no objects or persons come into contact with the spindle or protection tube at the front and rear attachments.

Risk of injury from pinching

If the actuator runs into fixed objects, the driving force may cause personal injury.

- If the actuator is left unattended, ensure that the full stroke length is free of obstacles and that no persons are located in the stroke area.
- Alternatively, provide a means of disconnecting all conductors from the mains power supply.

Risk of injury due to damaged housing

Injury due to cracks and related openings in the housing of the actuator or its accessories.

- If the housing is damaged due to cracks, fractures, or heavy wear, stop using the device and follow the disassembly instructions.

Risk of injury from moving components

Rotating or linearly moving components can cause severe injury. Therefore, observe the following:

- Do not work on moving components.
- Keep your entire body, hands, and arms away from moving components.

Property damage

- Any lateral force can destroy the actuator. Do not tamper with any attachments connected to the actuator during the stroke.
- Impact against fixed objects may result in injury due to the force exerted. Ensure that no fixed objects are in the hazard area during the stroke.
- Risk of damage to the linear actuator caused by static and dynamic overloading of the actuator. Do not use the actuator beyond the permissible specifications.

2.7 Safety regulations

The following safety regulations must be observed when working with the product. You can find further information on dangers and specific instructions in other chapters, including those entitled Installation, Commissioning, Operation, and Maintenance.

2.7.1 Safety equipment

Integration of an emergency shut-off system (for certain applications)

The device is intended exclusively for installation in an application or system. The device does not have its own operating elements and has no independent emergency-stop device. Observe the following:

- Install the device so that it is part of an emergency shut-off system and can be stopped if necessary.
- The emergency shut-off system must be connected in such a way that an interruption of the power supply, or restoration of the power supply after an interruption, does not pose a hazard to persons or property.
- Emergency shut-off systems must be freely accessible at all times.

It is the processor's responsibility to determine whether the installation of an emergency shut-off system is required for an application.

Integration of an emergency adjustment (for certain applications)

The device is intended exclusively for installation in an application or system. The device does not have its own operating elements or an additional manual emergency adjustment for operating the lifting column. In the event of a malfunction, the device cannot extend or retract.

If required by the application, a separate device for manual adjustment must be provided to ensure safe raising or lowering of the patient in the event of an emergency or device failure.

The processor determines which applications require manual adjustment for the patient.

Integration of a safety mechanism to prevent unintended triggering of the operating device (for certain applications)

The device does not have its own operating devices and has no safety mechanism to prevent unintended triggering of the operating device.

If required by the application, a suitable safety device must be provided to prevent unintended triggering of the operating device.

It is the processor's responsibility to determine whether the envisaged application requires the installation of a safety mechanism to prevent unintended triggering of the operating device.

Installed safety devices

The following safety devices are already installed:

- Thermoswitch:
  The actuator is equipped with a thermoswitch. The thermoswitch integrated into the motor shuts down the actuator in the event of excessive temperature to reduce the risk of fire.
- Back-up nut:
  A back-up nut is integrated into the main nut to prevent the actuator from collapsing if the main nut fails.
- Limit switches:
  Limit switches ensure that the power supply is safely switched off when the end position is reached. If the limit switches fail, a mechanical end stop prevents the device from exceeding its intended stroke.

2.7.2 Safeguard against restart

When working in hazard zones, there is a risk that the power supply could be turned on without prior authorization. Uncontrolled reconnection represents a potentially life-threatening situation for people within the danger zone.

Observe the following:

- Follow the instructions provided in this user manual on preventing uncontrolled reconnection of the power supply.
- Follow the steps described below to secure against reconnection.

Securing the actuator against unauthorized reconnection

Remove the control unit mains plug from the socket or disconnect the actuator from the control unit and secure it against reconnection.

2.7.3 Modifications to the device

To avoid hazardous situations and to ensure optimal performance, do not make any changes or modifications to the device that have not been specifically authorized by Schaeffler.

2.7.3.1 Warning labels

Symbols and warning signs are located in the hazard zone. They refer to the immediate surroundings.

For the meaning of the symbols and signs, see chapter *About the manual*.

Stickers and warning signs may become dirty or illegible over time or for other reasons. Please observe the following:

- Ensure that all safety instructions, warning notices, and operating instructions remain legible at all times.
- Replace damaged stickers and warning signs

2.7.4 Spare parts

The product is not intended for repair work by the user. Any warranty or service claims will be rendered invalid immediately, without prior notice, if any screws on the device have been tampered with.

Safety risk due to incorrect spare parts

Incorrect or faulty spare parts can compromise safety and lead to damage, malfunctions, or complete failure. Observe the following:

- Only use original spare parts from the manufacturer.
- Only use the listed accessories from verified manufacturers.
- Spare parts in or on the device may only be replaced by the manufacturer. The device must be dismantled and sent to the manufacturer.

If the device cannot be repaired on site by authorized personnel, it must be removed from the application and sent to the manufacturer.

2.7.5 Work on electrical devices

Work on the electrical system may only be carried out by professional electricians.

Wiring, opening, and closing of electrical connections may only be performed when the system is disconnected from the power supply and in a voltage-free state.

2.7.6 Transport and storage

The product may only be transported and stored in its original packaging and under the permissible ambient conditions, see *Technical data*.

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 product from the packaging until immediately before installation.

2.8 Manufacturer’s declaration of EMC conformity

The actuators are classified as incomplete machinery in accordance with the Machinery Directive. Meaningful and conclusive EMC tests can only be carried out in the final application.

3 Scope of delivery

The actuator is delivered as a unit, packaged either in a plastic bag, a cardboard box, or on pallets.

The scope of delivery comprises:

- Actuator
- integrated options according to the product label
- power cable in optional configuration
- User manual

Accessories

The following accessories are not included in the scope of delivery and must be ordered separately:

- 1 EWELLIX control unit
- 1 EWELLIX operating device: hand switch, desk switch, foot switch

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.

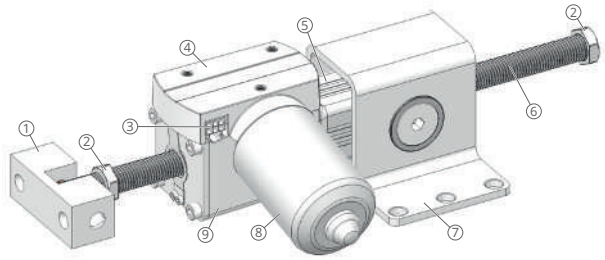
4 Product description

The actuator is used in an application and is intended for lifting movement with dynamic centric push force or pull force. It may only be used for lifting and lowering. The actuator is supplied with electrical power via an external control unit. The control unit is connected to the actuator via a detachable power cable. An operating device is also connected to the control unit.

Front and rear attachments are available as variants.

The gearbox is identical for all versions. A DC motor drives the trapezoidal sliding screw via a worm gear. The lead screw is self-locking and prevents retraction and extension without an additional brake.

1 Linear actuator design



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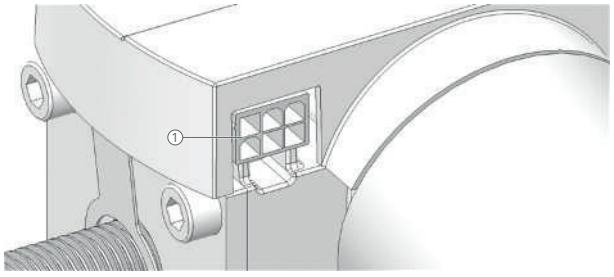
1	Front attachment	2	Adjustable end stop on both sides
3	Connecting socket, Molex Mini-Fit Jr., 6-pin	4	Limit switch with cover
5	Protection tube	6	Lead screw
7	Rear attachment	8	DC motor
9	Gearbox housing		

Connection

The connection uses a 6-pin Molex Mini-Fit Jr. connector. The actuator and control unit are connected via an optional detachable motor cable. The motor cable is available in several lengths.

2 Motor cable connecting socket



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1	Connecting socket, Molex Mini-Fit Jr., 6-pin		

Motor

The motor is a 24 V brushed DC motor. The speed depends on the load magnitude, load direction, and direction of movement. The motor features a 2-Hall encoder with an integrated 2-pole magnet.

Gearbox

The gearbox contains the drive unit and converts the rotary motion of the motor into the linear movement of the spindle.

A worm gear and a lead screw perform the conversion. The worm shaft is integrated into the DC motor. The worm wheel is integrated into the nut of the trapezoidal sliding screw.

A back-up nut is integrated into the nut. It prevents failure of the actuator if the spindle nut fails.

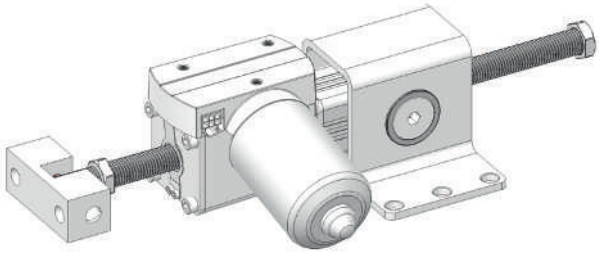
The gearbox is preloaded to eliminate axial play.

Protection tube

The protection tube provides the connection for the rear attachment. Length and machining vary depending on the selected attachment option. The protection tube is available in short and long versions.

In the short version, the protection tube is only long enough to provide space for the attachment, regardless of the stroke. From stroke S = 100 mm, the spindle remains unprotected.

3 Protection tube, short version



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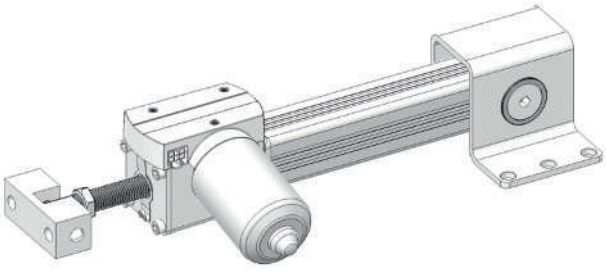
In the long version, the protection tube covers the entire spindle. The rear side remains open and provides access to the adjustable end stop.

4 Protection tube, long version



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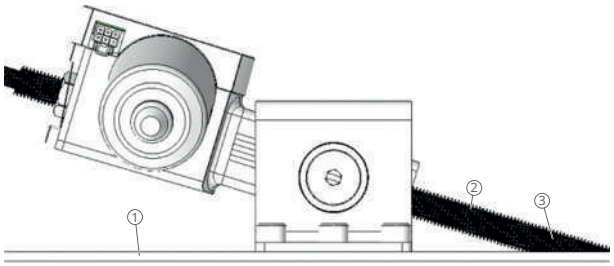
When a short protection tube is combined with a long lead screw, the rear side of the spindle can come into contact with the supporting structure. This may result in damage to or failure of the actuator or the supporting structure.

Check the system kinematics. Ensure sufficient clearance between the rear side of the spindle and the supporting structure.

5 Protection tube, short version, risk of collision



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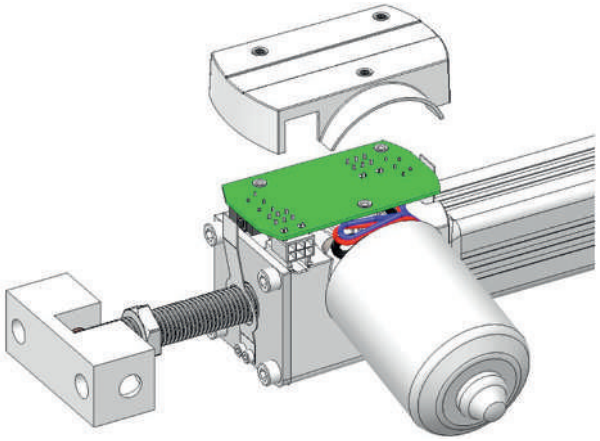
1	Supporting structure	2	Lead screw
3	Risk of collision		

Limit switches and end stops

The stroke is limited by integrated limit switches. The limit switches interrupt the power supply to the DC motor.

The limit switches are actuated via adjustable end stops and 2 flat springs. The flat springs are fastened on both sides to the gearbox housing and the front cover. When an end stop comes into contact with a flat spring, the spring bends and actuates the limit switch on the circuit board above the gearbox.

6 Limit switch on circuit board



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Adjust the upper and lower end positions by changing the position of the end stops. Use standard tools:

- front end stop: flat wrench, wrench size 22 mm
- rear end stop: tube spanner, wrench size 22 mm

In the event of a system malfunction and movement beyond the limit switches, the end stops act as mechanical safety-end stops and stop the movement.

If an end stop comes into contact with a fixed surface of the housing or front cover, the external control unit detects the resulting current peaks and shuts down. This prevents the motor from overheating.

The end stops are designed to be adjusted multiple times.

After each adjustment of the end stop, it must be checked that the torque is at least 0.5 Nm in order to securely maintain the position of the end stop. If the torque is too low, there is a risk that the end stop may shift unintentionally or, in the worst case, slip off the spindle. This may cause the actuator to collapse.

External control unit

The external control unit supplies power to the DC motor via the connection. The control unit controls the running direction of the actuator. The control unit reads 2 Hall signals integrated into the motor. This enables the control unit to provide variable-speed control and positioning.

The control unit provides a soft start/soft stop function. The function reduces shocks and improves the user experience of the system in which the actuator is installed.

In the event of overload, the control unit limits the current. This prevents the motor from overheating and protects the actuator from damage.

Schaeffler recommends using the following control units together with the actuator.

4 Suitable control units

Linear actuator	Control units							
	SCU1	SCU5	SCU9	VCU5	VCU8	VCU9	BCU5	BCU8
CAMT	✓	✓	✓	✓	✓	✓	✓	✓

✓ suitable
– not suitable

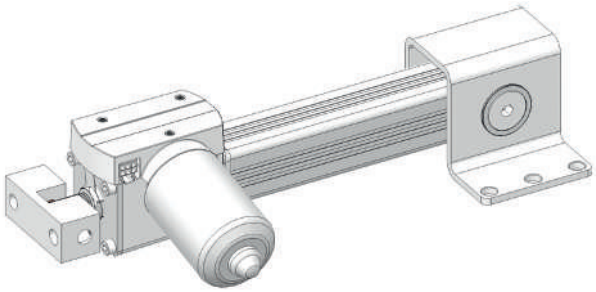
4.1 Attachment options

Different attachment types allow the actuator to be mounted on the supporting structure. Positions are possible at the front and rear. The product offers suitable connections on both sides:

- bracket with 1 degree-of-freedom (front and rear)
- bracket with 2 degrees-of-freedom (front and rear)
- U-bracket with 1 degree-of-freedom (rear only)

Brackets with 1 degree-of-freedom or 2 degrees-of-freedom fit directly onto EWELLIX lifting columns CPMT, TLG, TLT and enable the movements required for the application.

7 Bracket with 1 degree-of-freedom, front and rear



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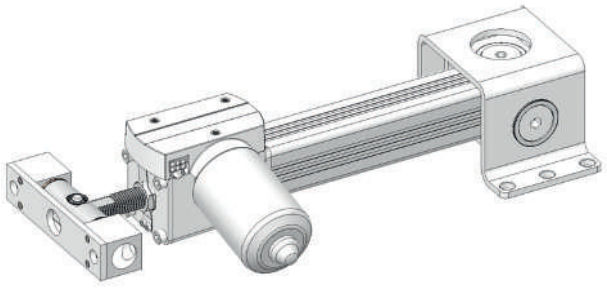
8 Bracket with 2 degrees-of-freedom, front and rear



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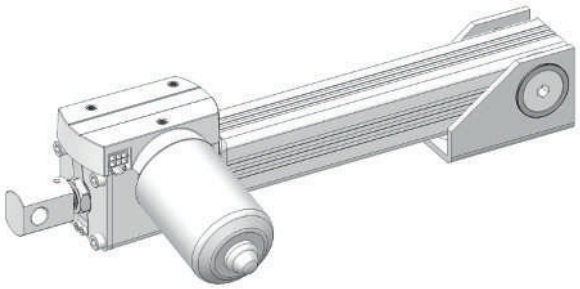
9 U-bracket with 1 degree-of-freedom, rear only



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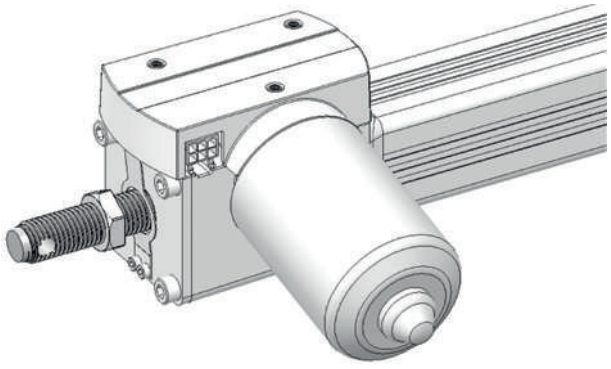
4.1.1 Spindle with Ø8 bore

The simplest standard front attachment is a Ø8H7 (+0.015/0) bore in the lead screw.

If the bore is used as a pivot point, Schaeffler recommends using a Ø8h7 (0/−0.015) cylinder pin in accordance with DIN 6325 to achieve a loose fit.

If the cylinder pin must be secured in the bore of the spindle and the pivot point is provided by a rod clevis designed by the customer, Schaeffler recommends using a Ø8m6 (+0.015/+0.06) cylinder pin in accordance with DIN 6325 in order to achieve a transition fit.

10 Spindle with bore



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4.1.2 Clevis attachment

The front connection features an additional head mounted at the end of the spindle and includes a Ø12H7 (+0.018/0) bore. A spring pin in accordance with DIN EN ISO 8752 is mounted transversely through the rod clevis and spindle to ensure a secure connection and prevent the rod clevis from loosening during operation.

If the bore is used as a pivot point, Schaeffler recommends using a Ø12h7 (0/−0.018) cylinder pin in accordance with DIN 6325 to achieve a loose fit.

If the cylinder pin must be secured in the bore of the spindle and the pivot point is provided by a rod clevis designed by the customer, Schaeffler recommends using a Ø12m6 (+0.018/+0.007) cylinder pin in accordance with DIN 6325 in order to achieve a transition fit.

11 Front clevis attachment

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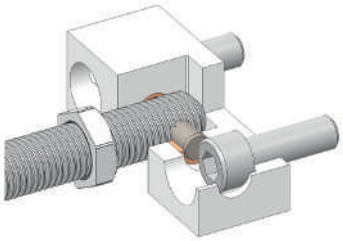
4.1.3 Bracket with 1 degree-of-freedom

The front bracket is attached to the spindle with a Ø8 mm dowel pin and allows movement about 1 axis of this dowel pin. The dowel pin is rigidly connected to the spindle, while the bracket pivots and is supported by two bushings. The connection to the upper surrounding structure is made using 2 M10 screws.

The front bracket is designed and tested to support loads in the axial direction. If mounted in the radial direction, the customer is responsible for verifying the strength of the supporting structure and the screw connection. Observe the assembly specifications such as tightening torque and strength class.

Failure to follow the assembly instructions may result in significant hazards to the safety and operation of the device.

12 Front bracket with 1 degree-of-freedom



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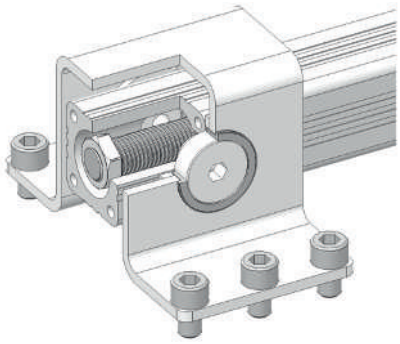
The rear bracket is attached to the protection tube as standard via 2 large trunnions and bushings. The rear bracket matches the outer tube size of several Schaeffler lifting columns and is attached using 6 M10 screws.

The rear attachment is designed for direct attachment to CPMT, TLG, and TLT lifting columns. If alternatively attached to an adapter plate or supporting structure, verify the design. Observe the assembly specifications such as tightening torque and strength class. Failure to follow the assembly instructions may result in significant hazards to the safety and operation of the device.

13 Rear bracket with 1 degree-of-freedom



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4.1.4 Bracket with 2 degrees-of-freedom

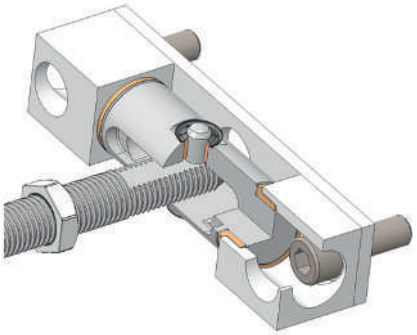
The front bracket is attached to the spindle via a Ø8 mm dowel pin and allows movement about 2 axes. The two freely rotating axes are arranged in a Cartesian coordinate system; the two complementary axes are perpendicular to the main spindle axis.

The dowel pin is rigidly connected to the spindle. The bracket pivots around the dowel pin and is supported by 2 bushings. Use spring washers to secure the position of the pins if the pin press-fit connection becomes loose.

The front bracket is designed and tested to support loads in the axial direction. If mounted in the radial direction, the customer is responsible for verifying the strength of the supporting structure and the screw connection. Observe the assembly specifications such as tightening torque and strength class.

Failure to follow the assembly instructions may result in significant hazards to the safety and operation of the device.

14 Front bracket with 2 degrees-of-freedom



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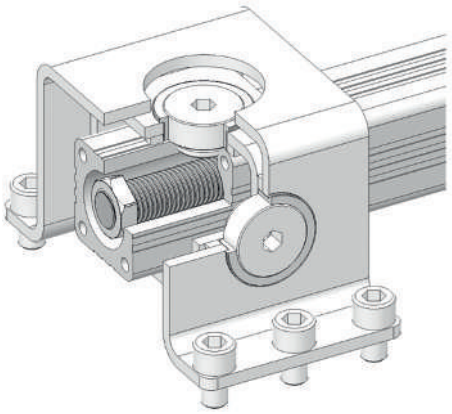
The rear bracket with 2 degrees-of-freedom has the same 2 rotational axes as the front bracket and is supplied fully assembled. The preassembled component minimizes play.

The rear bracket is attached to the protection tube as standard via 2 large trunnions and bushings. The rear bracket matches the outer tube size of several Schaeffler lifting columns and is attached using 6 M10 screws.

The rear attachment is designed for direct attachment to CPMT, TLG, and TLT lifting columns. If alternatively attached to an adapter plate or supporting structure, verify the design. Observe the assembly specifications such as tightening torque and strength class. Failure to follow the assembly instructions may result in significant hazards to the safety and operation of the device.

15 Rear bracket with 2 degrees-of-freedom



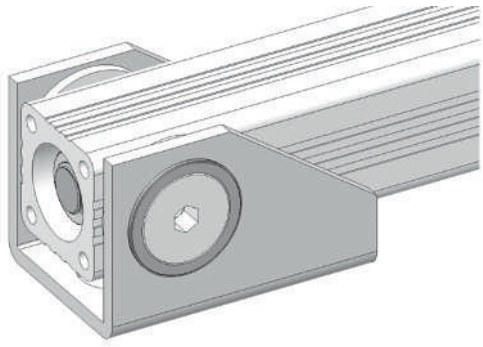
001DE8B8

4.1.5 U-bracket

Rear attachment variant with 1 degree-of-freedom available as a U-bracket.

- Use the standard attachment with 1 degree-of-freedom if the actuator is mounted centrally on the supporting column.
- For eccentric mounting, the U-bracket may need to be attached to the lifting column together with an adapter plate.

16 U-bracket with 1 degree-of-freedom



001DE8B9

4.2 Requirements for third party control units

Control units not offered by Schaeffler for actuators are considered third party control units.

Schaeffler strongly recommends using original Schaeffler control units to operate the actuators. If third party control units are used, well-documented proof must be available to confirm that the following requirements are met.

Requirements

The secondary circuit of third party control units must be designed as an overvoltage category I circuit.

Third party control units must include over current cut off. The rated current is 10 A; however, under cold-start conditions, the current may increase to 12.5 A for several seconds. The recommended cutoff value is therefore 13.7 A. The maximum cutoff delay must not exceed 50 ms.

Third party control units must allow the actuator to draw a current of ≤ 25 A for 200 ms after being switched on (starting current). The overload cutoff function may be temporarily deactivated for this purpose.

The operating voltage of the actuator is DC 24 V. A no-load voltage of DC 36 V may not be exceeded.

Once the system has been installed, electromagnetic compatibility must be ensured. The operating time and duty cycle of the actuator must not be exceeded, see Technical data.

The power supply of third-party manufacturers must provide isolation between the primary and secondary circuits in accordance with 2 MOPP and a non-grounded secondary circuit.

Momentary switch operation (recommended): The actuator operates for as long as the switch is pressed. The device is not equipped with any operating indicators and, depending on the application, it is recommended to install an operating indicator in the third party control unit.

For the 2-Hall pulse generator, the third party control unit must additionally fulfill the following requirements:

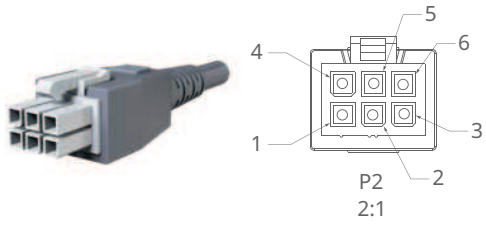
- supply the Hall sensors with a voltage of DC 4.5 V to DC 26.5 V at a current of 200 mA
- load the Hall sensor outputs with a maximum of 20 mA
- the Hall sensor outputs must be connected using pull-up resistors so that the signal from the open-collector outputs can be evaluated

4.3 Electrical connection

The actuator is connected to the control unit via the motor cable. The motor cable has a 6-pin Molex Mini-Fit Jr. connector at one end and a DIN-8 plug or open flying leads at the other end. The connected load is DC 24 V at max. 10 A, in accordance with the technical data.

- Ensure that cables cannot be pinched or damaged.
- Check that the supply voltage corresponds to the rated values on the product label.

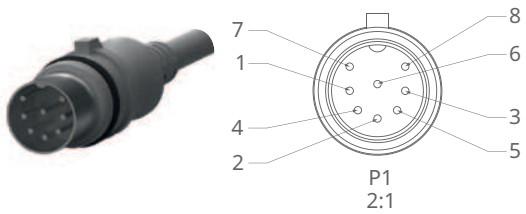
17 Plug P2: 6-pin Molex, Mini-Fit Jr. connector



Plug P2: Molex Mini-fit Jr. 6-pole

001D38DB

18 Plug P1: DIN-8 plug



Plug P1: DIN-8 connector

001D38BB

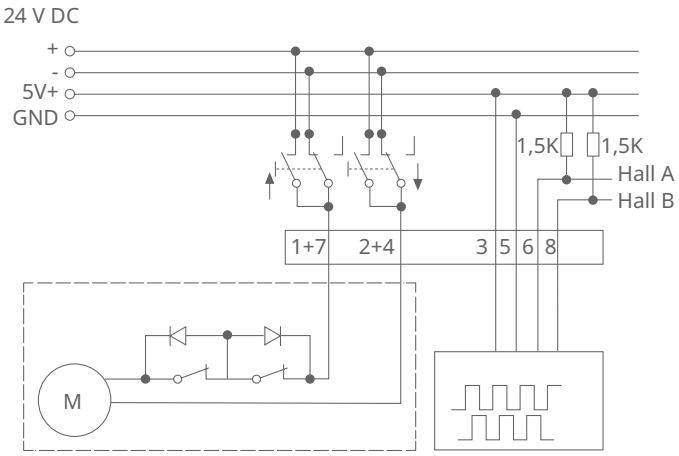
19 Open flying leads

001DDB34

5 Electrical connection CAMT

Plug P1	Color	Cross-section	Function	Plug P2
1+7	Blue	AWG 16	– on, + off	4
2+4	Red	AWG 16	+ on, – off	1
3	Pink	AWG 24	+5 V	2
5	Gray	AWG 24	GND	5
6	Yellow	AWG 24	Hall sensor signal 1	3
8	Green	AWG 24	Hall sensor signal 2	6

20 Connecting diagram CAMT



Encoder resolution 0,02127 mm/edge

001D38AB

4.4 Requirements for operating devices

General safety requirements in accordance with IEC 60601-1. The safety requirements are necessary for medical applications.

The device does not have its own operating elements. Operation is performed via a Schaeffler operating element connected to an external Schaeffler control unit. Observe the separate user manuals for these devices.

4.5 Special features

The designs can be identified from the type designation on the product label.

Load

Push force and pull force are 6000 N in accordance with the standard.

Supply voltage

Supply voltage is DC 24 V in accordance with the standard.

Stroke length

The standard stroke length ranges from 50 mm to 250 mm in increments of 50 mm in accordance with the standard. Customized stroke lengths are available in increments of 50 mm.

Back-up nut

The actuator is always equipped with a back-up nut on the trapezoidal sliding screw to prevent the actuator from collapsing in the event of a spindle nut defect.

End limit switches

The actuator is equipped with electromechanical end limit switches. These disconnect the power supply to the motor in order to quickly stop movement when the end position is reached. The end limit switches do not output a signal for further processing.

Dual Hall encoder

The actuator is equipped as standard with a dual Hall encoder integrated into the motor. The control unit can access the encoder to enable variable-speed control or positioning.

4.6 Options

Distance variations

The offset X refers to the distance between the pivot point of the front attachment and the front cover of the gearbox. Depending on the selected front attachment option, the distance may vary. The standard version allows a full motion angle to the front attachment without overlapping the front cover.

Customized distance variants are available in increments of 1 mm.

Protection tube length

The protection tube length is available in the two standard versions: short and long. In the long version, the lead screw is covered when fully retracted. The short version provides the minimum protection tube length at which overlap between the rear attachment and the gearbox is excluded at the full motion angle.

Additional protection tube lengths are available as custom designs in increments of 10 mm.

Front and rear attachment

Several standard options are available for the front and rear attachment. Details are described in the section on attachment options.

Cables

Available cable options include cables with a DIN-8 plug in lengths of 1 m and 2.3 m, as well as cables with open flying leads in a length of 2.3 m.

5 Transport and storage

NOTICE

Damage due to improper transport

Improper transport may result in significant property damage.

- 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 product from the packaging until immediately before installation.
- Observe the ambient conditions for return transport to the manufacturer.

5.1 Transport

Observe the safety regulations for transport.

Requirements for packaging

Each individual packaged part must be packed appropriately for the anticipated transport conditions. Only environmentally friendly materials may be used for the packaging.

The packaging is intended to protect the individual components from transport damage, corrosion, and other types of damage until assembly.

1. Do not destroy the packaging and only remove it shortly before assembly.
2. Keep the packaging in case the product needs to be returned to the manufacturer ➤29|5.3.

Packaging material consists of valuable raw materials, most of which can be effectively recycled and reused.

If the packaging is to be disposed of following intact delivery, the following instructions must be observed and complied with:

3. Dispose of packaging material in an environmentally responsible manner.
4. Observe the locally applicable disposal regulations.

5.2 Storage

Observe the safety regulations for the storage.

1. Store the product in its original packaging and avoid mechanical shocks.
2. If the storage period is ≥ 3 months, regularly check the general condition of all packaging components.
3. Follow any additional storage instructions detailed on the packaging.

5.3 Return to the manufacturer

Proceed as follows for return transport:

1. Dismantle the device if necessary.
2. Pack the device in its original packaging.
3. Observe the safety instructions for transport and storage ➤15|2.7.6.
4. Send to the manufacturer. The address is provided on the back of this operating manual.

6 Mounting

Observe the technical data in accordance with the operating conditions.

Comply with all safety regulations.

Authorized personnel

- Assembly and commissioning may only be carried out by qualified technical personnel.
- Work on the electrical system may only be carried out by trained, electrically skilled persons.

Safety instructions

DANGER

Risk of serious or fatal injuries from live components and moving parts

Serious or fatal injuries may be caused by contact with live components and by unexpected actuator movements.

- Switch off the power supply and secure it against unintentional reconnection before performing any work on the system.

DANGER

Risk of fatal injury from unauthorized reconnection of the power supply

Risk of fatal injury to persons in the hazard area due to moving parts or electric shock if the power supply is switched on without authorization during work on the system and causes the system to restart.

- Before starting work, switch off the system and secure it against reconnection.

WARNING

Risk of injury and equipment damage due to improper installation of optional devices

Risk of injury and property damage if optional devices are installed improperly.

- Install optional devices, particularly components used in retrofits, only in accordance with the respective instructions (circuit diagram).
- Check the electromagnetic compatibility for the installation and, if necessary, take appropriate measures as described in the user manual for the device.

WARNING

Risk of injury due to tampering with screws

Tampering with or loosening screws on the device or on optional components may result in injury and damage during operation.

- Do not loosen any screws, with the exception of the transport screws.

NOTICE

Property damage due to unsuitable screw connections

The use of unsuitable screws may result in significant hazards to the safety and operation of the actuator.

- Only use screws of the correct length, suitable material, specified quality, and with the defined tightening torque.

Special precautions regarding electromagnetic compatibility (EMC) must be observed. Install and commission the device in accordance with the EMC instructions provided in this user manual.

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.

Install the device in a location that meets the ambient conditions.

6.2 Inspections before initial startup

A professional electrician must carry out and document the following inspections and measurements before initial startup:

1. Visual inspection of the condition.
2. Check operating and safety functions.
3. Measure the protective conductor resistance.
4. Measure leakage currents.
5. Measure insulation resistance.

Further information on inspections and readings can be found in the section.

6.3 Overview

Attach the actuator using the designated mounting holes. Use fastening screws in the quantity, grade, and dimensions specified in the technical data.

The extension and alignment procedures for mounting, as well as the electrical connections, are described below.

Mounting example

An EWELLIX CPMT lifting column for height adjustment operates together with two EWELLIX CAMT linear actuators (1 and 2 degrees-of-freedom) in order to provide lateral tilt functions. Since the actuator design is variable, there is flexibility in mounting the linear actuators on the lifting column.

The simplest mounting option is as follows:

- Fasten the rear attachments to the lower side of the lifting column directly to the standard connection of the outer profile.
- Screw the existing front mounting brackets to the tilt frame.

If this variant cannot be implemented, an intermediate plate can be used to position the actuator as required. The intermediate plate is mandatory for the U-bracket. The standard attachment points are used for this purpose.

21 Lift modules and tilt modules for operating tables

001CF1F6

6.4 Mounting the actuator

The following assumption applies to the installation procedure: The cardan joint system connects the lifting column to the upper structure, for example an operating table or treatment chair. It is already securely mounted and fastened to the lifting column so that the linear actuators can be installed directly.

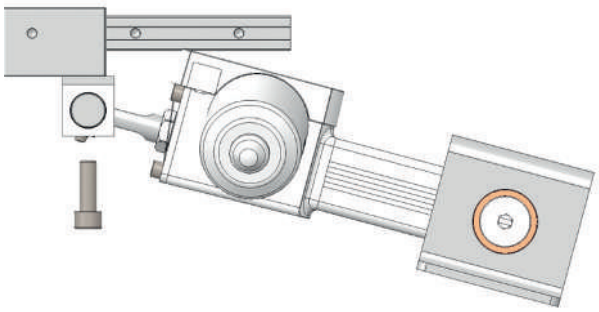
This procedure should also be used if a linear actuator must be replaced on a product that has already been fully assembled.

The following sequence describes a typical method for mounting a linear actuator on an EWELLIX lifting column. The procedure is suitable for configurations with 1 or 2 degrees-of-freedom. Depending on the design and application, the procedure may be adapted.

Front attachment

The distance between the front attachment and the gearbox housing may be limited depending on the configuration. It is therefore recommended to begin installation in this area in order to achieve greater flexibility.

22 Aligning the screw holes



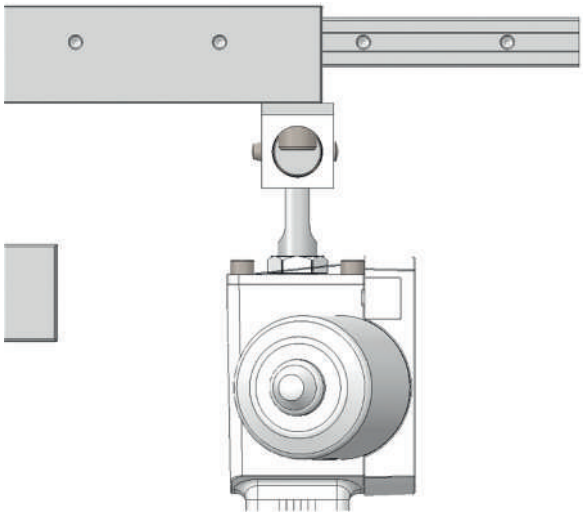
✓ fastening screws according to ISO 4762 are available: M10×40, strength class 10.9, zinc-plated

✓ tightening torque M_A = 60 Nm ±1.5 Nm

1. Remove the linear actuator from the packaging.
2. Position the linear actuator so that the screw holes of the front attachment align with the corresponding holes of the cardan structure.
3. Rotate the front connection until the holes are accessible.
4. Insert the fastening screws and tighten to M_A. Use M10 lock washers and secure the threads with LOCTITE 243.

» The linear actuator hangs beneath the cardan structure and can be adjusted in length.

23 Actuator ready for length adjustment



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Rear attachment

After unpacking, the distance between the attachments must be adjusted in the delivery condition so that the linear actuator fits on both sides.

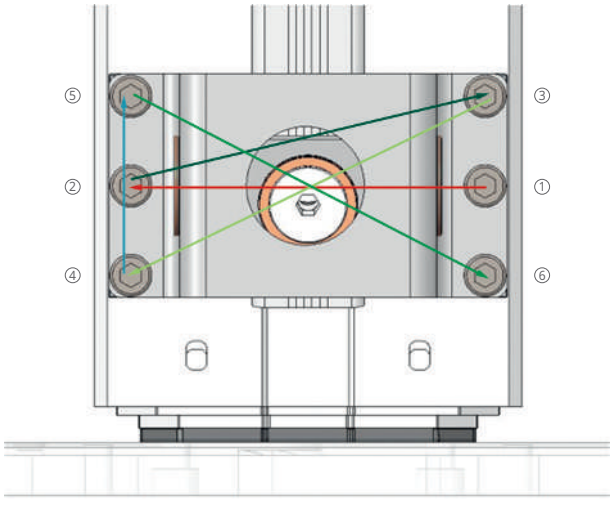
- ✓ fastening screws according to ISO 4762 are available: M10×16, strength class 8.8, zinc-plated
- ✓ tightening torque for mounting on EWELLIX lifting column: M_A = 25 Nm ±1.5 Nm
- ✓ tightening torque for mounting on mounting plate (min. thickness 10 mm): M_A = 35 Nm ±1.5 Nm

5. Connect the linear actuator to the control unit and manually adjust the stroke length using the hand switch.

› The mounting holes on the rear attachment align with the surrounding structure, e.g., the lifting column.

6. Tighten the fastening screws in a crisscross pattern. Use M10 lock washers and secure the threads with LOCTITE 243.

24 Aligning the screw holes and tightening the screws in a crisscross pattern



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6.5 Mounting the actuator with the U-bracket

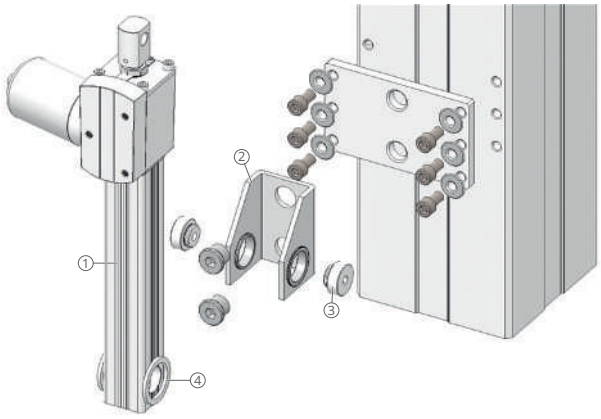
In most cases, the linear actuator and attachments are supplied as a preassembled unit that can be attached directly to the lifting column and does not need to be disassembled.

However, the U-bracket requires a different procedure.

- ✓ fastening screws according to ISO 4762 are available: M10×16, strength class 8.8, zinc-plated
- ✓ locking screws according to DIN 908 are available: M20×1.5, strength class 5.8, zinc-plated
- ✓ tightening torque for mounting the mounting plate (min. thickness 10 mm) on the EWELLIX lifting column: M_A = 25 Nm ±1.5 Nm
- ✓ tightening torque for mounting the U-bracket on the mounting plate (min. thickness 10 mm): M_A = 50 Nm ±2 Nm

1. Prepare the mounting plate and connection to the lifting column.
2. Separate the U-bracket from the linear actuator in order to insert the fastening screws.
3. Remove the pivot screws. Do not clean the greased pivot screws. Mount the U-bracket on the mounting plate.
4. Reattach the linear actuator to the U-bracket. Secure the pivot screws with LOCTITE 2701.
5. Attach the mounting plate with the standard hole pattern to the lifting column in the same manner as previously described.

25 Accessories included in the scope of delivery



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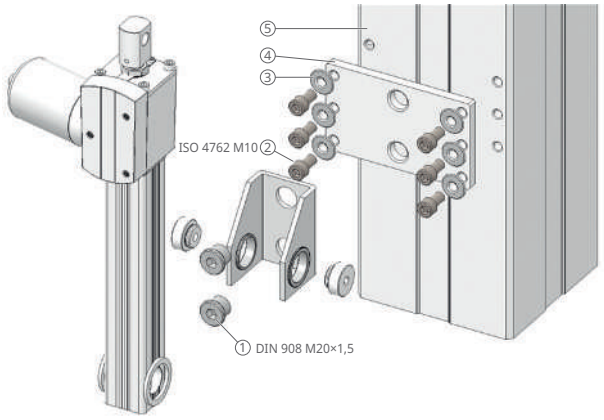
1	Linear actuator	2	U-bracket
3	Pivot screw	4	Spacer

26 Accessories not included in the scope of delivery



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1	Locking screw	2	Fastening screw
3	Lock washer	4	Mounting plate
5	Outer profile of the lifting column		

6.6 Connecting the control unit

The actuator requires an EWELLIX control unit. Only use EWELLIX control units. Observe the separate user manual for the control unit.

Third party control units

All control units that are not approved by Schaeffler for the EWELLIX actuator are treated as third party control units.

⚠ WARNING

Risk of injury and product damage due to non-approved control units

The use of third party control units may result in property damage. The manufacturer accepts no liability for any damage that may occur in connection with the use of a third party control unit.

Only use EWELLIX control units.

If you must use a third party control unit, contact Schaeffler.

⚠ WARNING

Risk of electric shock due to incorrect electrical installation of third party control units

If third party control units are installed incorrectly, there is a risk of electric shock

- ▸ Isolate the secondary DC 24 V circuit from the main circuit without connection to earth.

Low-voltage plug versions

The product is connected to the external control unit via a low-voltage plug. When connecting, observe the instructions provided in the user manual for the EWELLIX control unit.

Depending on the selected version, the actuator is delivered with or without cable. If a cable option is selected, the cable end on the actuator side is equipped with the appropriate Molex Mini-Fit connector, which is also used on the actuator.

Depending on the actuator version, the low-voltage plug on the control unit side is either a DIN-8 plug or an open cable end. Follow the corresponding instructions:

1. Connect actuator to control unit via DIN-8 plug.
2. Connect actuator to control unit via flying leads.

6.6.1 Connecting the DIN-8 plug to the control unit

The insertion position is dictated by the geometric shape of the plug. Strain relief for this system is provided by the mounting features of the respective housing of the EWELLIX control unit.

NOTICE

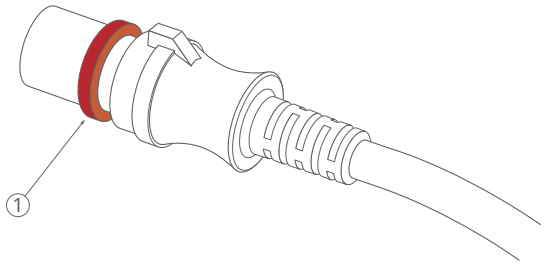
Risk of equipment damage due to damaged or incorrect sealing rings

Damaged or incorrect sealing rings on the plug of the power cable cannot ensure the IP protection of the control unit.

- Ask the manufacturer to replace damaged sealing rings immediately.

1. Check the sealing ring of the DIN-8 plug and the plug itself for damage.
2. If the sealing ring or the plug is damaged, arrange for these to be replaced by the manufacturer.

27 Checking the sealing ring of the DIN-8 plug for damage



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1	Sealing ring		

The following instructions are an example of using the actuator with the EWELLIX control unit BCU:

NOTICE

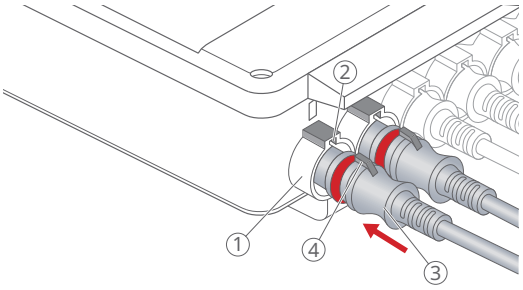
Incorrect lubricant

The use of incorrect additives may cause significant material damage.

- Use only the auxiliary products listed by the manufacturer.

3. Lightly lubricate the sealing ring with Klübersynth VR 69-252.
4. Insert the DIN-8-plug into the socket of the control unit. Ensure that the groove and the lug are correctly positioned.

28 Inserting the DIN-8 plug into the connecting socket of the control unit



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1	Connecting socket	2	Groove
3	DIN-8 plug	4	Key

6.6.2 Connecting flying leads to the control unit

✓ A customized control unit is used.

✓ Requirements for third party control units are fulfilled.

▸ Observe the color coding of the leads.

6.7 Connecting the operating device and power supply

The actuators do not display an operating state. However, for medical applications, indication of the operating state is mandatory and must be provided on the control unit used or on the operating device.

The control unit is connected to the mains power supply. When connecting, follow the instructions provided in the user manual for the control unit.

✓ The actuator is connected to the control unit.

1. Connect the operating device to the control unit. Observe the separate user manual for the operating device.
2. Connect the control unit to the power supply. Observe the separate user manual for the control unit.
3. Ensure that the mains plug of the control remains accessible at all times.

7 Commissioning

Observe the technical data in accordance with the operating conditions.

Comply with all safety regulations.

Special precautions regarding electromagnetic compatibility (EMC) must be observed. Install and commission the device in accordance with the EMC instructions provided in this user manual.

Authorized personnel

- Assembly and commissioning may only be carried out by qualified technical personnel.
- Work on the electrical system may only be carried out by trained, electrically skilled persons.

Inspection before initial startup

A professional electrician must carry out and document the following inspections and measurements before initial startup:

1. Visual inspection of the condition.
2. Check operating and safety functions.
3. Measure leakage currents.
4. Measure insulation resistance.

Further information on inspections and measurements is provided in the chapter *Maintenance*.

Inspecting the installation

⚠ WARNING

Risk of crushing and damage in the event of overload

The actuator can be damaged in the event of static or dynamic overload. There is a risk of crushing as the prescribed level of safety is then no longer guaranteed.

- ▸ Do not overload the actuator and do not use it outside the permissible operating data.
- ▸ Observe the information on the product label.

The installation must be checked before the actuator is put into operation for the first time. Before initial startup, ensure that the following precautions have been observed.

- ✓ All instructions in the previous chapters of this user manual have been followed.
- ✓ The resistance of the protective earth conductor and the substitute leakage currents have been checked in accordance with the threshold values required for use by the owner.
- ✓ No inadmissibly high lateral forces are acting on the actuator.
- ✓ Fastening screws are securely tightened.
- ✓ The entire stroke area is clear so that the actuator cannot run into any fixed objects.
- ✓ All cables are secured against pinching or crushing and are properly connected. Cables with flying leads are connected in accordance with the connection plan.
- ✓ The power supply is fused.
- ✓ The actuator is connected to the control unit.
- ✓ The operating device is connected.

5. The actuator may be put into operation.

Commissioning

- ✓ The installation has been checked.

6. The actuator may be put into operation: when the operating light is green, press the corresponding button on the operating device.

8 Operation

This chapter is aimed at owners and operating authorities. It provides all information required for the safe and proper operation of the actuators under normal operating conditions.

Observe the technical data in accordance with the operating conditions.

Comply with all safety regulations.

8.1 Safety instructions

⚠ WARNING

Risk of serious injury from remaining in the stroke area of the device

There is a risk of serious injury due to crushing within the operating area of the device.

- Ensure that no persons remain in the stroke area of the device during operation.
- Switch off the device immediately if unusual noises or changes in operation occur.
- Do not interfere with the elements connected to the device while the device is in operation.

NOTICE

Risk of equipment damage due to static or dynamic overload

Risk of damage to or failure of the device

- Do not overload the actuator or use it outside the permissible operating data; see *Technical data* and product label.
- Do not exceed the rated load.
- Do not tamper with connected components while the device is in operation.
- Ensure that no objects are located in the stroke area of the actuator during operation.

NOTICE

Ingress of fluids

The device may become damaged if liquids penetrate the actuator during extension or retraction.

- Keep liquids away from the device during operation.

⚠ WARNING

Contact with the fork head

Risk of injury from contact with the fork head

- Ensure that no objects or body parts come into contact with the fork head of the actuator.

NOTICE

Material damage due to overheating.

Overheating of the device may result in damage to the electronics.

- Only use the control with the integrated thermoswitch.
- Never exceed the rated load.
- Strictly observe idle times and operating times.

8.2 Switching on

Preconditions for operation

The actuator does not have its own operating device. The actuator is controlled via an operating device connected to the control unit.

1. Observe the separate user manual for the control unit.
2. Observe the separate user manual for the operating element.

Once the actuator is connected to the control unit, the actuator is ready for operation.

8.3 Switching off

The actuator does not have an on/off switch. To de-energize the actuator:

✓ The actuator should preferably be in the retracted position.

- Disconnect the actuator from the control unit.

8.4 Measures during operation

The product is intended for intermittent operation or short-time operation: For the permissible duty cycle, see table *Technical data*. If a higher duty cycle is required, Schaeffler must be contacted.

8.4.1 Controlling the actuator

During normal operation, the actuator raises or lowers the elements connected via the front and rear attachments. The actuator is controlled via an external control unit and the operating device.

A green LED on the control unit indicates operational readiness.

Moving the actuator

Use the [Up] and [Down] direction buttons on the operating device to control the actuator:

1. To extend the actuator, press the [Up] button.
2. To retract the actuator, press the [Down] button.

» The actuator moves until the operating button is released or an end position is reached.

The travel distance from releasing the button to coming to a stop depends on the speed and the direction of force.

The actuator stops when the [Up] or [Down] buttons are released or when the end position is reached.

When the end position is reached, an end limit switch is triggered, interrupting the power supply to the DC motor. Alternatively, an end position can be defined by a preprogrammed position in the control unit. Triggering is then carried out via the encoder signal from the linear actuator.

Excessive current consumption, unusual noises, or an unintentional movement indicate damage to the actuator. Cease operation and inform the manufacturer, who is responsible for carrying out the inspection.

8.4.2 Operating options

Details of the individual operations can be found in the following sections:

- Installation
- Commissioning
- Maintenance
- Troubleshooting
- Disassembly

8.5 Emergency disengagement

The actuator has no built-in on/off switch and must be disconnected from the power supply. The device can only be de-energized by disconnecting it from the power supply.

The application in which the actuator is installed must be equipped with an emergency-stop switch or allow disconnection of the control unit from the mains supply at all poles.

In hazardous situations, all movements of the device must be stopped as quickly as possible and the power supply must be disconnected.

Procedure in hazardous situations

1. Press the emergency-stop switch immediately, if available, or interrupt the power supply to the actuator.
2. Evacuate all persons from the danger zone and initiate first aid measures.
3. If necessary, notify a doctor and the fire department.
4. Inform the responsible person on site.
5. Keep access routes clear for rescue vehicles.
6. Depending on the severity of the emergency, notify the relevant authorities if necessary.
7. Assign qualified personnel to rectify the fault.

DANGER

Risk of fatal injury due to improper restart

Risk of fatal injury to persons in the danger zone, risk of property damage

- Do not restart the device until all persons are outside the danger zone.
- Check the device and the application that uses the device before resuming operation.
- Ensure that all safety devices are installed and fully functional.

Before restarting:

1. Check the device and the application that uses the device, and ensure that all safety devices are installed and fully functional.

8.6 Shutting down

1. Remove the power plug of the control unit from the socket to disconnect the device from the power supply.
2. Remove the DIN-8 plug of the cable from the connecting socket of the control unit.
3. Ensure that the mains cables cannot be reconnected accidentally.

9 Troubleshooting

The following chapter describes possible causes of device malfunctions and the measures required to restore operation.

If malfunctions occur frequently, shorten the maintenance intervals.

If a malfunction cannot be rectified with the measures described, contact Schaeffler Service.

Authorized personnel

- The measures described here may be carried out by the operator unless otherwise specified.
- Some tasks may only be performed by qualified personnel; this will be explicitly stated in the relevant fault description.
- Work on the electrical system may only be carried out by trained, electrically skilled persons.

Safety instructions

DANGER

Risk of fatal injury from unauthorized reconnection of the power supply

Risk of fatal injury to persons in the hazard area due to moving parts or electric shock if the power supply is switched on without authorization during work on the system and causes the system to restart.

- ▸ Before starting work, switch off the system and secure it against reconnection.

WARNING

Risk of injury and property damage due to improper troubleshooting

Improper troubleshooting may result in injury or property damage.

- ▸ Do not loosen any screws on the device.
- ▸ Do not open the device.
- ▸ If malfunctions cannot be resolved by following the instructions below, remove the actuator and send it to Schaeffler for repair.

Procedure in the event of malfunctions

As a general rule:

1. In the event of malfunctions that may pose an immediate risk to persons or property, switch off the actuator immediately and secure it against being switched on again.

› The actuator is secured against being switched on again.

2. Determine the cause of the malfunction.
3. Depending on the type of malfunction: have the malfunction remedied by qualified personnel.
4. Inform the responsible persons on site about the malfunction.

Refer to the *Troubleshooting* table to determine who is authorized to remedy the malfunction.

6 Troubleshooting

Error	Possible cause	Remedy	To be carried out by
Actuator does not move	Control unit not ready for operation	▸ Check the mains connection to the control unit.	Professional electrician
		▸ Ensure that the operating device is correctly connected to the control unit. ▸ Verify that the current limitation of the control unit complies with the requirements specified in this user manual. ▸ Read the user manual for the control unit.	Qualified personnel
	Operating device defective	▸ Replace operating device ▸ Read the user manual for the operating device.	Qualified personnel
	Poor contact between connector and control unit	▸ Ensure that the connector is inserted correctly into the control unit	Operator
	Incorrect load	▸ Ensure that the load on the actuator does not exceed the load limit specified in the technical data.	Qualified personnel
	Obstacle in the stroke area of the device	▸ Remove all obstacles from the stroke area.	Operator
	Cable defective	▸ Check cable for damage, cracks, and other defects	Professional electrician
	Motor shut down due to overheating	▸ Check permissible duty cycle. ▸ Wait 20 min and try to move the actuator again	Qualified personnel
	Service life of the actuator has been exceeded	▸ Check performance data ▸ Contact Schaeffler Service ▸ Replace the actuator if older than 10 a (years)	Qualified personnel
Actuator works in 1 direction only.	Actuator has reached the internal limit switch	▸ Move in the opposite direction.	Operator
	Control unit malfunction	▸ Read the user manual for the control unit.	Qualified personnel
	Operating device malfunction	▸ Read the user manual for the operating device.	Qualified personnel
	Obstacle in the stroke area	▸ Remove all obstacles from the stroke area.	Operator
Actuator stops before maximum stroke is reached	Control unit cuts off the power supply	▸ Ensure that the load on the actuator does not exceed the load limit specified in the technical data.	Qualified personnel
	Obstacle in the stroke area	▸ Remove all obstacles from the stroke area.	Operator
Markedly reduced speed	Obstacle in the stroke area of the actuator	▸ Remove all obstacles from the stroke area.	Operator
	Incorrect load	▸ Ensure that the load on the actuator does not exceed the load limit specified in the technical data.	Qualified personnel
	Motor, gearbox, spindle, or spindle nut defective	▸ Replace the device.	Qualified personnel

9.1 Startup after correcting a malfunction

Once the malfunction has been corrected:

▸ Before restarting, carry out the steps described in the Assembly and Commissioning sections.

10 Maintenance

Authorized personnel

- The measures described here may be carried out by the operator unless otherwise specified.
- Some tasks may only be carried out by qualified personnel; this will be explicitly stated in the description of the respective maintenance work.
- Work on the electrical system may only be carried out by trained, electrically skilled persons.

Safety instructions

DANGER

Improper maintenance

Risk of electric shock. Improper maintenance can result in serious injury, death, or damage.

- ▸ Work on electrical systems may only be carried out by professional electricians.

DANGER

Risk of fatal injury from unauthorized reconnection of the power supply

Risk of fatal injury to persons in the hazard area due to moving parts or electric shock if the power supply is switched on without authorization during work on the system and causes the system to restart.

- ▸ Before starting work, switch off the system and secure it against reconnection.

Schaeffler also recommends compliance with IEC 62353 with regard to maintenance.

10.1 Maintenance plan

The following sections describe the maintenance work required for optimum and trouble-free operation.

If increased wear is detected during regular inspections, shorten the maintenance intervals according to the actual signs of wear.

If the actuator is used outside the ambient conditions previously specified in this manual, check the components monthly for changes such as oxidation or deposits.

7 Maintenance plan

Maintenance interval	Maintenance work	Carried out by
Daily	▸ Remove dust and dirt if necessary.	Qualified personnel
	▸ Visual inspection: check the actuator for visible damage. ▸ Check the actuator for unusual noises or changes in performance.	Qualified personnel
Monthly	▸ Check the function of the operating devices and safety equipment. ▸ Check that attachments and fastening screws are securely fastened and correct if necessary.	Qualified personnel
Every 6 months	▸ Check the function of the emergency-stop switch, if present.	Professional electrician
	▸ Check whether all plugs are correctly inserted and whether sealing rings are intact.	
Every 12 months	▸ Check the lubrication of the spindle. ▸ Relubricate the spindle with Berlub FR 150-21 if necessary.	Qualified personnel
As determined by the processor	▸ Perform a visual inspection of the routing of the motor cable and operating device cable within the application. Cable routing elements should not be loose or broken.	Professional electrician

10.2 Maintenance work

The actuator is maintenance-free for the duration of its service life.

1. Check the power cable and housing for wear at regular intervals.
2. Perform periodic safety inspections on site, in accordance with the applicable regulations.
3. Check the resistance of the protective earth conductor and the substitute leakage currents annually.

10.2.1 Cleaning

Performed by qualified personnel

If contaminated, clean the product immediately to prevent the buildup of residue.

NOTICE

Improper cleaning

Risk of equipment damage due to improper cleaning of the device.

- Do not use aggressive cleaning agents. Wash water, including chemical additives, must be pH-neutral.
- Only use cleaning agents specified by the manufacturer.
- Do not use steam cleaners or high-pressure cleaners.
- Other cleaning agents or cleaning devices may only be used with the manufacturer's approval.
- The actuator must not come into contact with liquids during operation.
- The spindle must not be cleaned.

✓ The actuator is properly installed in the application.

✓ The actuator is protected against contact with liquids.

1. Disconnect the actuator from the power supply.
2. Clean the actuator manually using a damp cloth and water. If necessary, add a small amount of isopropyl alcohol to the washing water.

10.2.2 Inspections and measurements

To be performed by a qualified electrician

When carrying out inspections and measurements, observe the following:

- All inspections and measurements must be carried out in accordance with the applicable standards and regulations.
- All inspections and measurements must be documented in a maintenance log ➤46|10.2.3.

10.2.3 Service log

Enter the following in the maintenance log:

- name of the executing body (company, department)
- names of the staff on duty
- identification of the device or system (type, serial number, inventory number) and the respective accessories
- completed inspections and measurements
- scope and results of the inspections

- measurement method, measuring device, measuring results of the readings
- overall assessment and verification of all functions compared to specifications
- date and signature of the person performing the inspection, personal encoding is possible for IT applications.

10.2.4 Check the seal integrity of the DIN-8 plug

To be performed by a qualified electrician

NOTICE

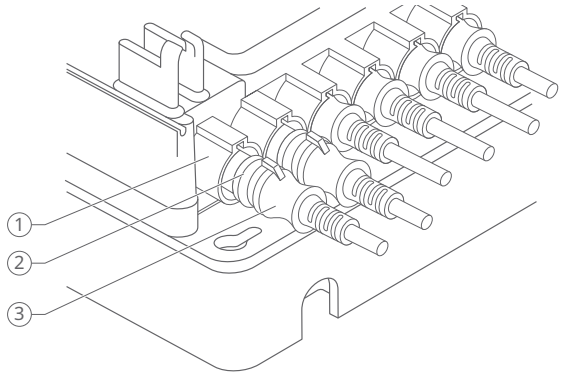
Risk of equipment damage due to damaged or incorrect sealing rings

Damaged or incorrect sealing rings on the plug of the power cable cannot ensure the IP protection of the control unit.

- ▸ Ask the manufacturer to replace damaged sealing rings immediately.

1. Disconnect the device from the power supply.
2. Check the sealing ring of the DIN-8 plug for damage.
3. If the sealing rings are damaged, arrange for these to be replaced by the manufacturer.
4. Ensure that there is no irregular gap between the DIN-8 plug and the connecting socket in the housing.
5. If no damage is detected, reconnect the device to the power supply.

29 Checking the seal integrity of the DIN-8 plug



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1	Connecting socket	2	Sealing ring
3	DIN-8 plug		

10.2.5 Visual inspection of the external condition

Performed by qualified personnel

1. Disconnect the device from the power supply and secure it against unintentional reconnection.
2. Check the cable for visible external damage such as cracks, cuts, and crushed sections.
3. If damage is detected, notify the processor or the manufacturer.
4. If no damage is detected and neither the processor nor the manufacturer has raised concerns, reconnect the device to the power supply.

10.3 Measures following completed maintenance

After completing the maintenance work, carry out the following steps before recommissioning the device:

1. Check all previously loosened screw connections for a secure fit.
2. Ensure that all tools, materials, and other equipment used have been removed from the work area.
3. Clean the work area and remove any spilled liquids, process media, or similar substances.
4. Ensure that all of the system's safety measures are working correctly.
5. Check functions against the product specifications.
6. Document the inspections in the maintenance log.

11 Dismounting

Comply with all safety regulations.

Authorized personnel

- Disassembly may only be carried out qualified technical personnel.
- Work on the electrical system may only be carried out by trained, electrically skilled persons.

Safety instructions

DANGER

Risk of severe or fatal injuries due to moving parts

Severe or fatal injuries may be caused by unexpected movement of the actuator.

- Switch off the power supply and secure it against unintentional reconnection before performing any work on the system.

WARNING

Risk of severe injury from improper disassembly

Stored residual energy, sharp-edged components, pins, and corners on individual parts or on the required tools can cause severe injuries if disassembly is performed improperly.

- Ensure sufficient space for disassembly before starting work.
- Exercise caution when working with exposed, sharp-edged components.
- Ensure that the disassembly area is clean and tidy. Avoid loosely stacked components or parts and tools lying on the floor which may pose a hazard.
- Disassemble components properly in accordance with applicable local regulations.
- Secure components to prevent them from falling or tipping over.
- Contact Schaeffler with any questions or concerns.

Removing the actuator

Remove the actuator from the application as follows:

1. Remove the cable from the external control unit to disconnect the actuator from the power supply.
2. Secure the application elements so that no pull or push forces act on the device.
3. Loosen and remove the fastening screws.
4. Disconnect the actuator from the fastening points in the application.
5. Clean the device
6. Carefully pack the device for shipping to the manufacturer.
7. Disassemble the device in accordance with locally applicable occupational safety and environmental protection regulations.

12 Disposal

If no return or disposal agreement is in place, disassembled components must be recycled.

NOTICE

Improper disposal

environmental damage

- Electronic waste, electronic components, lubricants, and other additives are subject to hazardous waste regulations and may only be disposed of by authorized specialist companies.

Observe the local regulations for disposal.

For information on environmentally sound disposal, contact your local authorities or specialist companies.

1. Dispose of metal and plastic parts at an appropriate recycling facility.
2. Sort remaining components by material and dispose of them in accordance with locally applicable occupational safety and environmental protection regulations.

13 Technical data

For detailed and current information on equipment and operating data:

PDB 105 | EWELLIX Linear Actuators | CAMT |
https://www.schaeffler.de/std/2258

For further information, contact Schaeffler.

Standard: IEC 60601-1

8 Technical data CAMT

Feature		CAMT20
Rated push force	N	6000
Rated pull force	N	6000
Static load (push/pull) [1]	N	13200
Safety factor under load conditions [2] [3]	–	4
Speed (full load ... no load) [4]	mm/s	5 to 6.5
Stroke S	mm	50 to 250
Voltage (DC)	V	24
Current consumption	A	10
Duty cycle	%	10
Ambient temperature	°C	+10 to +40
Protection code (IP)	–	IP20
Mass [5]	kg	5.8

1) Safety factor against mechanical hazards according to IEC 60601-2-46

2) static safety factor in accordance with IEC 60601-1

3) Depending on the stroke, the push force is reduced. For further information, see the Safety factor under load conditions diagram.

4) Speed at DC 24 V; the speed with VCU and SCU is higher. For further information, see the Speed-load diagram.

5) for stroke S = 250 mm, without attachment

9 Suitable control units and accessories for CAMT

Operating device		Control units		
Designation	Switch	SCU1, SCU5, SCU9	VCU5, VCU8, VCU9	BCU5, BCU8
EHE1	M	✓	✓	✓
STJ	F	✓	✓	✓
STE	T	✓	✓	✓

M Hand switch
F Foot switch
T Desk switch
✓ suitable
– not suitable

13.1 Ambient conditions

Transport and storage

The product may only be transported and stored in its original packaging under the following ambient conditions:

- dry and dust-free environment, not outdoors
- protected from sunlight and UV radiation
- chemically non-aggressive environment

- temperature: –20 °C (–4 °F) to +60 °C (+140 °F)
- humidity: max. 85 %, non-condensing
- air pressure: 700 hPa to 1060 hPa
- no mechanical shocks

If additional storage instructions are printed on the packaging that exceed the requirements listed here, those instructions must also be observed.

Operation

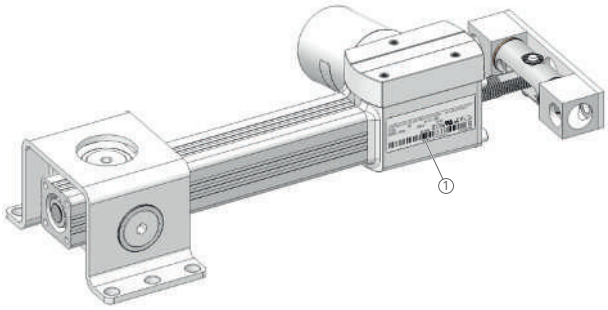
The product may only be operated under the following ambient conditions:

- indoor use only
- chemically non-aggressive environment
- non-explosive environment
- temperature: +10 °C (+50 °F) to +40 °C (+104 °F)
- humidity: 5 % to 85 %
- air pressure: 700 hPa to 1060 hPa
- no strong radiation fields

13.2 Type plate

The product label is located on the gearbox housing.

30 Position of the product label



1	Product label

The type plate contains the following Information:

31 Product label

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1	Type designation	2	Voltage
3	max. current consumption	4	Manufacturer
5	Duty cycle (ON/OFF)	6	Serial number
7	Speed	8	Indoor use only
9	CE marking	10	UL quality mark
11	Recommendation to read user manual	12	Disposal
13	Date of manufacture MM.YY	14	Manufacturer's address
15	max. stroke	16	Pull force
17	Push force		

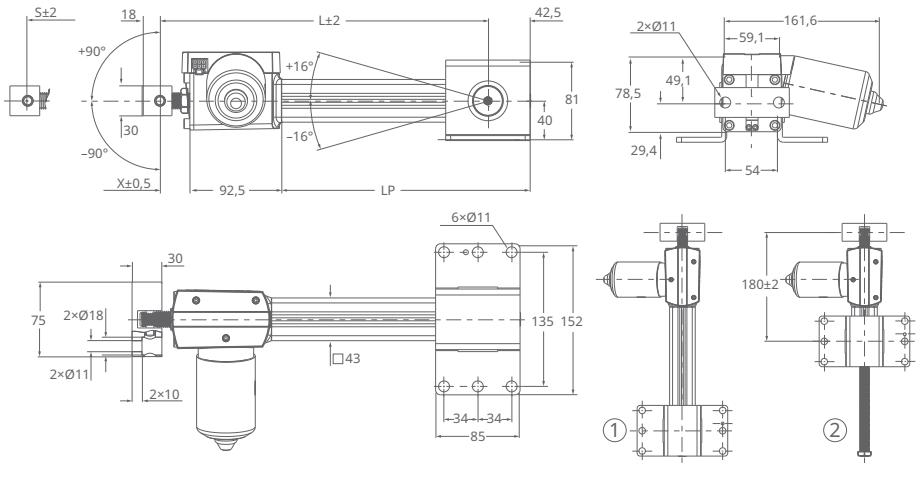
13

13.3 Dimensional drawings

Connection with 1 degree-of-freedom

Ordering designation: CAMT20-..-00..-BC-AF..-000

32 Dimensions for attachment with 1 degree-of-freedom



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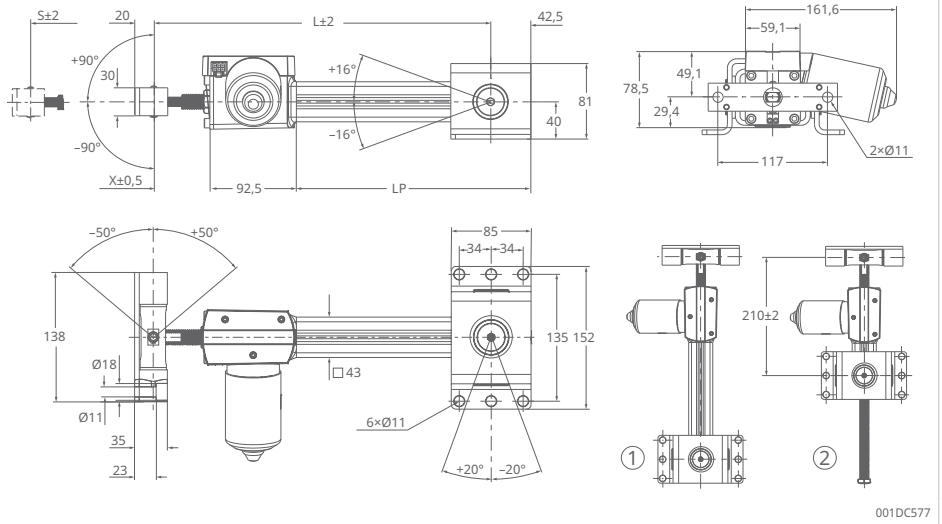
L	Retracted length	X	Offset
S	Stroke	LP	Protection tube length
1	Long protection tube	2	Short protection tube

Long protection tube: L = S + X + 50 mm
Short protection tube: L = X + 150 mm
Standard offset: X = 30 mm

Connection with 2 degrees-of-freedom

Ordering designation: CAMT20-..-00..-CC-AF..-000

33 Dimensions for attachment with 2 degrees-of-freedom



L	Retracted length	X	Offset
S	Stroke	LP	Protection tube length
1	Long protection tube	2	Short protection tube

Long protection tube: L = S + X + 50 mm
Short protection tube: L = X + 150 mm
Standard offset: X = 60 mm

13.4 Declaration of incorporation

CAMT |
https://www.schaeffler.de/std/228A

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