



Multi-turn actuators

SAEx 07.2-UW – SAEx 16.2-UW

SAREx 07.2-UW – SAREx 16.2-UW

for continuous underwater use

with actuator controls

ACExC 01.2 Non-Intrusive

Control

→ Parallel

Profibus DP

Profinet

Modbus RTU

Modbus TCP/IP

Foundation Fieldbus

HART



Read operation instructions first.

- Observe safety instructions.
- These operation instructions are part of the product.
- Store operation instructions during product life.
- Pass on instructions to any subsequent user or owner of the product.

Target group:

This document contains information for assembly, commissioning and maintenance staff.

Reference documents:

- Manual (Operation and setting) of actuator controls ACExC 01.2 Parallel

Reference documents can be downloaded from the Internet (www.auma.com) or ordered directly from AUMA (refer to <Addresses>).

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1. Safety instructions

1.1. Prerequisites for the safe handling of the product

Standards/directives	<p>The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation. They include among others standards and directives such as IEC 60079 "Explosive atmospheres".</p> <ul style="list-style-type: none"> Part 14: Electrical installations design, selection and erection. Part 17: Electrical installations inspection and maintenance.
Safety instructions/warnings	<p>All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.</p>
Qualification of staff	<p>Assembly, electrical connection, commissioning, operation, and maintenance must be carried out by suitably qualified personnel authorised by the end user or contractor of the plant only.</p> <p>Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.</p> <p>Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant is responsible for respect and control of these regulations, standards, and laws.</p>
Commissioning	<p>Prior to commissioning, imperatively check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.</p>
Operation	<p>Prerequisites for safe and smooth operation:</p> <ul style="list-style-type: none"> Correct transport, proper storage, mounting and installation, as well as careful commissioning. Only operate the device if it is in perfect condition while observing these instructions. Immediately report any faults and damage and allow for corrective measures. Observe recognised rules for occupational health and safety. Observe national regulations. During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature using an appropriate thermometer and wearing protective gloves, prior to working on the device.
Protective measures	<p>The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.</p>
Maintenance	<p>To ensure safe device operation, the maintenance instructions included in this manual must be observed.</p> <p>Any device modification requires prior written consent of the manufacturer.</p>

1.2. Range of application

The devices described below are approved for use in the potentially explosive atmospheres of zones 1, 2, 21, and 22.

If temperatures >40 °C are to be expected at the valve flange or the valve stem (e.g. due to hot media), please consult AUMA. Temperatures > 40 °C are not considered with regards to the non-electrical explosion protection.

Other applications require explicit (written) confirmation by the manufacturer.

The following applications are not permitted, e.g.:

- Industrial trucks according to EN ISO 3691
- Lifting appliances according to EN 14502
- Passenger lifts according to DIN 15306 and 15309
- Service lifts according to EN 81-1/A1
- Escalators
- Continuous duty
- Buried service
- Potentially explosive areas of zones 0 and 20
- Potentially explosive areas of group I (mining)
- Radiation exposed areas in nuclear power plants

No liability can be assumed for inappropriate or unintended use.

Observance of these operation instructions is considered as part of the device's designated use.

These operation instructions are only valid for the "clockwise closing" standard version, i.e. driven shaft turns clockwise to close the valve. For "counterclockwise closing" version, a supplement must be observed in addition to these operation instructions.

1.3. Warnings and notes

The following warnings draw special attention to safety-relevant procedures in these operation instructions, each marked by the appropriate signal word (DANGER, WARNING, CAUTION, NOTICE).



Indicates an imminently hazardous situation with a high level of risk. Failure to observe this warning results in death or serious injury.




Indicates a potentially hazardous situation with a medium level of risk. Failure to observe this warning could result in death or serious injury.



Indicates a potentially hazardous situation with a low level of risk. Failure to observe this warning could result in minor or moderate injury. May also be used with property damage.



Potentially hazardous situation. Failure to observe this warning could result in property damage. Is not used for personal injury.

Safety alert symbol  warns of a potential personal injury hazard.
 The signal word (here: DANGER) indicates the level of hazard.

1.4. References and symbols

The following references and symbols are used in these instructions:

Information The term **Information** preceding the text indicates important notes and information.



Symbol for CLOSED (valve closed)



Symbol for OPEN (valve open)

M ▶ Via the menu to parameter

Describes the menu path to the parameter. When using the push buttons of local controls, the required parameter can be quickly found on the display. Display texts are shaded in grey: **Display**.

Wiring diagram Texts extracted from other documents

Texts extracted from other documents are highlighted in a different font. For example *Wiring diagram*.

➡ Result of a process step

Describes the result of a preceding process step.

2. Identification

2.1. Name plate

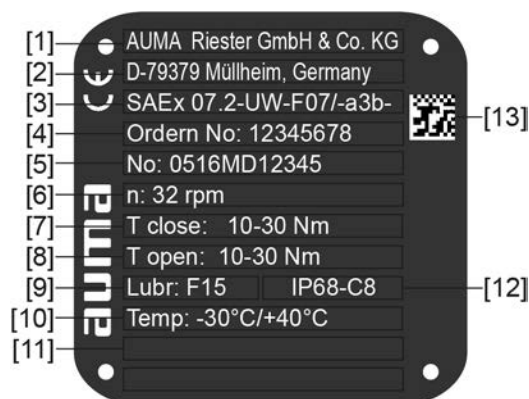
Figure 1: Arrangement of name plates



- [1] Actuator name plate
- [2] Actuator controls name plate
- [3] Motor name plate
- [4] Additional plate, e.g. KKS plate (Power Plant Classification System)
- [5] Explosion protection approval plate

Actuator name plate

Figure 2: Actuator name plate (example)

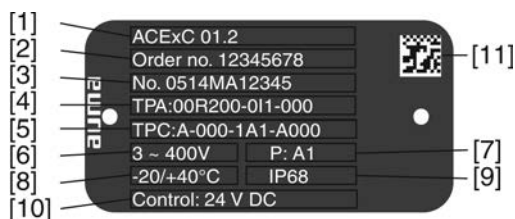


auma (= manufacturer logo); **CE** (= CE mark)

- [1] Name of manufacturer
- [2] Address of manufacturer
- [3] **Type designation**
- [4] **Order number**
- [5] **Serial number**
- [6] Speed
- [7] Torque range in direction CLOSE
- [8] Torque range in direction OPEN
- [9] Type of lubricant
- [10] Permissible ambient temperature
- [11] Can be assigned as an option upon customer request
- [12] **Enclosure protection**
- [13] **Data Matrix code**

Actuator controls name plate

Figure 3: Name plate for actuator controls (example)



auma (= manufacturer logo)

- [1] **Type designation**
- [2] **Order number**
- [3] **Serial number**
- [4] **Actuator terminal plan**
- [5] Actuator controls terminal plan
- [6] Mains voltage
- [7] **AUMA power class for switchgear**
- [8] Permissible ambient temperature
- [9] Enclosure protection
- [10] **Control**
- [11] Data Matrix code

Motor name plate

Figure 4: Motor name plate (example)

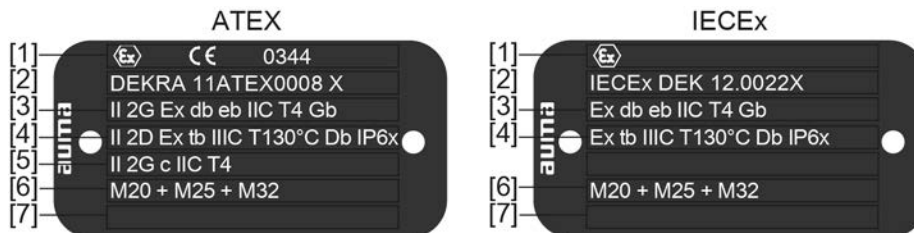


auma (= manufacturer logo); **CE** (= CE mark)

- [1] Motor type
- [2] Motor article number
- [3] Serial number
- [4] Current type, mains voltage
- [5] Rated power
- [6] Rated current
- [7] Type of duty
- [8] Enclosure protection
- [9] Motor protection (temperature protection)
- [10] Insulation class
- [11] Speed
- [12] Power factor cos phi
- [13] Mains frequency
- [14] Data Matrix code

Approval plate in explosion-proof version

Figure 5: Approval plates in explosion-proof version (examples)



- [1] Ex symbol, CE mark, number of test authority
 [2] Ex certificate (number)
Classification:
 [3] Electrical gas explosion protection
 [4] Electrical dust explosion protection
 [5] Non-electrical explosion protection
 [6] Threads for line bushings at electrical connection
 [7] Not used

Descriptions referring to name plate indications

Type designation

Figure 6: Type designation (example)



1. Type and size of actuator
2. Flange size
3. Ex marking

Type and size

These instructions apply to the following devices types and sizes:

- Type SAEx: Multi-turn actuators for open-close duty
 Sizes and generation: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
 Version: UW = for continuous underwater use
- Type SAREx = Multi-turn actuators for modulating duty
 Sizes and generation: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
 Version: UW = for continuous underwater use
- Type ACExC = AUMATIC actuator controls
 Size and generation: 01.2

Order number

The product can be identified using this number and the technical data as well as order-related data pertaining to the device can be requested.

Please always state this number for any product inquiries.

On the Internet at <http://www.auma.com> > Service & Support > myAUMA, we offer a service allowing authorised users to download order-related documents such as wiring diagrams and technical data (both in German and English), inspection certificate and the operation instructions when entering the order number.

Actuator serial number

Table 1:

Description of serial number (example of 0519MD12345)			
05	19	MD12345	
05			Positions 1+2: Assembly in week = week 05
	19		Positions 3+4: Year of manufacture = 2019
		MD12345	Internal number for unambiguous product identification

Actuator enclosure protection IP68-C8: The maximum permissible head of water is 8 m.

Actuator terminal plan Position 9 after **TPA**: Position transmitter version

I, Q = MWG (magnetic limit and torque transmitter)

AUMA power class for switchgear The switchgear used in the actuator controls (reversing contactors/thyristors) are classified according to AUMA power classes (e.g. A1, B1,). The power class defines the max. permissible rated power (of the motor) the switchgear has been designed for. The rated power (nominal power) of the actuator motor is indicated in kW on the motor name plate. For the assignment of the AUMA power classes to the nominal power of the motor types, refer to the separate electrical data sheets.

For switchgear without assignment to any power classes, the actuator controls name plate does not indicate the power class but the max. rated power in kW.

Control

Table 2:

Control examples (indications on actuator controls name plate)	
Input signal	Description
24/48/60 V DC	Control voltage 24/48/60 V DC for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)
100 – 125 V DC	Control voltage 100 – 125 V DC for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)
100 – 120 V AC	Control voltage 100 – 120 V AC for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)
0/4 – 20 mA	Input current for setpoint control via analogue input

Data Matrix code When registered as authorised user, you may use our **AUMA Assistant App** to scan the Data Matrix code and directly access the order-related product documents without having to enter order number or serial number.

Figure 7: Link to AUMA Assistant App:



For further Service & Support, software/apps/... refer to www.auma.com.

2.2. Short description

AUMA multi-turn actuators are driven by an electric motor. For setting and emergency operation, a handwheel can be installed as an option. Switching off in end positions may be either by limit or torque seating. Actuator controls are required to operate or process the actuator signals. SAEEx 07.2-UW – SAEEx 16.2-UW/SAREx 07.2-UW – SAREx 16.2-UW

Actuator controls ACExC 01.2 actuator controls are used to operate AUMA actuators and are supplied ready for use. The actuator controls are mounted separately on a wall bracket.

The functions of ACExC 01.2 actuator controls include standard valve control in OPEN-CLOSE duty, positioning, process control, logging of operating data right through to diagnostic functions.

Local controls/ AUMA software Operation, setting, and display can be performed directly at actuator controls or alternatively from Remote via binary input signals.

The following options are available at the actuator controls in local operation:

- The actuator can be operated via the push buttons of the local controls or settings can be made in the actuator controls menu. The display shows information on the actuator as well as menu settings (contents of these instructions).

- Using the AUMA CDT software for Windows-based notebooks or the AUMA Assistant App for Android-based devices, data can be uploaded and read whereas settings can be modified and stored. The connection between computer and actuator controls is wireless via Bluetooth interface (not included in these instructions). AUMA CDT software can be downloaded free of charge from our website www.auma.com.

Non-Intrusive

Non-Intrusive version (control unit: electronic):

Limit and torque setting is performed via the controls, without removal of actuator or actuator controls covers. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also capable to supply analogue torque feedback signals/torque indication and analogue position feedback signals/position indication at the actuator controls output.

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.



Suspended load!

Death or serious injury.

- Do NOT stand below suspended load.
- Attach ropes or hooks for the purpose of lifting by hoist only to housing and NOT to handwheel.
- Actuators mounted on valves: Attach ropes or hooks for the purpose of lifting by hoist to valve and NOT to actuator.
- Actuators mounted to gearboxes: Attach ropes or hooks for the purpose of lifting by hoist only to the gearbox using eyebolts and NOT to the actuator.
- Respect total weight of combination (actuator, gearbox, valve)
- Secure load against falling down, sliding or tilting.
- Perform lift trial at low height to eliminate any potential danger e.g. by tilting.

Figure 8: Example: Lifting the actuator



Table 3:

Weights of multi-turn actuators SAEx 07.2-UW – SAEx 16.2-UW / SAREx 07.2-UW – SAREx 16.2-UW with 3-phase AC motors

Type designation Actuator	Motor type ¹⁾	Weight ²⁾
		approx. [kg]
SAEx 07.2-UW/ SAREx 07.2-UW	VDX...	25
	ADX...	26
SAEx 07.6-UW/ SAREx 07.6-UW	VDX...	25
	ADX...	27
SAEx 10.2-UW/ SAREx 10.2-UW	VDX...	31
	ADX...	33
SAEx 14.2-UW/ SAREx 14.2-UW	VDX...	54
	ADX...	58
SAEx 14.6-UW/ SAREx 14.6-UW	VDX...	56
	ADX...	62
SAEx 16.2-UW/ SAREx 16.2-UW	VDX...	72
	ADX...	93

1) Refer to motor name plate

- 2) Indicated weight includes AUMA NORM multi-turn actuator with 3-phase AC motor, electrical connection or plug/socket connector incl. cable glands (approx. 2.3 kg) as well as output drive type B1. For other output drive types, heed additional weights. Heed weight of cables if plug/socket connector is linked.

3.2. Storage

NOTICE

Danger of corrosion due to inappropriate storage!

- Store in a well-ventilated, dry room.
- Protect against floor dampness by storage on a shelf or on a wooden pallet.
- Cover to protect against dust and dirt.
- Apply suitable corrosion protection agent to uncoated surfaces.

NOTICE

Risk of damage due to excessively low temperatures!

- Actuator controls may only be stored permanently down to –30 °C.
- On request, actuators controls may be transported in specific cases and for short duration at temperatures down to –60 °C.

Long-term storage

For long-term storage (more than 6 months), observe the following points:

1. Prior to storage:
Protect uncoated surfaces, in particular the output drive parts and mounting surface, with long-term corrosion protection agent.
2. At an interval of approx. 6 months:
Check for corrosion. If first signs of corrosion show, apply new corrosion protection.

3.3. Packaging

Our products are protected by special packaging for transport when leaving the factory. The packaging consists of environmentally friendly materials which can easily be separated and recycled. We use the following packaging materials: wood, cardboard, paper, and PE foil. For the disposal of the packaging material, we recommend recycling and collection centres.

4. Assembly

4.1. Mounting position

The product described in this document can be operated without restriction in any mounting position.

4.2. Multi-turn actuator: mount to valve/gearbox

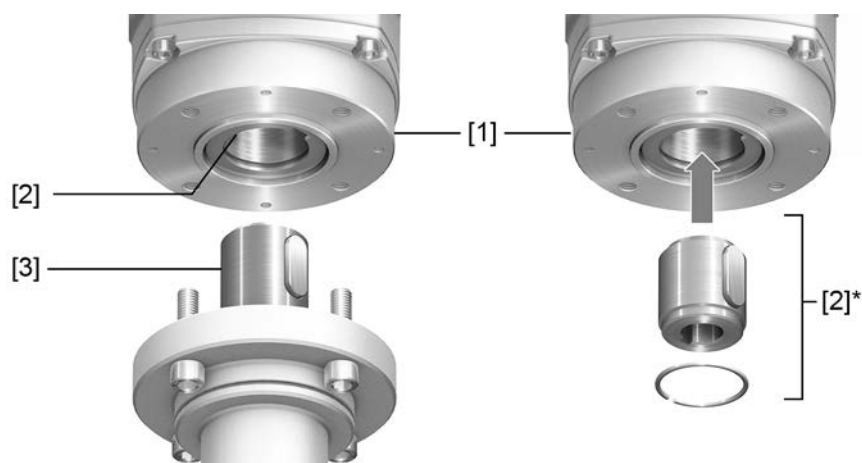
NOTICE

Corrosion due to damage to paint finish and condensation!

- Touch up damage to paint finish after work on the device.
- After mounting, connect the device immediately to electrical mains to ensure that heater minimises condensation.

4.2.1. Design of output drive types B

Figure 9: Output drive type B



- [1] Multi-turn actuator flange
- [2] For output drive types B/B1/B2 solid shaft with bore and keyway
- [2]* For output drive types B3/B4/E, an output drive sleeve is fitted into the bore of the solid shaft
- [3] Gearbox/valve shaft with parallel key

Information Spigot at valve flanges should be loose fit.

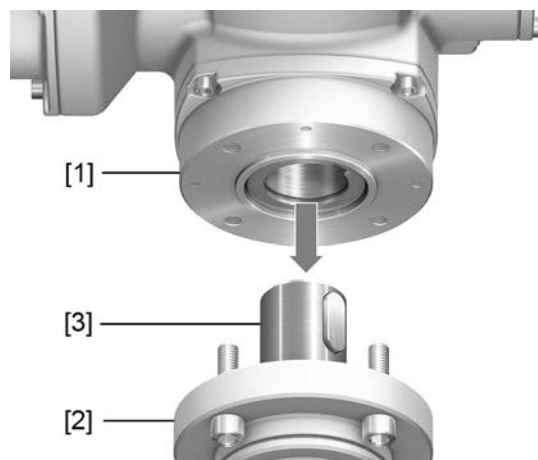
For output drive types B/B1/B2, the connection to the valve or the gearbox is made by directly placing the multi-turn actuator solid shaft (output drive shaft) onto the input shaft of the valve or gearbox.

For output drive types B3/B4/E, the connection is made via output drive sleeve which is inserted into the bore of the solid shaft of the multi-turn actuator and fixed by a retaining ring.

When exchanging the output drive sleeve, later retrofitting to a different output drive type is possible

4.2.1.1. Multi-turn actuator with output drive type B: mount

Figure 10: Mounting output drive types B



- [1] Multi-turn actuator
- [2] Valve/gearbox
- [3] Valve/gearbox shaft

- Procedure**
1. Check if mounting flanges fit together.
 2. Check if output drive of multi-turn actuator [1] matches the output drive of valve/gearbox or valve/gearbox valve shaft [2/3].
 3. Apply a small quantity of grease to the valve or gearbox shaft [3].
 4. Place multi-turn actuator [1] and ensure that the spigot fits uniformly in the recess and that the mounting faces are in complete contact.
 5. Fasten multi-turn actuator with screws according to table.
Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.
 6. Fasten screws crosswise to a torque according to table.

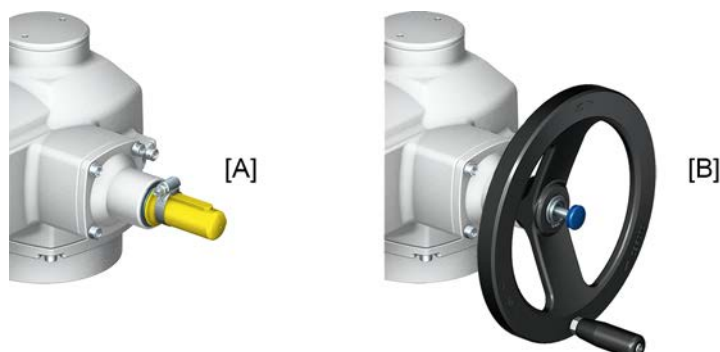
Table 4:

Tightening torques for screws	
Threads	Tightening torque [Nm]
	Strength class A2-80/A4-80
M6	10
M8	24
M10	48
M12	82
M16	200
M20	392

4.3. Accessories for assembly

4.3.1. Handwheel temporarily mounted – for setting tasks

Figure 11: Version prepared for temporary handwheel operation (with protective cap)

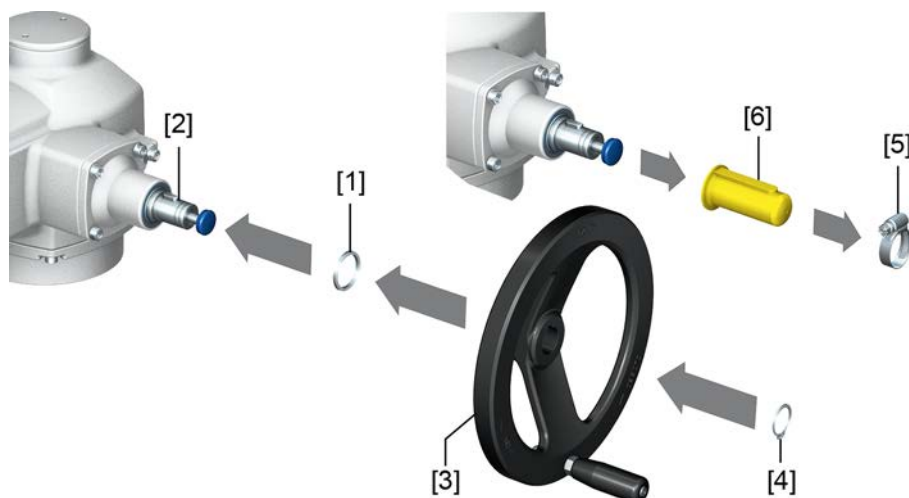


- [A] Protective cap for operation (and on delivery)
[B] Handwheel fitted (handwheel must be ordered separately)

In this version, the handwheel is provided for temporary use such as setting tasks during commissioning or during maintenance. The handwheel must be removed again for operation. A protective cap made of plastics is provided to protect the input shaft against deposits.

4.3.1.1. Handwheel fitting/disasassembly

Figure 12: Fit handwheel



- [1] Spacer
[2] Input shaft
[3] Handwheel
[4] Retaining ring
[5] Hose clamp
[6] Protective cap

- Fit handwheel**
1. Loosen hose clamp [5] and remove protective cap [6].
 2. If required, fit spacer [1] on input shaft [2].
 3. Slip handwheel [3] onto input shaft.

- Dismount handwheel**
4. Secure handwheel [3] with retaining ring [4].
 5. Remove retaining ring [4] and pull off handwheel [3].
 6. If provided, remove spacer [1].
 7. Slide protective cap [6] onto input shaft and secure with hose clamp [5].

4.3.2. Handwheel permanently mounted – for emergency operation and setting tasks

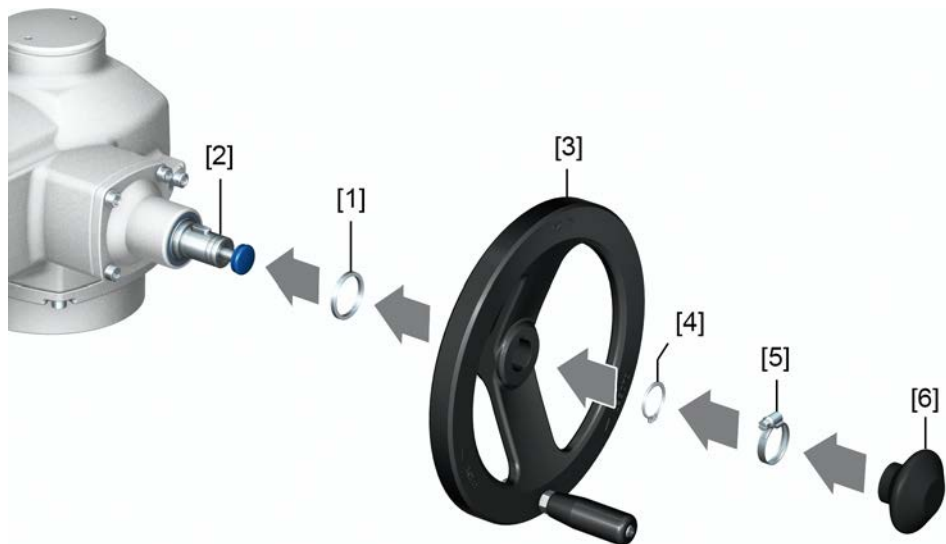
Figure 13: Version with permanently mounted handwheel (with bellows)



For actuator in version with permanently mounted handwheel, the handwheel is provided for operation during setting tasks and for emergency operation of the actuator. The handwheel is also approved for continuous immersion. Handwheel activation is protected by specific bellows against deposits.

4.3.2.1. Handwheel fitting

Figure 14: Handwheel fitting



- [1] Spacer
- [2] Input shaft
- [3] Handwheel
- [4] Retaining ring
- [5] Schlauchschelle
- [6] Bellows

Handwheel fitting

Information: For transport reason, handwheels with a diameter of 400 mm and larger are supplied separately within the scope of delivery. Handwheel \leq 315 mm are already mounted.

1. If required, fit spacer [1] on input shaft [2].
2. Slip handwheel [3] onto input shaft.
3. Secure handwheel [3] using the retaining ring [4] supplied.
4. Put bellows [6] over push button and secure with hose clamp [5].

5. Electrical connection

5.1. Basic information



Electric shock due to presence of hazardous voltage!

Failure to observe this warning can result in death, serious injury, or property damage.

- The electrical connection must be carried out exclusively by suitably qualified personnel.
- Prior to connection, observe basic information contained in this chapter.
- After connection but prior to applying the voltage, observe the <Commissioning> and <Test run> chapters.

Wiring diagram/terminal plan

The pertaining wiring diagram/terminal plan (in German or English) is attached to the device in a weather-proof bag, together with these operation instructions. It can also be requested from AUMA (state order number, refer to name plate) or downloaded directly from the Internet (<http://www.auma.com>).

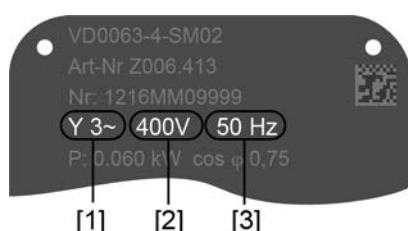
Permissible networks (supply networks)

The actuators are suitable for use in TN and TT networks with directly grounded star point for nominal voltages up to maximum 690 V AC. Use in IT network is permissible for nominal voltages up to maximum 600 V AC. For IT network, a suitable, approved insulation monitor measuring the pulse code is required.

Current type, mains voltage, mains frequency

Type of current, mains voltage and mains frequency must match the data on the actuator controls and motor name plates. Also refer to chapter <Identification>/<Name plate>.

Figure 15: Motor name plate (example)



- [1] Type of current
- [2] Mains voltage
- [3] Mains frequency (for 3-phase and 1-phase AC motors)

Protection and sizing on site

For short-circuit protection and for disconnecting the actuator from the mains, fuses and disconnect switches have to be provided by the customer.

The current values for sizing the protection can be derived from the current consumption of the motor (refer to motor name plate) plus the current consumption of actuator controls.

We recommend adapting the switchgear sizing to the max. current (I_{max}) and selecting and setting the overcurrent protection device in compliance with the indications in the electrical data sheet.

Table 5:

Current consumption of actuator controls		
Mains voltage	Max. current consumption	
Permissible variation of the mains voltage	±10 %	±30 %
100 to 120 V AC	750 mA	1,200 mA
208 to 240 V AC	400 mA	750 mA
380 to 500 V AC	250 mA	400 mA
515 to 690 V AC	200 mA	400 mA

Table 6:

Maximum permissible protection		
Switchgear (switchgear with power class) ¹⁾	Rated power	max. protection
Reversing contactor A1	up to 1.5 kW	16 A (gL/gG)
Reversing contactor A2	up to 7.5 kW	32 A (gL/gG)
Reversing contactor A3	up to 15 kW	63 A (gL/gG)
Thyristor B1	up to 1.5 kW	16 A (g/R) $I^2t < 1,500A^2s$
Thyristor B2	up to 3 kW	32 A (g/R) $I^2t < 1,500A^2s$
Thyristor B3	up to 5.5 kW	63 A (g/R) $I^2t < 5,000A^2s$

1) The AUMA power class (A1, B1, ...) is indicated on the actuator controls name plate

Consider the motor starting current (I_A) (refer to electrical data sheet) when selecting the circuit breaker. We recommend tripping characteristics D or K for circuit breakers in accordance with IEC 60947-2. For controls equipped with thyristors, we recommend safety fuses instead of circuit breakers. However, the use of circuit breakers is basically permitted.

For actuator controls equipped with a heating system and external electronics power supply, the fuses for the heating system have to be provided by the customer (refer to wiring diagram F4 ext.)

Table 7:

Fuse for heating system		
Designation in wiring diagram = F4 ext.		
External power supply	115 V AC	230 V AC
Fuse	2 A T	1 A T

Potential of customer connections

All input signals (control inputs) must be supplied with the same potential.
All output signals (status signals) must be supplied with the same potential.

Safety standards

Safety measures and safety equipment must comply with the respectively valid national on site specifications. All externally connected devices shall comply with the relevant safety standards for the place of installation.

Connecting cables, cable glands, reducers, blanking plugs

- We recommend using connecting cables and connecting terminals according to rated current (I_N) (refer to motor name plate or electrical data sheet).
- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- Use connecting cables, cable glands, reducers, blanking plugs with a minimum temperature range of +80 °C.
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.
- For the connection of position transmitters, screened cables must be used.

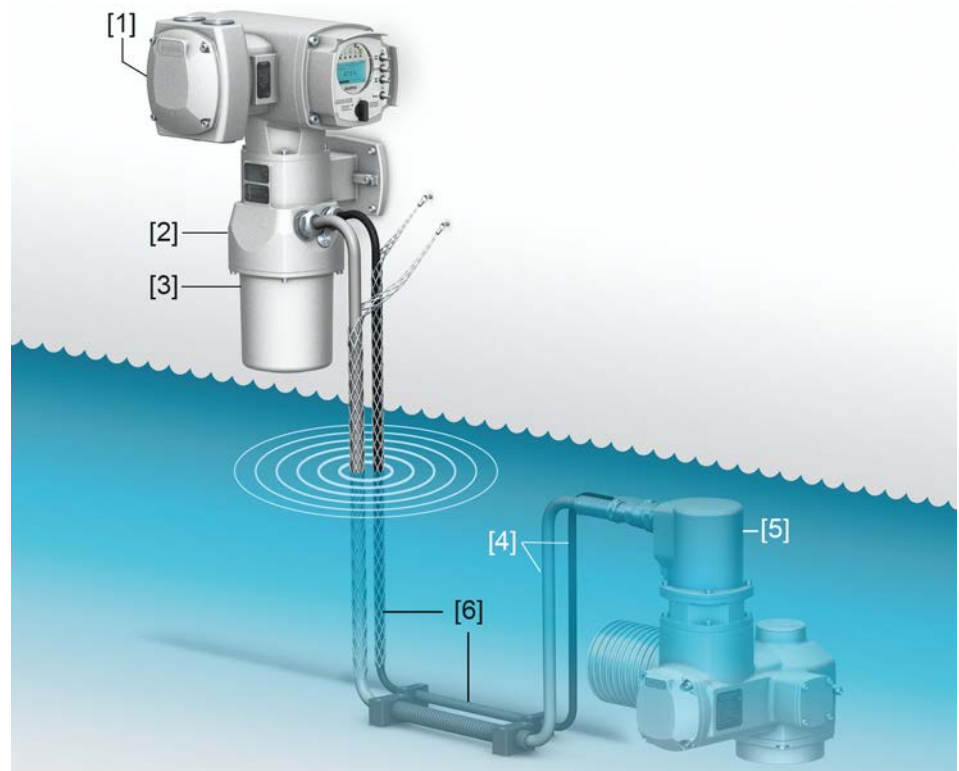
Cable installation in accordance with EMC

Signal and fieldbus cables are susceptible to interference. Motor cables are interference sources.

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and fieldbus cables increases if the cables are laid close to the earth potential.
- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference.
- Avoid parallel paths with little cable distance of cables being either susceptible to interference or interference sources.

5.2. Cable installation between actuator controls (wall bracket) and actuator

Figure 16: Example of cable installation for actuator controls – wall bracket



- [1] Electrical connection for actuator controls (figure shows KT version)
- [2] Wall bracket
- [3] Electrical connection of wall bracket
- [4] Connecting cables
- [5] Plug/socket connector for actuator
- [6] Fixing the connecting cables (example)

Wall bracket

- Actuator controls are always mounted separately from the actuator on a wall bracket, outside the flooded area.
- The permissible cable length between actuator controls on wall bracket and the actuator amounts to 100 m maximum.

Connecting cables

- Connecting cables must be protected against damage and securely fixed. Continuous strain relief must be ensured. Cables may not move within the cable glands. The plant operator or the contractor are responsible for providing the required cable protection.



Risk of damage to connecting cables and cable glands due to improper installation!

Leakage and ingress of water!

- If there is need to pull cables for installation: Place lifting accessories like slings and ropes around the cable or use cable stockings.
- DO NOT pull at plug/socket connector or cable glands for cable installation or lifting.
- Respect minimum bending radii. When installing the connecting cables, make sure not to fall short of the minimum bending radius.

- When installing the connecting cables, make sure not to fall short of the minimum bending radius.

Figure 17: Example at actuator plug/socket connector

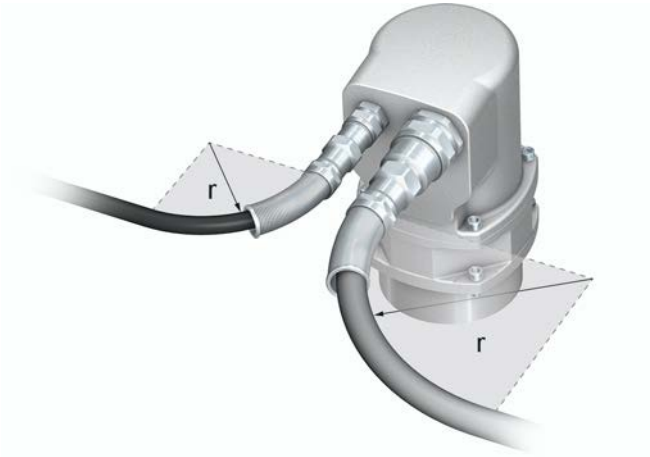


Table 8:

Connecting cable	Outer diameter d [mm]	Minimum bending ra- dius r [mm]	Cable gland Max. tensile force F ¹⁾
Motor cable	approx. 12.1	90	60.5 N (approx. 6 kg)
	approx. 14.7	110	73.5 N (approx. 7.5 kg)
Hybrid cable	approx. 17.2	105	86 N (approx. 8.5 kg)

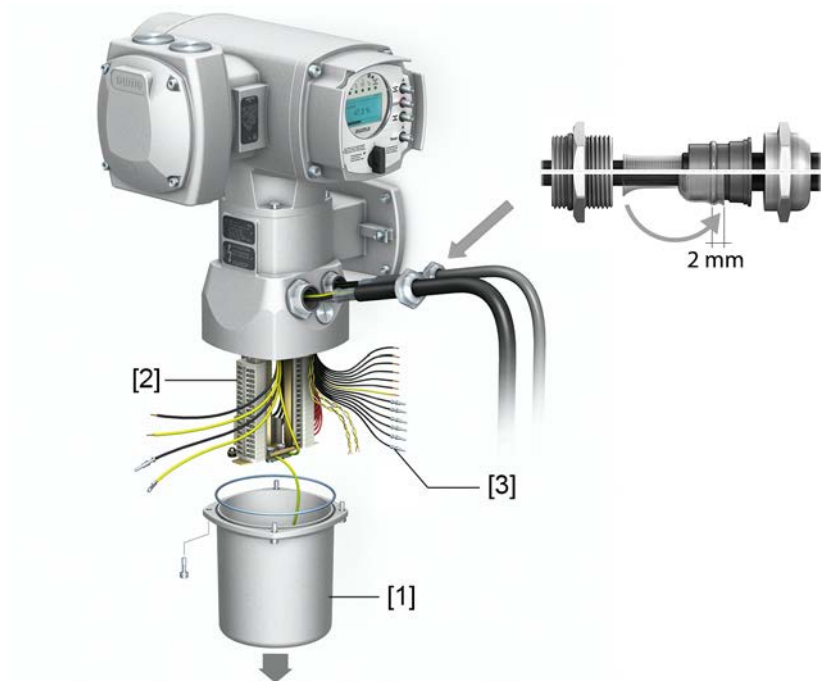
1) Calculation of the tensile force: Outer diameter (d) x 5 [N]; valid for circular cross section

- Exclusively use AUMA “LSW” cable sets as connecting cables!

Table 9:

Cable set	LSW 81	LSW 82
Plug/socket con- nector for actuator	Ready-made, checked for leak tightness	Ready-made Tested for leak tightness
Plug/socket con- nector for wall bracket	Ready-made	Open connecting cable to wall bracket, wiring to be performed by the customer

- For LSW 82 cable set, the cover must be opened at wall bracket level and the cables must be connected to the terminals according to the terminal plan. Connect flexible cables using wire end sleeves.
Figure 18: Connection using LSW 82



[1] Cover for electrical connection on wall bracket

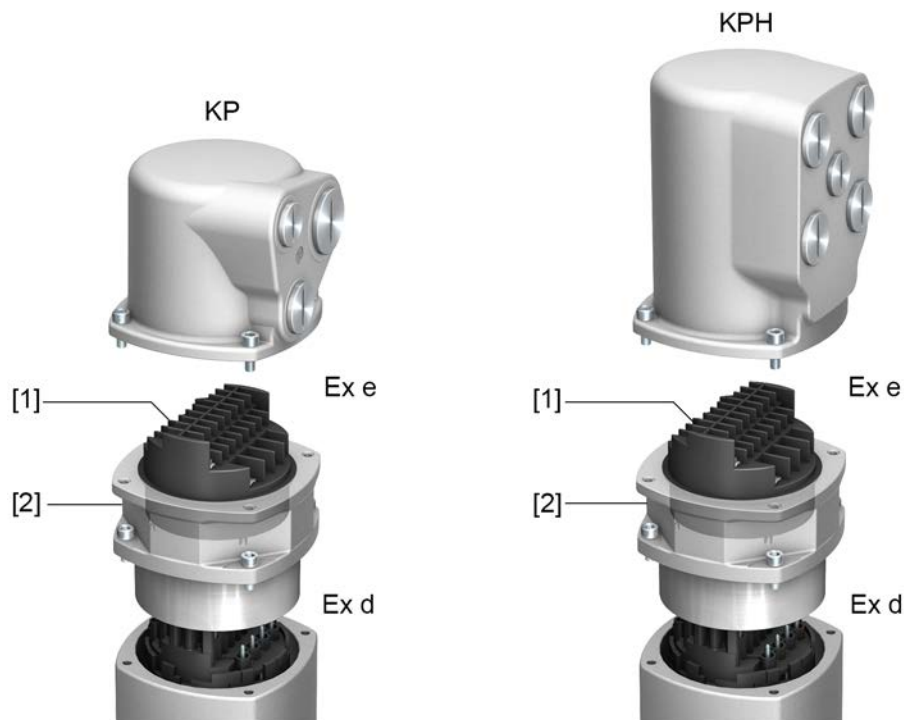
[2] Terminals

[3] Cables (for flexible cables with wire end sleeves)

- When connecting, make sure that the shield of both connecting cables is sufficiently overlapping (approx. 2 mm over the O-ring) the contact socket of the cable gland.
- Connect all protective earth wires to the protective earthing (symbol ⚡).

5.3. KP/KPH electrical connection

Figure 19: KP and KPH electrical connection



- [1] Screw-type terminals
 [2] Plug-in frame (flameproof)

Short description KP/KPH plug-in electrical connection with screw-type terminals for power and control contacts.

KP version (standard) with three cable entries. KPH version (enlarged) with additional cable entries. Cable entries via the cover.

The terminal compartment (with screw-type terminals) is designed in protection type Ex e (increased safety). Plug-in connection is made via the frame. Removing the cover is sufficient for connecting the cables. The flameproof frame remains connected to the device. The flameproof interior of the connected device remains sealed.

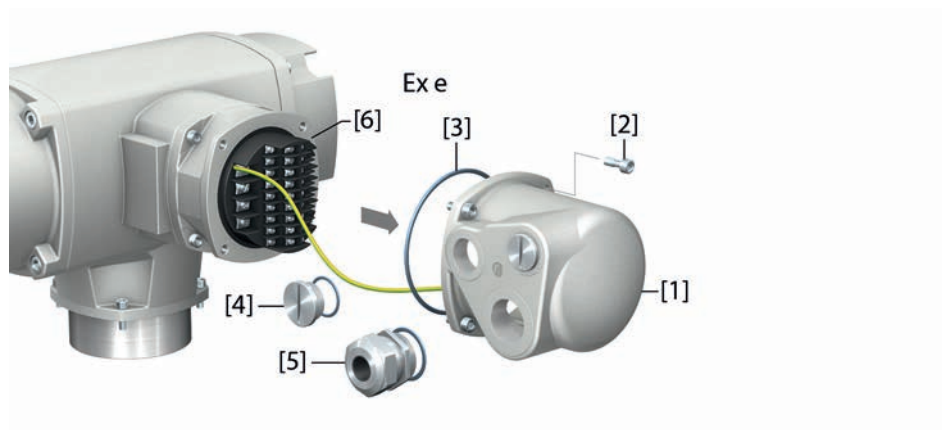
Technical data

Table 10:

KP/KPH electrical connection		
	Power contacts	Control contacts
No. of contacts max.	3 + protective earth conductor (PE)	38 pins/sockets + protective earth conductor (PE)
Designations	U1, V1, W1, ⊕ (PE)	1 to 24, 31 to 40, 47 to 50, PE
Connection voltage max.	525 V	250 V
Rated current max.	25 A	10 A
Type of customer connection	Screw connection	Screw connection
Connection diameter max.	6 mm ²	1.5 mm ²

5.3.1. Terminal compartment: open

Figure 20: Open terminal compartment



- [1] Cover (figure shows KP version)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plugs
- [5] Cable gland (example)
- [6] Flameproof frame



Electric shock due to presence of hazardous voltage!

Failure to observe this warning results in death or serious injury.

→ Disconnect device from the mains before opening.

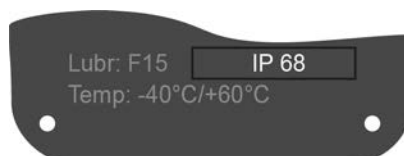
1. Loosen screws [2] and remove cover [1].

Information: The terminal compartment is designed in protection type Ex e (increased safety). The flameproof interior of the connected device remains closed when removing the cover [1].

2. Insert cable glands suitable for connecting cables.

Information: When selecting cable glands observe type of protection (with Ex e approval) and enclosure protection IP (refer to name plate). The enclosure protection IP... stated on the name plate is only ensured if suitable cable glands are used.

Figure 21: Name plate, example with enclosure protection IP68



Information: For shielded cables: Use EMC cable glands.

3. Seal unused cable entries with approved plugs suitable for the required protection type.

5.3.2. Cable connection

Table 11:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U1, V1, W1)	With small clamp washers: 1.5 – 4.0 mm ² (flexible or solid) With large clamp washers: 2.5 – 6 mm ² (flexible or solid)	0.9 – 1.1 Nm
Protective earth connection ⚡ (PE)		
Control contacts (1 to 24, 31 to 40, 47 to 50, PE)	0.75 – 1.5 mm ² (flexible or solid)	0.5 – 0.7 Nm

1. Remove cable sheathing in a length of 120 – 140 mm.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
Information: For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).
4. Strip wires.
 → Controls max. 8 mm, motor 12 mm
5. For flexible cables: Use wire end sleeves according to DIN 46228.
6. Connect cables according to order-related wiring diagram.
Information: Two wires for each connection permitted.
 → When using motor cables with wire cross section of 1.5 mm²: Use small clamp washers for connection to terminals U1, V1, W1 and PE (the small clamp washers are in the cover of electrical connection upon delivery).



In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

- Connect all protective earth conductors.
- Connect PE connection to external protective earth conductor of connecting cables.
- Start running the device only after having connected the protective earth conductor.

7. Firmly tighten protective earth to PE connection.

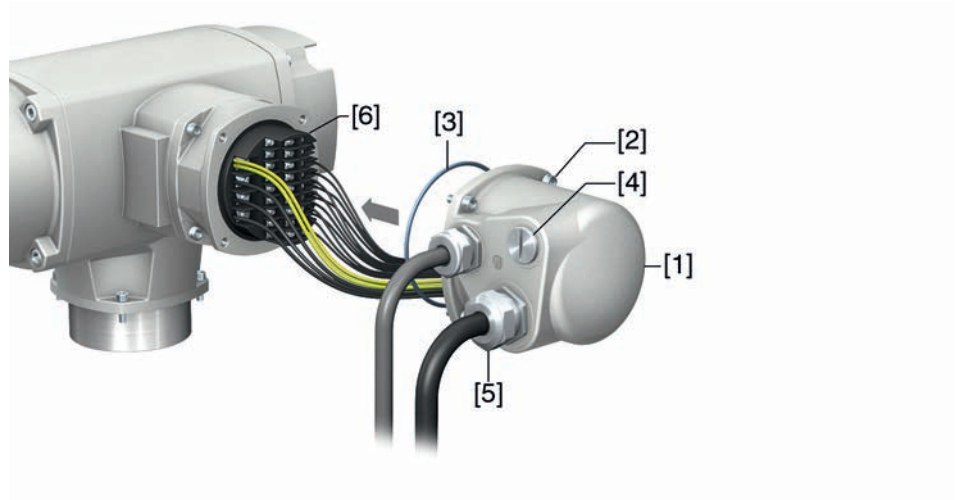
Figure 22: PE connection



- [1] PE connection, control cable
- [2] PE connection, motor cable

5.3.3. Terminal compartment: close

Figure 23: Close terminal compartment

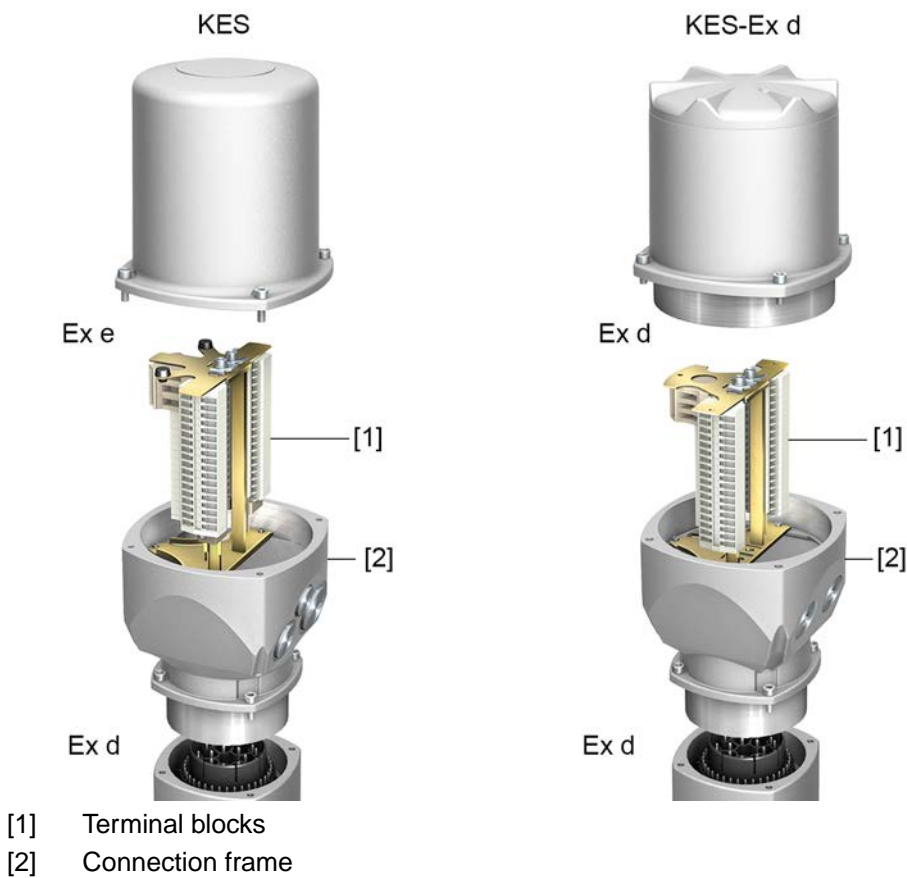


- [1] Cover (figure shows KP version)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plugs
- [5] Cable gland
- [6] Flameproof frame

1. Clean sealing faces of cover [1] and frame [6].
2. Check whether O-ring [3] is in good condition, replace if damaged.
3. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.
4. Fit cover [1] and fasten screws [2] evenly crosswise.
5. Fasten cable glands and blanking plugs applying the specified torque to ensure the required enclosure protection.

5.4. KES electrical connection

Figure 24: KES electrical connection



- [1] Terminal blocks
- [2] Connection frame

Short description KES plug-in electrical connection with terminal blocks for power and control contacts. Cable entry via the connection frame. Cover in KES-e version for terminal compartment in type of protection Ex e (increased safety). Cover in KES-Ex d version for terminal compartment in type of protection Ex d (flameproof enclosure).

Plug-in connection is made via the connection frame. For cable connection, simply remove the cover. The connection frame remains within the device. The flameproof interior of the connected devices remains sealed.

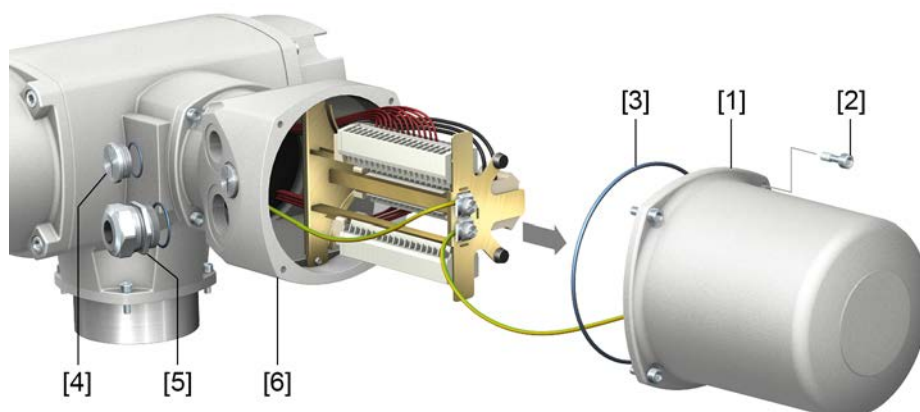
Technical data

Table 12:

KES electrical connection		
	Power contacts	Control contacts
No. of contacts max.	3 + protective earth connection at frame	50
Designation	U, V, W, ⊕ (PE)	1 to 50
Connection voltage max.	750 V	250 V
Rated current max.	25 A	10 A
Type of customer connection	Screw connection PE = Ring lug/U-bracket	Cage clamp, screw-type connection as an option
Connection diameter max.	6 mm ² /10 mm ²	2.5 mm ² flexible, 4 mm ² solid

5.4.1. Terminal compartment: open

Figure 25: Open terminal compartment



- [1] Cover (illustration shows type of protection Ex e)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plugs
- [5] Cable gland (example)
- [6] Connection frame



Electric shock due to presence of hazardous voltage!

Failure to observe this warning results in death or serious injury.

→ Disconnect device from the mains before opening.

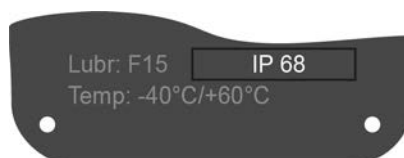
1. Loosen screws [2] and remove cover [1].

Information: Terminal compartment is designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure) (refer to Ex marking on name plate). The flameproof interior of the connected device remains closed when removing the cover [1].

2. Insert cable glands suitable for connecting cables.

Information: When selecting cable glands observe type of protection (with Ex e or Ex d approval) and enclosure protection IP (refer to name plate). The type of protection stated on the name plate IP is only ensured if suitable cable glands are used.

Figure 26: Name plate, example with enclosure protection IP68



Information: For shielded cables: Use EMC cable glands.

3. Seal unused cable entries with approved plugs suitable for the required protection type.

5.4.2. Cable connection

Table 13:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U, V, W)	max. 10 mm ² (flexible or solid)	1.5 – 1.8 Nm
PE connection	max. 10 mm ² (flexible or solid)	3.0 – 4.0 Nm
Control contacts (1 to 50)	max. 2.5 mm ² flexible, or max. 4 mm ² solid	0.6 – 0.8 Nm

1. Remove cable sheathing and insert the wires into the cable glands.
2. Fasten cable glands with the specified torque to ensure required enclosure protection.
Information: For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).
3. Strip wires.
4. For flexible cables: Use end sleeves according to DIN 46228.
5. Connect cables according to order-related wiring diagram.

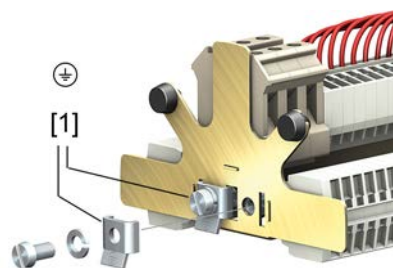


In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

- Connect all protective earth conductors.
- Connect PE connection to external protective earth conductor of connecting cables.
- Start running the device only after having connected the protective earth conductor.

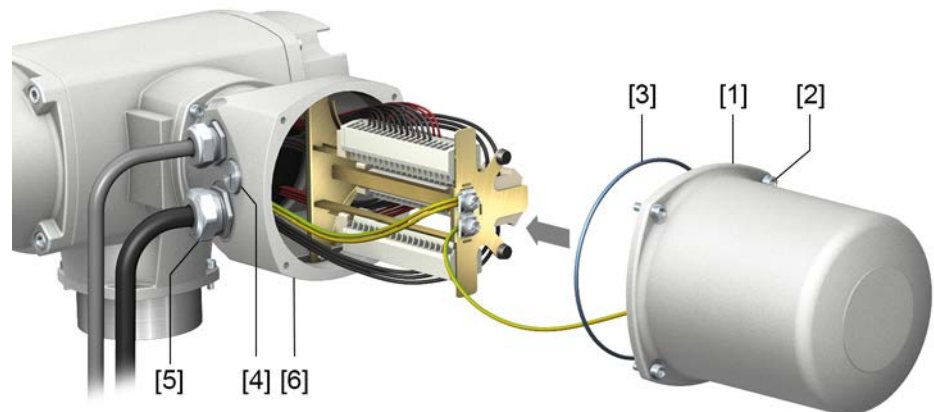
6. Firmly tighten protective earth to PE connection (symbol: ⊕).
 Figure 27: Protective earth (PE)



[1] U-bracket for PE connection

5.4.3. Terminal compartment: close

Figure 28: Close terminal compartment



- [1] Cover (illustration shows type of protection Ex e)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plugs
- [5] Cable gland (example)
- [6] Connection frame

1. Clean sealing faces of cover [1] and connection frame [6].
2. For Ex plug/socket connector designed as KES flameproof: Preserve joint surfaces with an acid-free corrosion protection agent.
3. Check whether O-ring [3] is in good condition, replace if damaged.
4. Apply a thin film of non-acidic grease to the O-ring and insert it correctly.



WARNING

Flameproof enclosure, danger of explosion!

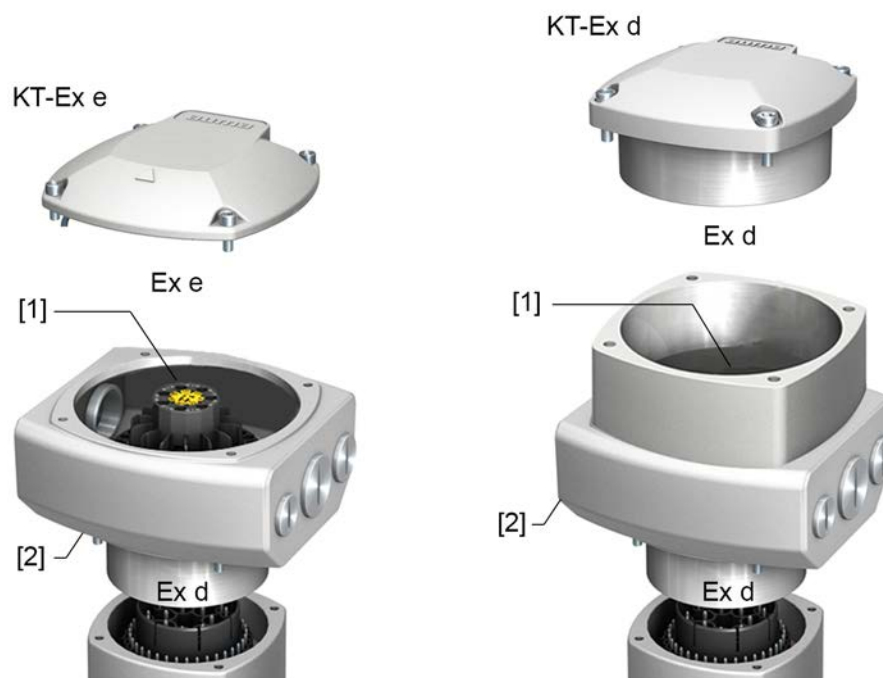
Risk of death or serious injury.

- Handle cover and housing parts with care.
- Joint surfaces must not be damaged or soiled in any way.
- Do not jam cover during fitting.

5. Fit cover [1] and fasten screws [2] evenly crosswise.

5.5. KT/KM electrical connection

Figure 29: KT/KM electrical connection



[1] Terminal carrier with screw-type/spring clamp terminals

[2] Connection frame

Figure shows KT version

Short description KT plug-in electrical connection with screw-type terminals for power connection and spring clamp terminals for control contacts.

KM version with additional support terminals (terminal blocks) via terminal carrier.

Both versions (KT and KM) are available with terminal compartment in protection type Ex e (increased safety) as well as in protection type Ex d (flameproof enclosure) (refer to Ex marking on name plate).

Plug-in connection is made via the connection frame. For cable connection, simply remove the cover. The connection frame with the cable entries remains within the device. The flameproof interior of the connected devices remains sealed.

Technical data

Table 14:

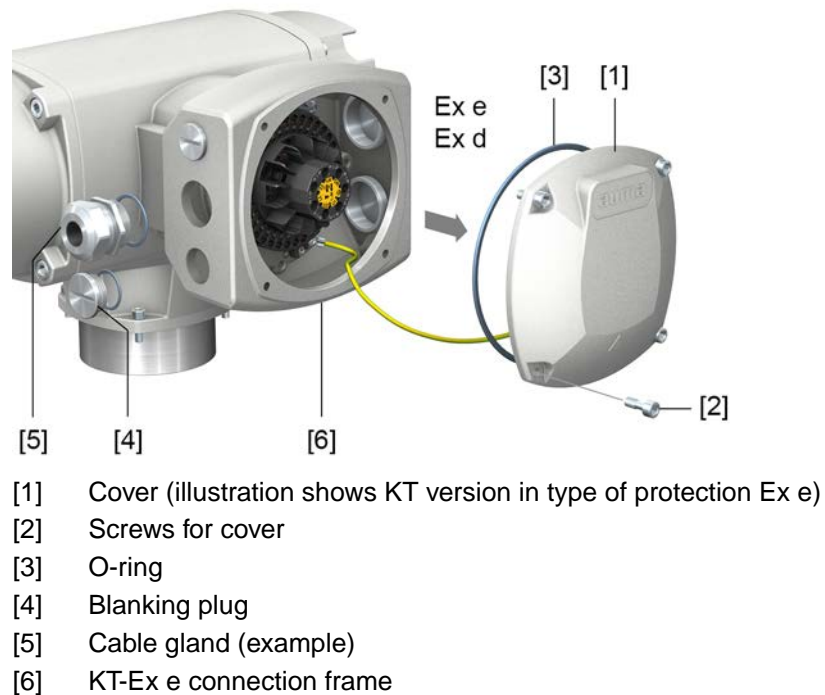
KT/KM electrical connection		
	Power contacts	Control contacts
No. of contacts max.	6 + PE conductors ¹⁾	50
Designations	U1, V1, W1, U2, V2, W2, ⊕	1 to 36, 37 to 50
Support terminals max.	3	12
Connection voltage max.	1,000 V	250 V
Rated current max.	25 A	5 A ²⁾
Type of customer connection	Screw connection PE = Ring lug/U-bracket	Spring clamp terminals
Connection diameter max.	10 mm ²	2.5 mm ²

1) Four protective earth connections within frame

2) The sum of the currents of all control contacts must not exceed 50 A.

5.5.1. Terminal compartment: open

Figure 30: Open terminal compartment



Terminal compartment is designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure) (refer to Ex marking on name plate). The flameproof interior of the connected device remains closed when removing the cover [1].

Procedure



Electric shock due to presence of hazardous voltage!

Failure to observe this warning results in death or serious injury.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove cover [1].
2. Insert cable glands suitable for connecting cables.

Information: When selecting cable glands observe type of protection (with Ex e or Ex d approval) and enclosure protection IP (refer to name plate). The enclosure protection stated on the name plate IP is only ensured if suitable cable glands are used. Thread types and thread sizes are specified on the approval plate in explosion-proof version. Refer to chapter <Identification/name plate>.

Figure 31: Name plate, example with enclosure protection IP68




Information: For shielded cables: Use EMC cable glands.

3. Seal unused cable entries with approved plugs suitable for the required protection type.

5.5.2. Cable connection

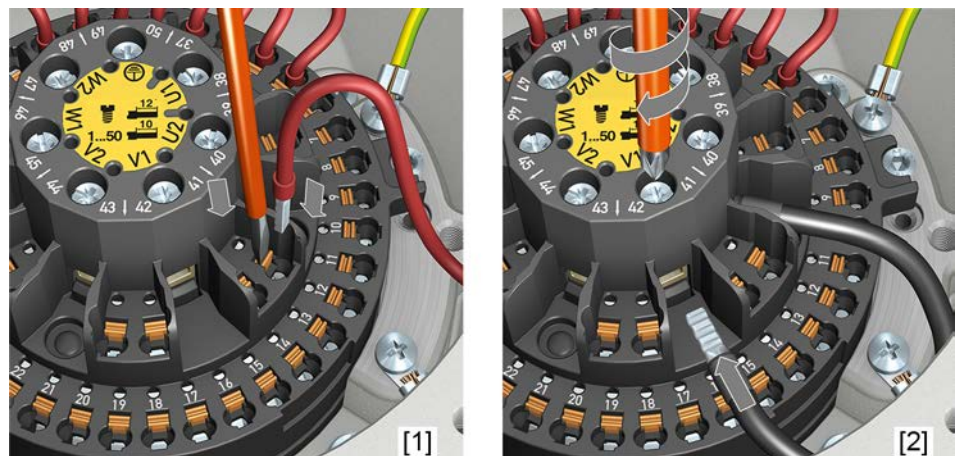
Table 15:

Terminal cross sections and tightening torques		
Designation	Terminal cross sections	Connection type
Power contacts (U1, V1, W1, U2, V2, W2) PE connection 	Flexible or solid: 0.25 – 10.0 mm ² (for one wire per terminal) Flexible: 2 x 0.25 – 4 mm ² (for two wires per terminal)	Screw-type terminals Tightening torque = 1.2 – 1.5 Nm
Control contacts (1 to 36, 37 to 50)	Flexible or solid: 0.25 – 2.5 mm ² (for one wire per terminal) 2 x 0.25 – 0.75 mm ² (for two wires per terminal)	Spring clamp terminals
Protective earth connection within frame (customer connection)	2 x M6 for cables with M6 ring lug or with U-bracket for up to two wires with 1.5 mm ² – 10 mm ²	Ring lug/U-bracket Tightening torque = 3 – 4 Nm

Procedure

1. Remove cable sheathing in a length of 250 – 300 mm.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
Information: For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).
4. Strip wires:
 - 4.1 Remove wire sheathing of control cables (1...50) in a length of approx. 10 mm
 - 4.2 Remove wire sheathing of motor cables (U, V, W) in a length of approx. 12 mm
5. For flexible cables: Use wire end sleeves according to DIN 46228. For spring clamp terminals, connection is also possible without wire end sleeves.
Information: For two flexible wires per terminal, a joint wire end sleeve must be used.
6. Connect cables according to order-related wiring diagram.

Figure 32: Connect cables to terminal carrier



- [1] Fitting control cables into spring clamp terminals
- [2] Tightening power terminals

Information For service purposes, each spring clamp terminal for control cables is equipped with a test contact located above the numbering.



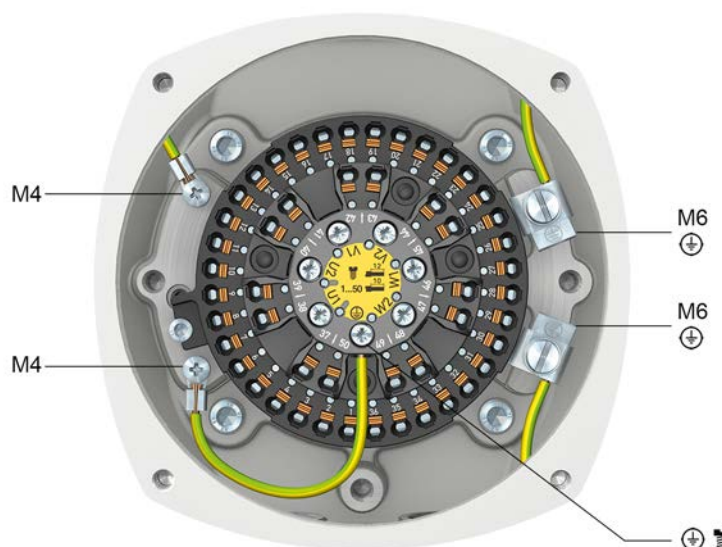
In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

- Connect all protective earth conductors.
- Connect PE connection to external protective earth conductor of connecting cables.
- Start running the device only after having connected the protective earth conductor.

7. Firmly tighten protective earth to PE connection (M6 ⚡).

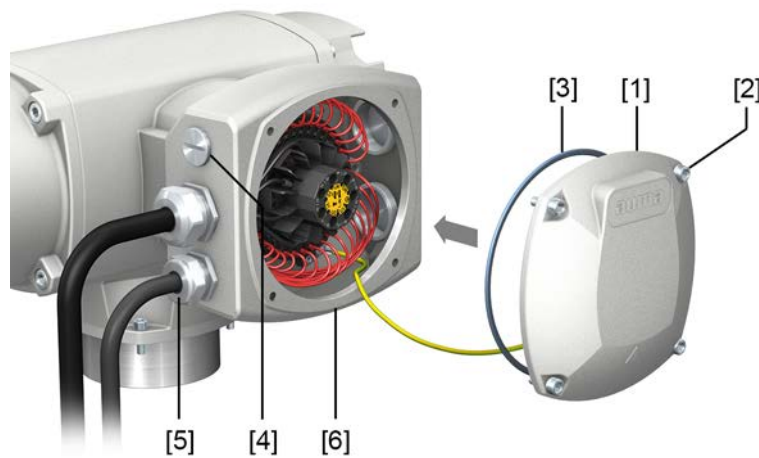
Figure 33: Protective earth connections within connection frame



- M6 Customer protective earth connection for M6 ring lug or with U-bracket for up to two wires.
- M4 Internal protective earth connections via M4 ring lug (to cover and terminal carrier) connected in the factory
- ⚡ Protective earth connection to terminal carrier (power terminals); connected in the factory.

5.5.3. Terminal compartment: close

Figure 34: Close terminal compartment



- [1] Cover (illustration shows KT version in type of protection Ex e)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plug
- [5] Cable gland
- [6] KT-Ex e connection frame

- Procedure**
1. Clean sealing faces of cover [1] and connection frame [6].
 2. For design in flameproof enclosure (Ex d): Preserve joint surfaces with an acid-free corrosion protection agent.
 3. Check whether O-ring [3] is in good condition, replace if damaged.
 4. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.
 5. Fit cover [1] and fasten screws [2] evenly crosswise.
For design in flameproof enclosure (Ex d):



Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

- Handle cover and housing parts with care.
- Joint surfaces must not be damaged or soiled in any way.
- Do not jam cover during fitting.

6. Fasten cable glands and blanking plugs applying the specified torque to ensure the required enclosure protection.

6. Operation

6.1. Manual operation

Actuators equipped with manual gearing can be operated via handwheel in manual operation. When switching on the motor, the manual drive will automatically be disengaged. The handwheel does not rotate during motor operation.

NOTICE

Damage at the motor coupling due to faulty operation!

→ Engage manual operation only during motor standstill.

Engage manual operation

1. Press push button.

Figure 35: Version prepared for temporary handwheel operation

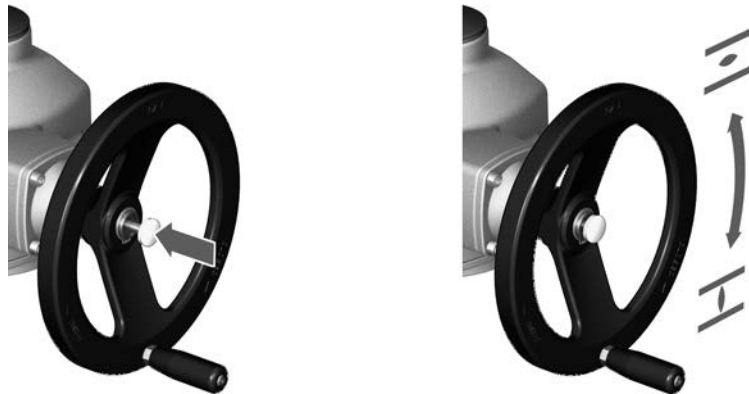
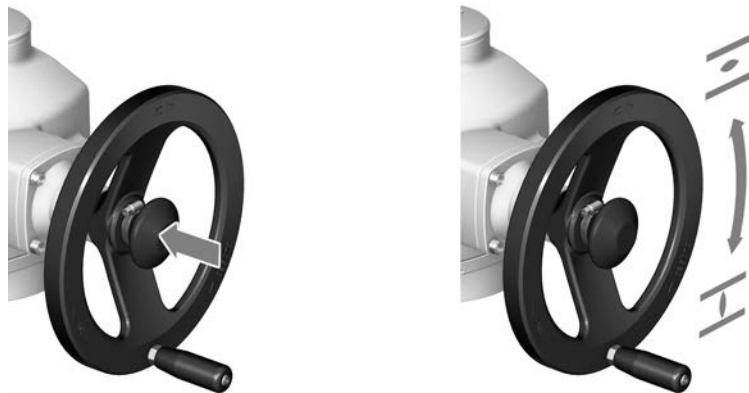


Figure 36: Version with permanently mounted handwheel (with bellows)



2. Turn handwheel in desired direction.
 - 2.1 To close the valve, turn handwheel clockwise:
 - ➔ Drive shaft (valve) turns clockwise in direction CLOSE
 - ➔ (for clockwise closing version)
 - 2.2 To open the valve, turn handwheel counterclockwise:
 - ➔ Drive shaft (valve) turns counterclockwise in direction CLOSE.
 - ➔ (for clockwise closing version)

Information

In the version prepared for temporary handwheel operation, a handwheel may be temporarily mounted for setting tasks during operation or maintenance. For operation, the handwheel must be removed and the input shaft be protected by a protective cap.

6.2. Motor operation

NOTICE

Valve damage due to incorrect basic setting!

→ Prior to electric actuator operation, perform the basic settings for “type of seating” and “torque switching”.

6.2.1. Operating the actuator from local controls

Local actuator operation is performed using the local controls push buttons of actuator controls.

Figure 37: Local controls



- [1] Push button for operation command in direction OPEN
- [2] Push button STOP
- [3] Push button for operation command in direction CLOSE
- [4] Push button RESET
- [5] Selector switch

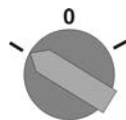
CAUTION

Hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight!

Risk of burns

→ Verify surface temperature and wear protective gloves.

→ Set selector switch [5] to position **Local control** (LOCAL).



➡ The actuator can now be operated using the push buttons [1 – 3]:

- Run actuator in direction OPEN: Press push button [1]
- Stop actuator: Press push button STOP [2].
- Run actuator in direction CLOSE: Press push button [3]

Information

The OPEN and CLOSE operation commands can be given either in push-to-run or in self-retaining operation mode. In self-retaining mode, the actuator runs to the defined end position after pressing the button, unless another command has been received beforehand. For further information, please refer to the Manual (Operation and setting).

6.2.2. Actuator operation from remote

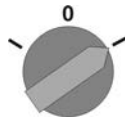
CAUTION

Risk of immediate actuator operation when switching on!

Risk of personal injuries or damage to the valve

- If the actuator starts unexpectedly: Immediately turn selector switch to **0** (OFF).
- Check input signals and functions.

- Set selector switch to position **Remote control** (REMOTE).



- ➔ Now, it is possible to operate the actuator via remote control, via operation commands (OPEN, STOP, CLOSE) or analogue setpoints (e.g. 0 – 20 mA).

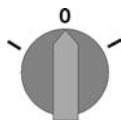
Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SET-POINT). For further information, please refer to the Manual (Operation and setting).

Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SET-POINT). Selection is made via MODE input, e.g. based on a 24 V DC signal (refer to wiring diagram).

6.3. Menu navigation via push buttons (for settings and indications)

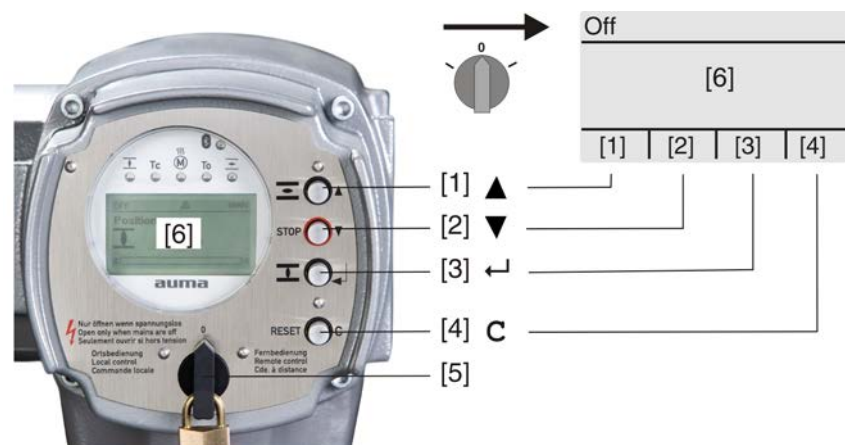
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

Set the selector switch [5] to position **0** (OFF) when navigating through the menu.



The bottom row of the display [6] serves as navigation support and explains which push buttons [1 – 4] are used for menu navigation.

Figure 38:



- [1–4] Push buttons or navigation support
- [5] Selector switch
- [6] Display

Table 16: Important push button functions for menu navigation

Push buttons	Navigation support on display	Functions
[1] ▲	Up ▲	Change screen/selection Change values Enter figures from 0 to 9
[2] ▼	Down ▼	Change screen/selection Change values Enter figures from 0 to 9
[3] ↵	Ok	Confirm selection
	Save	Save
	Edit	Enter <Edit> menu
	Details	Display more details
[4] C	Setup	Enter Main menu
	Esc	Cancel process Return to previous display

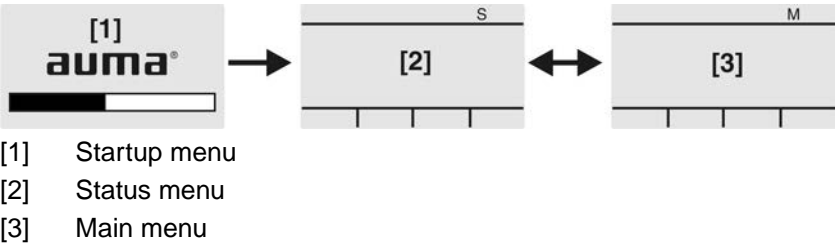
- Backlight

 - The display is illuminated in white during normal operation. It is illuminated in red in case of a fault.
 - The screen illumination is brighter when operating a push button. If no push button is operated for 60 seconds, the display will become dim again.

6.3.1. Menu layout and navigation

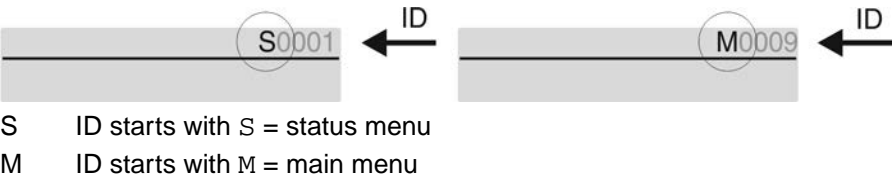
Groups The indications on the display are divided into 3 groups:

Figure 39: Groups



ID Status menu and main menu are marked with an ID.

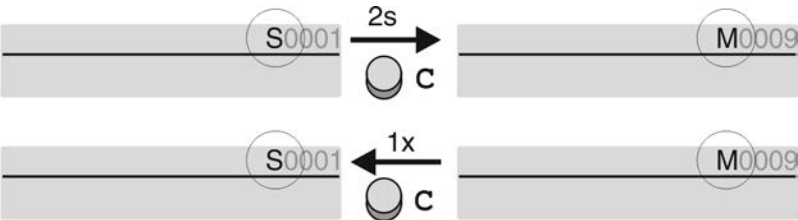
Figure 40: Marking with ID



Group selection It is possible to select between status menu S and main menu M:

For this, set selector switch to 0 (OFF), hold down push button C for approx. 2 seconds until a screen containing the ID M... appears.

Figure 41: Select menu groups



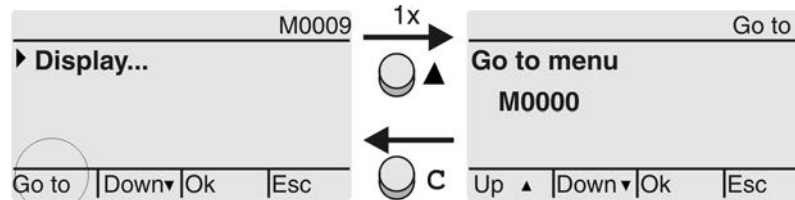
You return to the status menu if:

- the push buttons on the local controls have not been operated within 10 minutes
- or by briefly pressing **C**

Direct display via ID

When entering the ID within the main menu, screens can be displayed directly (without clicking through).

Figure 42: Direct display (example)



Display indicates in the bottom row: **Go to**

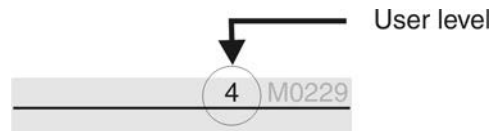
1. Press push button **▲ Go to**.
Display indicates: **Go to menu M0000**
2. Use push buttons **▲▼ Up ▲ Down ▼** to select figures 0 to 9.
3. Press push button **↵ Ok** to confirm first digit.
4. Repeat steps 2 and 3 for all further digits.
5. To cancel the process: Press **C Esc**.

6.4. User level, password

User level The user level defines which menu items or parameters can be displayed or modified by the active user.

There are 6 different user levels. The user level is indicated in the top row:

Figure 43: User level display (example)



Password A password must be entered to allow parameter modification. The display indicates: **Password 0*****

A specific password is assigned to each user level and permits different actions.

Table 17:

User levels and authorisations	
Designation (user level)	Authorisation/password
Observer (1)	Verify settings No password required
Operator (2)	Change settings Default factory password: 0000
Maintenance (3)	Reserved for future extensions
Specialist (4)	Change device configuration e.g. type of seating, assignment of output contacts Default factory password: 0000
Service (5)	Service staff Change configuration settings
AUMA (6)	AUMA administrator

6.4.1. Password entry

1. Select desired menu and hold down push button **↵** for approx. 3 seconds.
➡ Display indicates the set user level, e.g. **Observer (1)**

2. Select higher user level via ▲ Up ▲ and confirm with ↵ Ok.
- ➡ Display indicates: Password 0***
3. Use push buttons ▲▼ Up ▲ Down ▼ to select figures 0 to 9.
4. Confirm first digit of password via push button ↵ Ok.
5. Repeat steps 1 and 2 for all further digits.
- ➡ Having confirmed the last digit with ↵ Ok, access to all parameters within one user level is possible if the password entry is correct.

6.4.2. Password change

Only the passwords of same or lower access level may be changed.

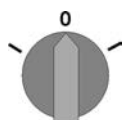
Example: If the user is signed in as Specialist (4), he/she can change passwords as for password levels (1) through (4).

M ▶ Device configuration M0053
 Service functions M0222
 Change passwords M0229

Menu item Service functions M0222 is only visible, if user level Specialist (4) or higher is selected.

Select main menu

1. Set selector switch to position 0 (OFF).

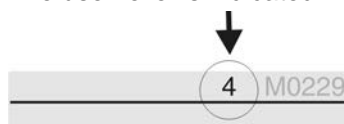


2. Press push button C Setup and hold it down for approx. 3 seconds.

➡ Display goes to main menu and indicates: ▶ Display

Change passwords

3. Select parameter Change passwords either:
 - click via the menu M ▶ to parameter, or
 - via direct display: press ▲ and enter ID M0229
- Display indicates: ▶ Change passwords
- The user level is indicated in the top row (1 – 6), e.g.:



- For user level 1 (view only), passwords cannot be changed. To change passwords, you must change to a higher user level. For this, enter a password via a parameter.
4. For a user level between 2 and 6: Press push button ↵ Ok.
 - ➡ The display indicates the highest user level, e.g.: For user 4
 5. Select user level via push buttons ▲▼ Up ▲ Down ▼ and confirm with ↵ Ok.
 - ➡ Display indicates: ▶ Change passwords Password 0***
 6. Enter current password (→ enter password).
 - ➡ Display indicates: ▶ Change passwords Password (new) 0***
 7. Enter new password (→ enter password).
 - ➡ Display indicates: ▶ Change passwords For user 4 (example)
 8. Select next user level via push buttons ▲▼ Up ▲ Down ▼ or cancel the process via Esc.

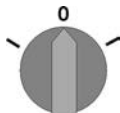
6.5. Language in the display

The display language can be selected.

6.5.1. Language change

M ▶ Display M0009
Language M0049

Select main menu 1. Set selector switch to position **0** (OFF).



2. Press push button **C Setup** and hold it down for approx. 3 seconds.

➔ Display goes to main menu and indicates: ▶ **Display**

Change language

3. Press **↵ Ok**.

➔ Display indicates: ▶ **Language**

4. Press **↵ Ok**.

➔ Display indicates the selected language, e.g.: ▶ **Deutsch**

5. The bottom row of the display indicates:

→ **Save** → continue with step 10

→ **Edit** → continue with step 6

6. Press **↵ Edit**.

➔ Display indicates: ▶ **Observer (1)**

7. Select user level via **▲▼ Up ▲ Down ▼** resulting in the following significations:

→ black triangle: ▶ = current setting

→ white triangle: ▷ = selection (not saved yet)

8. Press **↵ Ok**.

➔ Display indicates: **Password 0*****

9. Enter password (→ enter password).

➔ Display indicates: ▶ **Language** and **Save** (bottom row)

Language selection

10. Select new language via **▲▼ Up ▲ Down ▼** resulting in the following significations:

→ black triangle: ▶ = current setting

→ white triangle: ▷ = selection (not saved yet)

11. Confirm selection via **↵ Save**.

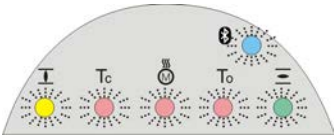
➔ The display changes to the new language. The new language selection is saved.

7. Indications

7.1. Indications during commissioning

LED test When switching on the power supply, all LEDs on the local controls illuminate for approx. 1 second. This optical feedback indicates that the voltage supply is connected to the controls and all LEDs are operable.

Figure 44: LED test

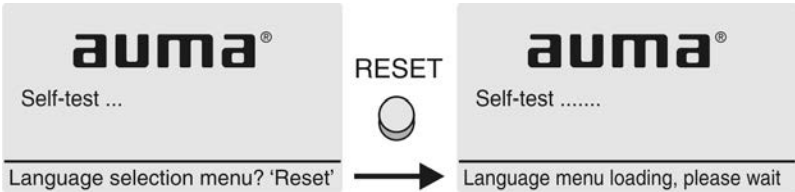


Language selection During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch to position **0** (OFF).

Activate language selection:

- 1. Display indicates in the bottom row: **Language selection menu? 'Reset'**
- 2. Press push button **RESET** and hold it down until the following text is displayed in the bottom line: **Language menu loading, please wait**.

Figure 45: Self-test



The language selection menu follows the startup menu.

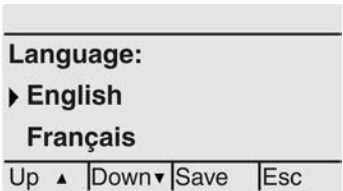
Startup menu The current firmware version is displayed during the startup procedure:

Figure 46: Startup menu with firmware version: 04.00.00–xxxx



If the language selection feature has been activated during the self-test, the menu for selecting the display language will now be indicated. For further information on language setting, please refer to chapter <Language in the display>.

Figure 47: Language selection

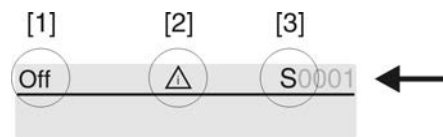


If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

7.2. Indications in the display

Status bar The status bar (first row in the display) indicates the operation mode [1], the presence of an error [2] and the ID number [3] of the current display indication.

Figure 48: Information in the status bar (top)

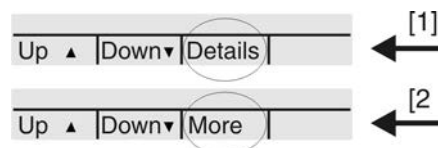


- [1] Operation mode
- [2] Error symbol (only for faults and warnings)
- [3] ID number: S = Status page

Navigation support

If further details or information are available with reference to the display, the following indications **Details** or **More** appear in the navigation support (bottom display row). Then, further information can be displayed via the push button.

Figure 49: Navigation support (bottom)



- [1] shows list with detailed indications
- [2] shows further available information

The navigation support (bottom row) is faded out after approx. 3 seconds. Press any push button (selector switch in position **0** (OFF)) to fade in the navigation support.

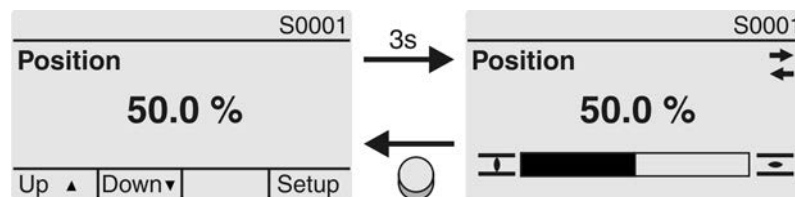
7.2.1. Feedback indications from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

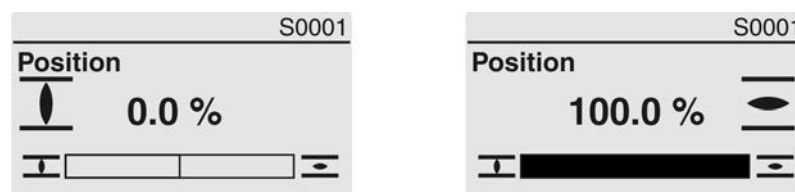
- **S0001** on the display indicates the valve position in % of the travel.
- The bar graph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 50: Valve position and direction of operation



Reaching the preset end positions is additionally indicated via (CLOSED) and (OPEN) symbols.

Figure 51: End position CLOSED/OPEN reached



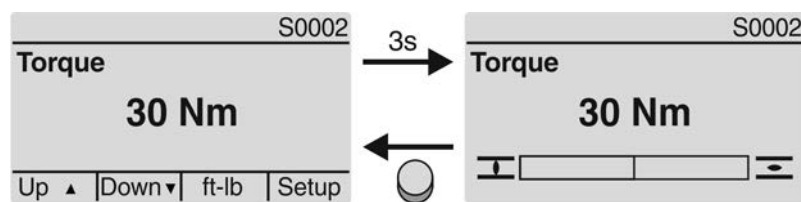
0% Actuator is in end position CLOSED

100% Actuator is in end position OPEN

Torque (S0002)

- **S0002** on the display indicates the torque applied at the actuator output.
- The bar graph display appears after approx. 3 seconds.

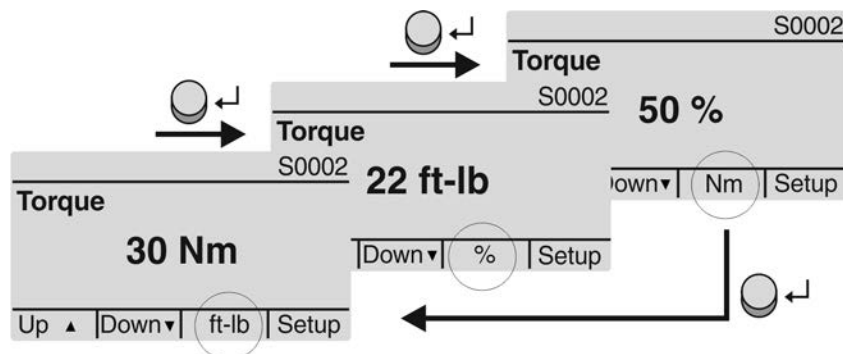
Figure 52: Torque



Select unit

The push button allows to select the unit displayed (percent %, Newton metre Nm or "foot-pound" ft-lb)

Figure 53: Units of torque



Display in percent

100 % indication equals the max. torque indicated on the name plate of the actuator.
 Example: SA 07.6 with 20 – 60 Nm.

- 100 % corresponds to 60 Nm of nominal torque.
- 50 % corresponds to 30 Nm of nominal torque.

Operation commands (S0003)

The display S0003 indicates:

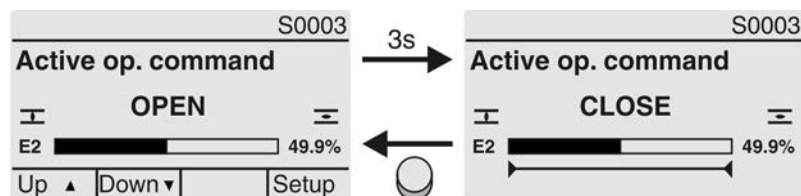
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bar graph indication and as value between 0 and 100 %
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points and operation behaviour of pivot points

The navigation support (bottom row) is faded out after approx. 3 seconds and the axis/axes for pivot point display are shown.

OPEN - CLOSE control

Active operation commands (OPEN, CLOSE, ...) are shown above the bar graph display. The figure below shows the operation command in direction CLOSE.

Figure 54: Display for OPEN - CLOSE control



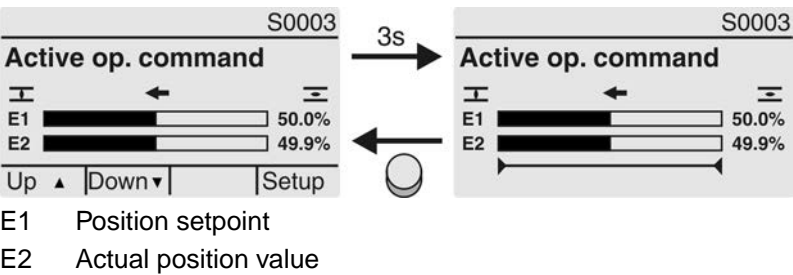
E2 Actual position value

Setpoint control

If the positioner is enabled and activated, the bar graph indication for E1 (position setpoint) is displayed.

The direction of the operation command is displayed by an arrow above the bar graph indication. The figure below shows the operation command in direction CLOSE.

Figure 55: Indication for setpoint control (positioner)



Pivot point axis The pivot points and their operation behaviour (operation profile) are shown on the pivot point axis by means of symbols.

The symbols are only displayed if at least one of the following functions is activated:

Operation profile M0294

Timer CLOSE M0156

Timer OPEN M0206

Figure 56: Examples: on the left pivot points (intermediate positions); on the right stepping mode



Table 18: Symbols along the pivot point axis

Symbol	Pivot point (intermediate position) with operation profile	Stepping mode
	Pivot point without reaction	End of stepping mode
◀	Stop during operation in direction CLOSE	Start of stepping mode in direction CLOSE
▶	Stop during operation in direction OPEN	Start of stepping mode in direction OPEN
◆	Stop during operation in directions OPEN and CLOSE	–
◁	Pause for operation in direction CLOSE	–
▷	Pause for operation in direction OPEN	–
◇	Pause for operation in directions OPEN and CLOSE	–

7.2.2. **Status indications according to AUMA classification**

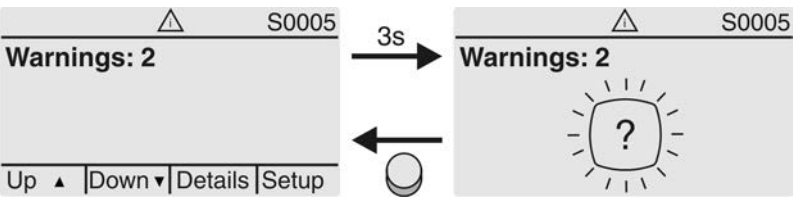
These indications are available if the parameter **Diagnostic classific.** M0539 is set to **AUMA**.

Warnings (S0005)

If a warning has occurred, the display shows **S0005**:

- the number of warnings occurred
- a blinking question mark after approx. 3 seconds

Figure 57: Warnings



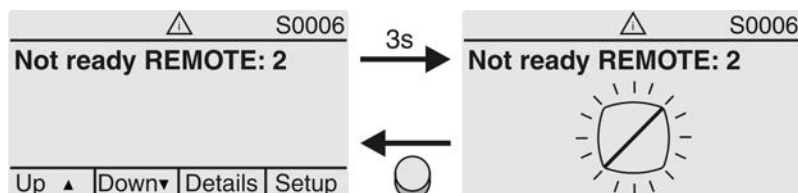
Not ready REMOTE (S0006)

The **S0006** display shows indications of the Not ready REMOTE group.

If such an indication has occurred, the display shows **S0006**:

- the number of indications occurred
- a blinking crossbar after approx. 3 seconds

Figure 58: Not ready REMOTE indications



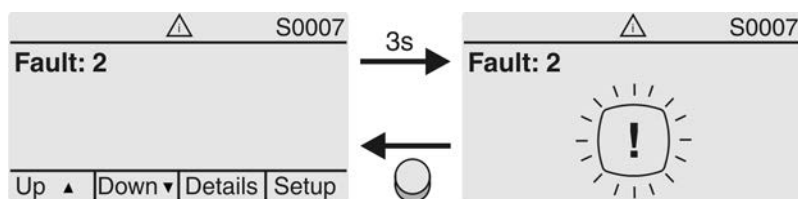
For further information, please also refer to <Corrective action>.

Fault (S0007)

If a fault has occurred, the display shows **S0007**:

- the number of faults occurred
- a blinking exclamation mark after approx. 3 seconds

Figure 59: Fault



For further information, please also refer to <Corrective action>.

7.2.3. Status indications according to NAMUR recommendation

These indications are available, if the parameter **Diagnostic classific. M0539** is set to **NAMUR**.

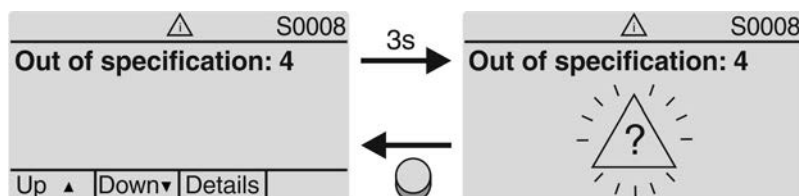
Out of Specification (S0008)

The **S0008** indication shows out of specification indications according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows **S0008**:

- the number of indications occurred
- a blinking triangle with question mark after approx. 3 seconds

Figure 60: Out of specification



For further information, please also refer to <Corrective action>.

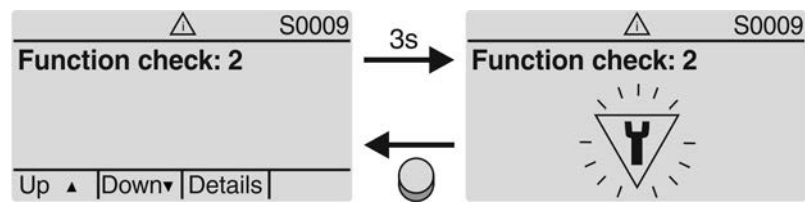
Function check (S0009)

The **S0009** indication shows function check indications according to NAMUR recommendation NE 107.

If an indication has occurred via the function check, the display shows **S0009**:

- the number of indications occurred
- a blinking triangle with a spanner after approx. 3 seconds

Figure 61: Function check



For further information, please also refer to <Corrective action>.

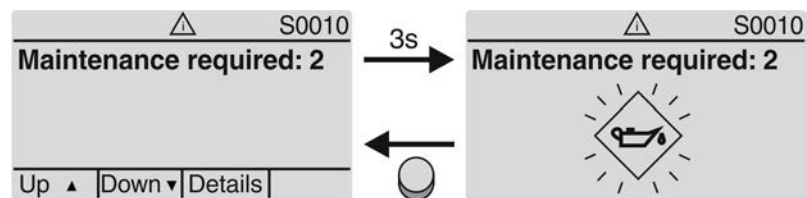
Maintenance required (S0010)

The **S0010** indication shows maintenance indications according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows **S0010**:

- the number of indications occurred
- a blinking square with an oilcan after approx. 3 seconds

Figure 62: Maintenance required



For further information, please also refer to <Corrective action>.

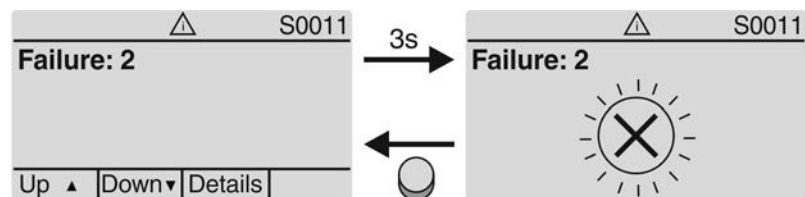
Failure (S0011)

The **S0011** indication shows the causes of the failure indication according to NAMUR recommendation NE 107.

If such an indication has occurred, the display shows **S0011**:

- the number of indications occurred
- a blinking circle with a cross after approx. 3 seconds

Figure 63: Failure



For further information, please also refer to <Corrective action>.

7.3. Indication lights of local controls

Figure 64: Arrangement and signification of indication lights



- [1] Marking with symbols (standard)
- [2] Marking with figures 1 – 6 (option)
- 1 End position CLOSED reached (blinking: operation in direction CLOSE)
- 2 Tc Torque fault CLOSE
- 3 Motor protection tripped
- 4 To Torque fault OPEN
- 5 End position OPEN reached (blinking: operation in direction OPEN)
- 6 Bluetooth connection

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

- M ▶ **Device configuration M0053**
 - Local controls M0159
 - Indication light 1 (left) M0093
 - Indication light 2 M0094
 - Indication light 3 M0095
 - Indication light 4 M0096
 - Indicat. light 5 (right) M0097
 - Signal interm. pos. M0167

Default values (Europe):

- Indication light 1 (left) = End p. CLOSED, blink
- Indication light 2 = Torque fault CLOSE
- Indication light 3 = Thermal fault
- Indication light 4 = Torque fault OPEN
- Indicat. light 5 (right) = End p. OPEN, blink
- Signal interm. pos. = OPEN/CLOSED = Off

Further setting values:

Refer to Manual (Operation and setting).

8. Signals (output signals)

8.1. Status signals via output contacts (digital outputs)

Characteristics Output contacts are used to send status signals (e.g. reaching the end positions, selector switch position, faults...) as binary signals to the control room.
 Status signals only have two states: active or inactive. Active means that the conditions for the signal are fulfilled.

8.1.1. Assignment of outputs

The output contacts (outputs DOUT 1 – 12) can be assigned to various signals.
 Required user level: **Specialist (4)** or higher.

M ▶ **Device configuration** M0053
 I/O interface M0139
 Digital outputs M0110
 Signal DOUT 1 M0109

Table 19: Default values

Output	Default value:	Output	Default value:
Signal DOUT 1	Fault	Signal DOUT 7	Thermal fault
Signal DOUT 2	End position CLOSED	Signal DOUT 8	OPEN
Signal DOUT 3	End position OPEN	Signal DOUT 9	Limit switch CLOSED
Signal DOUT 4	Selector sw. REMOTE	Signal DOUT 10	Limit switch OPEN
Signal DOUT 5	Torque fault CLOSE	Signal DOUT 11	Torque sw. CLOSED
Signal DOUT 6	Torque fault OPEN	Signal DOUT 12	Torque sw. OPEN

8.1.2. Coding the outputs

The output signals **Coding DOUT 1 – Coding DOUT 12** can be set either to high active or low active.

- High active = output contact closed = signal active
 - Low active = output contact open = signal active
- Signal active means that the conditions for the signal are fulfilled.

Required user level: **Specialist (4)** or higher.

M ▶ **Device configuration** M0053
 I/O interface M0139
 Digital outputs M0110
 Coding DOUT 1 M0102

Default values:

Coding DOUT 1 = **Low active**
Coding DOUT 2 – Coding DOUT 12 = **High active**

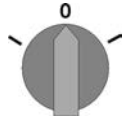
8.2. Analogue signals (analogue outputs)

Valve position Signal: E2 = 0/4 – 20 mA (galvanically isolated)
 Designation in the wiring diagram: AOUT1 (position)

Torque feedback Signal: E6 = 0/4 – 20 mA (galvanically isolated)
 Designation in the wiring diagram: AOUT2 (torque)
 For further information on this topic, please refer to Manual (Operation and setting).

9. Commissioning (basic settings)

1. Set selector switch to position **0** (OFF).



Information: The selector switch is not a mains switch. When positioned to **0** (OFF), the actuator cannot be operated. The controls' power supply is maintained.

2. Switch on the power supply.

Information: Observe heat-up time for ambient temperatures below $-30\text{ }^{\circ}\text{C}$.

3. Perform basic settings.

9.1. Type of seating: set

NOTICE

Valve damage due to incorrect setting!

- The type of seating setting (limit or torque seating) must match the selection for the valve.
- Only change the setting with prior consent of the valve manufacturer.

M ▶ Customer settings M0041
Type of seating M0012
End position CLOSED M0086
End position OPEN M0087

Default value: Limit

Setting values:

Limit

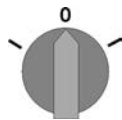
Seating in end positions via limit switching.

Torque

Seating in end positions via torque switching.

Select main menu

1. Set selector switch to position **0** (OFF).



2. Press push button **C Setup** and hold it down for approx. 3 seconds.

➔ Display goes to main menu and indicates: ▶ Display

Select parameter

3. Select parameter either:

- click via the menu M ▶ to parameter, or
- via direct display: Press ▲ and enter ID M0086 or M0087

➔ Display indicates: End position CLOSED

CLOSE or OPEN

4. Use ▲▼ Up ▲ Down ▼ to select:

- ▶ End position CLOSED
- ▶ End position OPEN

➔ The black triangle ▶ indicates the current selection.

5. Press ◀ Ok.

➔ Display indicates the current setting: Limit or Torque

➔ The bottom row of the display indicates either:

- Edit → continue with step 6
- Save → continue with step 10

- | | |
|------------------------|---|
| User login | 6. Press ↵ Edit .
➔ Display indicates: ► Specialist (4)
7. Use ▲ ▼ Up ▲ Down ▼ to select user:
Information: Required user level: Specialist (4) or higher
➔ The symbols have the following meaning:
- black triangle: ► = current setting
- white triangle: ▷ = selection (not saved yet)
8. Press ↵ Ok .
➔ Display indicates: Password 0***
9. Enter password (→ enter password).
➔ The screen indicates the pre-set type of seating (► Limit or ► Torque) by means of a black triangle ► . |
| Change settings | 10. Use ▲ ▼ Up ▲ Down ▼ to select new setting.
➔ The symbols have the following meaning:
- black triangle: ► = current setting
- white triangle: ▷ = selection (not saved yet)
11. Confirm selection via ↵ Save .
➔ The setting for the type of seating is complete.
12. Back to step 4 (CLOSED or OPEN): Press ↵ Esc . |

9.2. Torque switching: set

Once the set torque is reached, the torque switches will be tripped (overload protection of the valve).

Information The torque switches may also trip during manual operation.

NOTICE

Valve damage due to excessive tripping torque limit setting!

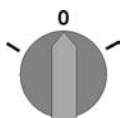
- The tripping torque must suit the valve.
- Only change the setting with the consent of the valve manufacturer.

M ▶ **Customer settings M0041**
Torque switching M0013
Trip torque CLOSE M0088
Trip torque OPEN M0089

Default value: According to order data

Setting range: Torque range according to actuator name plate

- Select main menu** 1. Set selector switch to position **0** (OFF).



2. Press push button **C Setup** and hold it down for approx. 3 seconds.
 ➔ Display goes to main menu and indicates: **► Display**

- Select parameter** 3. Select parameter either:
 → click via the menu **M ▶** to parameter, or
 → via direct display: press **▲** and enter ID **M0088**.
 ➔ Display indicates: **Trip torque CLOSE**

- CLOSE or OPEN**
4. Use ▲▼ Up ▲ Down ▼ to select:
 - ▶ Trip torque CLOSE
 - ▶ Trip torque OPEN
 - ➡ The black triangle ▶ indicates the current selection.
 5. ⬅ Press **Ok**.
 - ➡ Display shows the set value.
 - ➡ The bottom row indicates: **Edit Esc**
 6. ⬅ Press **Edit**.
 - ➡ Display indicates:
 - **Specialist (4)** → continue with step 7
 - in bottom row **Up ▲ Down ▼ Esc** → continue with step 11
- User login**
7. Use ▲▼ Up ▲ Down ▼ to select user:

Information: Required user level: **Specialist (4)** or higher.

 - ➡ The symbols have the following meanings:
 - black triangle: ▶ = current setting
 - white triangle: ▷ = selection (not saved yet)
 8. ⬅ Press **Ok**.
 - ➡ Display indicates: **Password 0*****
 9. Enter password (→ enter password).
 - ➡ Display shows the set value.
 - ➡ The bottom row indicates: **Edit Esc**
 10. ⬅ Press **Edit**.
- Change value**
11. Enter new value for tripping torque via ▲▼ Up ▲ Down ▼.

Information: The adjustable torque range is shown in round brackets.
 12. Save new value via ⬅ **Save**.
 - ➡ The tripping torque is set.
 13. Back to step 4 (CLOSED or OPEN): Press ⬅ **Esc**.
- Information**
- The following fault signals are issued if the torque setting performed has been reached **in mid-travel**:
- In the display of the local controls: Status indication **S0007 Fault** = **Torque fault OPEN** or **Torque fault CLOSE**
- The fault has to be acknowledged before the operation can be resumed. The acknowledgement is made:
1. either by an operation command in the opposite direction.
 - For **Torque fault OPEN**: Operation command in direction **CLOSE**
 - For **Torque fault CLOSE**: Operation command in direction **OPEN**
 2. or, in case the torque applied is lower than the preset tripping torque:
 - in selector switch position **Local control** (LOCAL) via push button **RESET**.
 - in selector switch position **Remote control** (REMOTE):
 - via a digital (I/O interface) with the Reset command if a digital input is configured for **RESET** signal.

9.3. Limit switching: set

NOTICE

Valve damage at valve/gearbox due to incorrect setting!

- When setting with motor operation: Stop actuator **prior** to reaching end of travel (press STOP push button).
- For limit seating, provide for sufficient backlash between end position and mechanical end stop due to potential overrun.

NOTICE

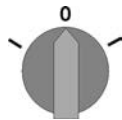
Valve damage at valve/gearbox due to incorrect setting!

- Allow for overrun when selecting limit seating.
- Prior to setting the limit switching, set the torque switching to the lowest possible value to avoid valve damage when approaching the end positions.

M ▶ Customer settings M0041
 Limit switching M0010
 Set end pos.CLOSED? M0084
 Set end pos. OPEN? M0085

Select main menu

1. Set selector switch to position **0** (OFF).



2. Press push button **C** and hold it down for approx. 3 seconds.

→ Display goes to main menu and indicates: **► Display**

Select parameter

3. Select parameter either:
 - click via the menu **M ▶** to parameter, or
 - via direct display: press **▲** and enter ID **M0084**.

→ Display indicates: **Set end pos.CLOSED?**

CLOSED or OPEN

4. Select via **▲▼ Up ▲ Down ▼**:
 - **► Set end pos.CLOSED? M0084**
 - **► Set end pos. OPEN? M0085**

→ The black triangle **►** indicates the current selection.

5. Press **↵ Ok**.

→ The display indicates either:

- **Set end pos.CLOSED? CMD0009** → continue with step 9
- **Set end pos. OPEN? CMD0010** → continue with step 12
- **Specialist (4)** → continue with step 6

User login

6. Use **▲▼ Up ▲ Down ▼** to select user:
Information: Required user level: **Specialist (4)** or higher

→ The symbols have the following meaning:

- black triangle: **►** = current setting
- white triangle: **▷** = selection (not saved yet)

7. Press **Ok** to confirm selected user.

→ Display indicates: **Password 0*****

8. Enter password (→ enter password).

→ The display indicates either:

- **Set end pos.CLOSED? CMD0009** → continue with step 9
- **Set end pos. OPEN? CMD0010** → continue with step 12

- Set end position
CLOSED CMD0009with
handwheel)


9.

Set end position CLOSED again :

Information:

The following description applies to actuators **with** handwheel.
For actuators **without** handwheel, continue with the next step.

9.1

For large strokes: Set selector switch in position **Local control** (LOCAL) and operate actuator in motor operation via push button  (CLOSE) in direction of the end position.

Information:

Stop actuator **before** reaching end of travel (press **STOP** push button to avoid damage.

9.2

Engage manual operation.

9.3

Turn handwheel until valve is closed.

9.4

Turn handwheel by approximately half a turn (overrun) in the opposite direction of end position.

9.5

Set selector switch to position **0** (OFF).

➔

Display indicates: Set end pos.CLOSED? Yes No
- Set end position
CLOSED CMD0009
(without handwheel)


10.

Set end position CLOSED again :

Information:

The following description applies to actuators **without** handwheel.
For actuators **with** handwheel, continue with the next step.


10.1

Set selector switch in position **Local control** (LOCAL) and operate actuator in via push button  (CLOSE) to the end position.

Information:

To avoid valve damage, set the torque switching to a value as low as possible!

10.2

Operate a small distance (in push-to-run operation via push button  (OPEN)) out of end position CLOSED to consider overrun.


10.3

Set selector switch to position **0** (OFF).

➔

Display indicates: Set end pos.CLOSED? Yes No
- Confirm new end position

11.





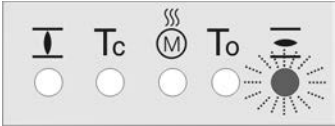
Press  **Yes** to confirm new end position.

➔

Display indicates: End pos. CLOSED set!

➔

The left LED is illuminated (standard version) and thus indicates that the end position CLOSED setting is complete.
-
- 56

	<p>12. Make selection:</p> <p>→ Edit → back to step 9: Set end position CLOSED "once again"</p> <p>→ Esc → back to step 4; either set end position OPEN or exit the menu.</p>
<p>Set end position OPEN CMD0010 with hand-wheel)</p>	<p>13. Re-set end position OPEN:</p> <p>Information: The following description applies to actuators with handwheel. For actuators without handwheel, continue with the next step.</p> <p>13.1 For large strokes: Set selector switch in position Local control (LOCAL) and operate actuator in motor operation via push button  (OPEN) in direction of the end position. Information: Stop actuator before reaching end of travel (press STOP push button to avoid damage).</p> <p>13.2 Engage manual operation.</p> <p>13.3 Turn handwheel until valve is open.</p> <p>13.4 Turn handwheel by approximately half a turn (overrun) in the opposite direction of end position.</p> <p>13.5 Set selector switch to position 0 (OFF).</p> <p>➡ Display indicates: Set end pos. OPEN? Yes No</p>
<p>Set end position OPEN CMD0010 (without hand-wheel)</p>	<p>14. Re-set end position OPEN:</p> <p>Information: The following description applies to actuators without handwheel. For actuators with handwheel, continue with the next step.</p> <p>14.1 Set selector switch in position Local control (LOCAL) and operate actuator in via push button  (OPEN) to the end position. Information: To avoid valve damage, set the torque switching to a value as low as possible!</p> <p>14.2 Operate a small distance (in push-to-run operation via push button  (CLOSE)) out of end position CLOSED to consider overrun.</p> <p>14.3 Set selector switch to position 0 (OFF).</p> <p>➡ Display indicates: Set end pos. OPEN? Yes No</p>
<p>Confirm new end position</p>	<p>15. Press  Yes to confirm new end position.</p> <p>➡ Display indicates: End pos. OPEN set!</p> <p>➡ The right LED is illuminated (standard version) and thus indicates that the end position OPEN setting is complete.</p> <div data-bbox="584 1496 919 1621">  </div>
	<p>16. Make selection:</p> <p>→ Edit → back to step 12: Set end position OPEN "once again"</p> <p>→ Esc → back to step 4; either set end position CLOSED or exit the menu.</p>
	<p>17. After setting the limit switching, reset the torque switching to the value recommended by the valve manufacturer.</p>
<p>Information</p>	<p>If an end position cannot be set: Check the type of control unit in actuator.</p>

9.4. Test run

Perform test run only once all settings previously described have been performed.

9.4.1. Direction of rotation: check

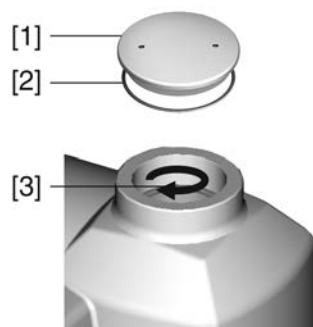
NOTICE

Valve damage due to incorrect direction of rotation!

- If the direction of rotation is wrong, switch off immediately (press STOP).
- Eliminate cause, i.e. correct phase sequence for cable set wall bracket.
- Repeat test run.

1. Move actuator to intermediate position or to sufficient distance from end position.
 2. Unfasten threaded plug [1] and seal [2].
 3. Switch on actuator via local controls push button in direction OPEN and observe the direction of rotation at the hollow shaft [3]:
 - Switch off before reaching the end position.
- ➡ The direction of rotation is correct if the **actuator runs in direction CLOSE** and the hollow shaft turns **clockwise**.

Figure 65: Hollow shaft for clockwise closing

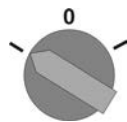


- [1] Threaded plug
- [2] Seal
- [3] Hollow shaft

4. Insert seal [2] and tightly fasten threaded plug [1].
- Information:** To ensure perfect tightness, make sure that the seal is correctly inserted and the threaded plug securely and tightly fastened.

9.4.2. Limit switching: check

1. Set selector switch to position **Local control** (LOCAL).



2. Operate actuator using push buttons OPEN, STOP, CLOSE.
 - ➡ The limit switching is set correctly if (default indication):
 - the yellow indication light/LED1 is illuminated in end position CLOSED
 - the green indication light/LED5 is illuminated in end position OPEN
 - the indication lights go out after travelling into opposite direction.
 - ➡ The limit switching is set incorrectly if:
 - the actuator comes to a standstill before reaching the end position
 - one of the red indication lights/LEDs is illuminated (torque fault)
 - the status indication **S0007** in the display signals a fault.
3. If the end position setting is incorrect: Reset limit switching.

10. Corrective action

10.1. Faults during operation/commissioning

Table 20:

Faults during operation/commissioning		
Fault	Description/cause	Remedy
In spite of correct setting of mechanical limit switching, actuator operates into the valve or actuator end position.	<p>The overrun was not considered when setting the limit switching.</p> <p>The overrun is generated by the inertia of both the actuator and the valve and the delay time of the actuator controls.</p>	<ul style="list-style-type: none"> Determine overrun: Overrun = travel covered from switching off until complete standstill. Set limit switching again considering the overrun. (Turn handwheel back by the amount of the overrun) (Turn actuator in the opposite direction away from the end position by the amount of overrun)

10.2. Fault indications and warning indications

Faults interrupt or prevent the electrical actuator operation. In the event of a fault, the display backlight is red.

Warnings have no influence on the electrical actuator operation. They only serve for information purposes. The display remains white.

Collective signals include further indications. They can be displayed via the **Details** push button. The display remains white.

Table 21:

Faults and warnings via status indications in the display		
Indication on display	Description/cause	Remedy
S0001	Instead of the valve position, a status text is displayed.	For a description of the status texts, refer to Manual (Operation and setting).
S0005 Warnings	Collective signal 02: Indicates the number of active warnings.	For indicated value > 0: Press push button Details . For details, refer to <Warnings and Out of specification> table.
S0006 Not ready REMOTE	Collective signal 04: Indicates the number of active signals.	For indicated value > 0: Press push button Details . For details, refer to <Not ready REMOTE and Function check> table.
S0007 Fault	Collective signal 03: Indicates the number of active faults. The actuator cannot be operated.	For indicated value > 0: Press push button Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.
S0008 Out of specification	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions.	For indicated value > 0: Press push button Details . For details, refer to <Warnings and Out of specification> table.
S0009 Function check	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.	For indicated value > 0: Press push button Details . For details, refer to <Not ready REMOTE and Function check> table.
S0010 Maintenance required	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.	For indicated value > 0: Press push button Details to display a list of detailed indications.
S0011 Failure	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid	For indicated value > 0: Press push button Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.




Table 22:


Warnings and Out of specification		
Indication on display	Description/cause	Remedy
Config. warning	Collective signal 06: Possible cause: Configuration setting is incorrect. The device can still be operated with restrictions.	Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Internal warning	Collective signal 15: Device warnings The device can still be operated with restrictions.	Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
24 V DC external	The external 24 V DC voltage supply of the controls has exceeded the power supply limits.	Check 24 V DC voltage supply.
Wrn op.mode run time	Warning on time max. running time/h exceeded	<ul style="list-style-type: none"> Check modulating behaviour of actuator. Check parameter Perm. run time M0356, re-set if required.
Wrn op.mode starts	Warning on time max. number of motor starts (starts) exceeded	<ul style="list-style-type: none"> Check modulating behaviour of actuator. Check parameter Permissible starts M0357, re-set if required.
Failure behav. active	The failure behaviour is active since all required setpoints and actual values are incorrect.	Verify signals: <ul style="list-style-type: none"> Setpoint E1 Actual value E2 Actual process value E4
Wrn input AIN 1	Warning: Loss of signal analogue input 1	Check wiring.
Wrn input AIN 2	Warning: Loss of signal analogue input 2	Check wiring.
Wrn setpoint position	Warning: Loss of signal setpoint position Possible causes: For an adjusted setpoint range of e.g. 4 – 20 mA, the input signal is 0 (signal loss). For a setpoint range of 0 – 20 mA, monitoring is not possible.	Check setpoint signal.
Op. time warning	The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED.	The warning indications are automatically cleared once a new operation command is executed. <ul style="list-style-type: none"> Check valve. Check parameter Perm.op. time, manual M0570.
Wrn controls temp.	Temperature within controls housing too high.	Measure/reduce ambient temperature.
Time not set	Real time clock has not yet been set.	Set time.
RTC voltage	Voltage of the RTC button cell is too low.	Replace button cell.
PVST fault	Partial Valve Stroke Test (PVST) could not be successfully completed.	Check actuator (PVST settings).
PVST abort	Partial Valve Stroke Test (PVST) was aborted or could not be started.	Perform RESET or restart PVST.
Wrn no reaction	No actuator reaction to operation commands within the set reaction time.	<ul style="list-style-type: none"> Check movement at actuator. Check parameter Reaction time M0634.
Torque wrn OPEN	Limit value for torque warning in direction OPEN exceeded.	Check parameter Wrn torque OPEN M0768 , re-set if required.
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769 , re-set if required.
SIL fault ¹⁾	SIL sub-assembly fault has occurred.	Refer to separate Manual Functional Safety.
PVST required	Execution of PVST (Partial Valve Stroke Tests) is required.	
Maintenance required	Maintenance is required.	
FQM fail safe flt ²⁾	FQM fault	Checking and fault remedy are required. Refer to FQM operation instructions.

1) For actuators controls in SIL version

2) For actuators with fail safe unit


Table 23:

Faults and Failure		
Indication on display	Description/cause	Remedy
Configuration error	Collective signal 11: Configuration error has occurred.	Press push button  Details to display a list of individual indications.. For a description of the individual signals, refer to Manual (Operation and setting).
Config. error REMOTE	Collective signal 22: Configuration error has occurred.	Press push button  Details to display a list of individual indications.. For a description of the individual signals, refer to Manual (Operation and setting).
Internal error	Collective signal 14: Internal error has occurred.	AUMA service Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Torque fault CLOSE	Torque fault in direction CLOSE	Perform one of the following measures: <ul style="list-style-type: none"> • Issue operation command in direction OPEN. • Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET.
Torque fault OPEN	Torque fault in direction OPEN	Perform one of the following measures: <ul style="list-style-type: none"> • Issue operation command in direction CLOSE. • Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET.
Phase fault	<ul style="list-style-type: none"> • When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing. 	Test/connect phases.
Incorrect phase seq	The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system.	Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases.
Mains quality	Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring.	<ul style="list-style-type: none"> • Check mains voltage. For 3-phase/1-phase AC current, the permissible variation of the mains voltage is $\pm 10\%$ (option $\pm 30\%$). The permissible variation of the mains voltage is $\pm 5\%$ • Check parameter Tripping time M0172, extend time frame if required.
Thermal fault	Motor protection tripped	<ul style="list-style-type: none"> • Cool down, wait. • If the fault indication display persists after cooling down: <ul style="list-style-type: none"> - Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET. • Check fuses.
Fault no reaction	No actuator reaction to operation commands within the set reaction time.	Check movement at actuator.
Poti Out of Range	Potentiometer is outside the permissible range.	Check device configuration: Parameter Low limit Uspan M0832 must be less than parameter Volt.level diff. potent. M0833 .
LPV not ready ¹⁾	LPV: Lift Plug Valve function The master actuator signals a fault	
Wrn input AIN 1	Loss of signal analogue input 1	Check wiring.

Faults and Failure		
Indication on display	Description/cause	Remedy
Wrn input AIN 2	Loss of signal analogue input 2	Check wiring.
Incorrect rotary direct.	Contrary to the configured direction of rotation and the active operation command, the motor turns into the wrong direction.	Check operation command control. For 3-phase AC current mains, activate phase monitoring (parameter Adapt rotary dir. M0171). Check device configuration setting (parameter Closing rotation M0176). To delete the fault indication: Disconnect actuator controls from the mains and perform reboot.
FQM collective fault ²⁾	Collective signal 25:	Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).

- 1) For lift plug valve product variant
2) For actuators equipped with fail safe unit

Table 24:

Not ready REMOTE and Function check (collective signal 04)		
Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: <ul style="list-style-type: none"> Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SET-POINT operation simultaneously) A setpoint is present and the positioner is not active 	<ul style="list-style-type: none"> Check operation commands (reset/clear all operation commands and send one operation command only). Set parameter Positioner to Function active. Check setpoint. Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Sel. sw. not REMOTE	Selector switch is not in position REMOTE.	Set selector switch to position REMOTE.
Service active	Operation via service interface (Bluetooth) and AUMA CDT service software.	Exit service software.
Disabled	Actuator is in operation mode Disabled.	Check setting and status of function <Local controls enable>.
EMCY stop active	The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected.	<ul style="list-style-type: none"> Enable EMERGENCY stop switch. Reset EMERGENCY stop state by means of Reset command.
EMCY behav. active	Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input.	<ul style="list-style-type: none"> Detect cause for EMERGENCY signal. Verify failure source. Apply +24 V DC at EMERGENCY input.
I/O interface	The actuator is controlled via the I/O interface (parallel).	Check I/O interface.
Handwheel active	Manual operation is activated.	Start motor operation.
Interlock	An interlock is active.	Check interlock signal.
Interlock by-pass	By-pass function is interlocked.	Check states of main and by-pass valve.
PVST active	Partial Valve Stroke Test (PVST) is active.	Wait until PVST function is complete.
SIL function active ¹⁾	SIL function is active	

- 1) For actuators controls in SIL version

10.3. Fuses**10.3.1. Fuses within the actuator controls****F1/F2**

Table 25:

Primary fuses F1/F2 (for power supply unit)		
G fuse	F1/F2	AUMA art. no.
Size	6.3 x 32 mm	
Reversing contactors Power supply ≤ 500 V	1 A T; 500 V	K002.277
Reversing contactors Power supply > 500 V	2 A FF; 690 V	K002.665
Thyristor units for motor power up to 1.5 kW	1 A T; 500 V	K002.277
Thyristor units for motor power up to 3.0 kW		
Thyristor units for motor power up to 5.5 kW		

F3 Internal 24 V DC supply

Table 26:

Secondary fuses F3 (internal 24 V DC supply)		
G fuse according to IEC 60127-2/III	F3	AUMA art. no.
Size	5 x 20 mm	
Voltage output (power supply unit) = 24 V	2.0 A T; 250 V	K006.106
Voltage output (power supply unit) = 115 V	2.0 A T; 250 V	K006.106

F4

Table 27:

Secondary fuse F4 (internal AC supply) ¹⁾		
G-fuse according to IEC 60127-2/III	F4	AUMA art. no.
Size	5 x 20 mm	
Voltage output (power supply unit) = 24 V	1.25 A T; 250 V	K001.184
Voltage output (power supply unit) = 115 V	—	—

1) Fuse for: Switch compartment heater, reversing contactor control, PTC tripping device (at 24 V AC only), at 115 V AC also control inputs OPEN, STOP, CLOSE

F5 Automatic reset fuse as short-circuit protection for external 24 V DC supply for customer (see wiring diagram)**10.3.2. Motor protection (thermal monitoring)**

In order to protect against overheating and impermissibly high surface temperatures at the actuator, PTC thermistors or thermoswitches are embedded in the motor winding. Motor protection trips as soon as the max. permissible winding temperature has been reached.

The actuator is switched off and the following signals are given:

- LED 3 (motor protection tripped) on the local controls is illuminated.
- The status indications **S0007** or **S0011 Failure** display a fault.
The fault **Details** is displayed when selecting **Thermal fault**.

The motor has to cool down before operation can be resumed.

Depending on the parameter setting (motor protection behaviour), the fault signal is either automatically reset or the fault signal has to be reset using **RESET** push button with selector switch position **Local operation** (LOCAL).

Proof-test motor protection

Test correct functioning of the motor protection as described hereafter. Perform the functional test at the latest within the framework of maintenance (refer to chapter <Servicing and maintenance>).

The test is performed by simulating the motor protection signal via actuator controls local controls:

Required user level: **Specialist (4)** or higher.

M ▶ **Diagnostics M0022**
TMS proof test M1950

- Test procedure:**
1. Set selector switch to position **0** (OFF).
 2. Return to the main menu and select the simulation value: **Thermal test** in parameter **TMS proof test M1950**.
 3. Activate motor protection simulation: Press **Ok** push button.
The safety function is correct if no fault signal is displayed.
 4. Reset simulation: Press **Ok** push button or exit the simulation menu and reset the selector switch to its initial position.

11. Servicing and maintenance



Damage caused by inappropriate maintenance!

- Servicing and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or the contractor of the plant. Therefore, we recommend contacting our service.
- Only perform servicing and maintenance tasks when the device is switched off.

AUMA Service & Support

AUMA offers extensive service such as servicing and maintenance as well as customer product training. For the relevant contact addresses, please refer to <Addresses> in this document or to the Internet (www.auma.com)

11.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Carry out visual inspection:
Cable entries, cable glands, blanking plugs, etc. have to be checked for correct tightness and sealing.
Consider torques according to manufacturer's details.
- Check fastening screws between actuator and gearbox/valve for tightness. If required, fasten screws while applying the tightening torques as indicated in chapter <Assembly>.
- When rarely operated: Perform test run.

11.2. Disconnection from the mains

If the device must be dismantled, e.g. for service purposes, it can be isolated from the mains without having to remove the wiring at the electrical connection.

11.2.1. Disconnection from the mains with KP/KPH and KES electrical connection

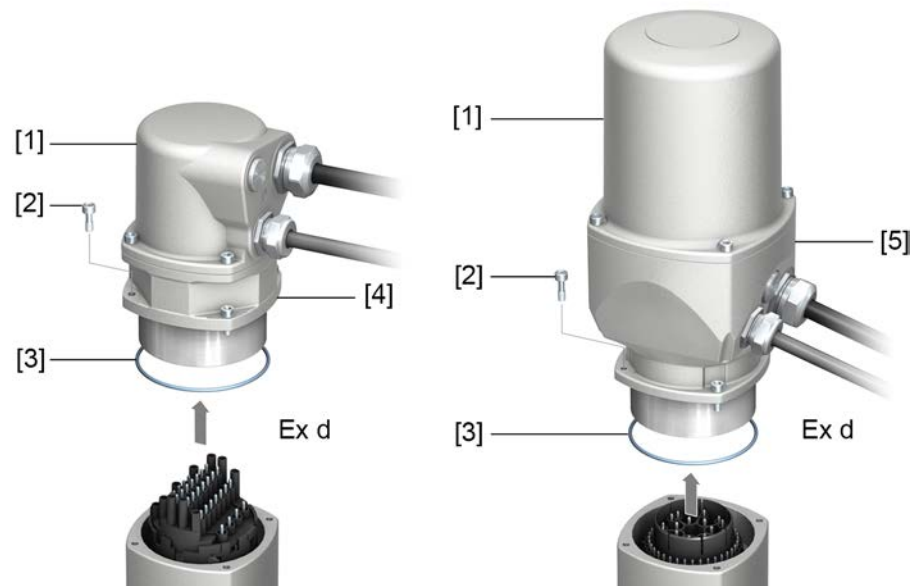


Ignition of potentially explosive atmospheres caused by sparks.

Risk of death or serious injury.

- Before opening the flameproof enclosure, ensure absence of gas and voltage.
- Handle cover and housing parts with care.
- Joint surfaces must not be damaged or soiled in any way.
- Do not jam cover during fitting.

Figure 66: KP/KPH and KES electrical connection



- [1] Cover
- [2] Screws for housing
- [3] O-ring
- [4] Plug-in frame (KP/KPH)
- [5] Connection frame (KES)

Removing the plug:

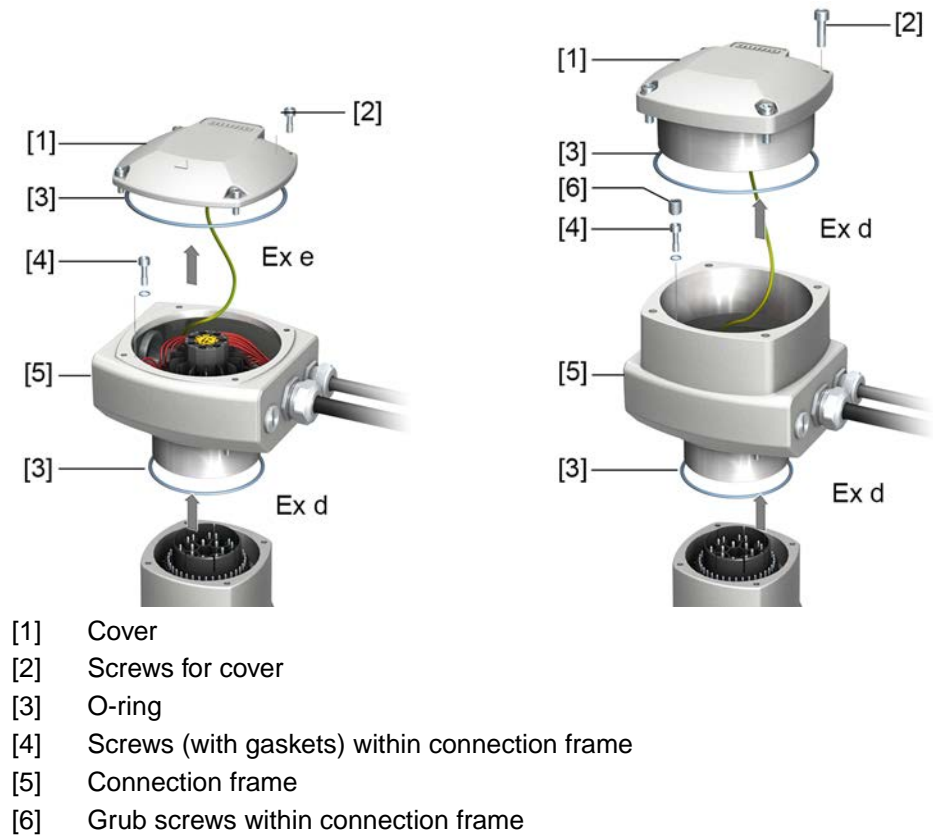
1. Loosen the screws [2].
2. Remove electrical connection.
- ➡ Cover [1] and plug-in type frame [4] or connection frame [5] remain together.
3. Seal open plug/socket connection, e.g. using AUMA protection cover and parking frame.

Fitting the plug/socket connector:

4. Clean sealing faces of plug/socket connector and housing.
5. Preserve joint surfaces with an acid-free corrosion protection agent.
6. Check whether O-ring [3] is in good condition, replace if damaged.
7. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.
8. Replace electrical connection and fasten screws evenly crosswise.

11.2.2. Disconnection from the mains with KT/KM electrical connection

Figure 67: KT/KM electrical connection



Ignition of potentially explosive atmospheres caused by sparks.

Risk of death or serious injury.

- Before opening the flameproof enclosure, ensure absence of gas and voltage.
- Handle cover and housing parts with care.
- Joint surfaces must not be damaged or soiled in any way.
- Do not jam cover during fitting.

Removing the plug:

1. Loosen the screws [2].
2. Remove cover [1].
3. For versions with terminal compartment in type of protection Ex d (flameproof enclosure): Remove grub screws [6] inside the connection frame.
4. Loosen screws [4] inside the connection frame.
5. Remove electrical connection.

Fitting the plug/socket connector:

6. Clean sealing faces of plug/socket connector, cover and housing.
7. Preserve joint surfaces with an acid-free corrosion protection agent.
8. Check whether O-rings [3] are in good condition, replace if damaged.
9. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-rings and insert them correctly.
10. Fit electrical connection (connection frame) and fasten screws [4] (with gaskets) evenly crosswise.
11. For versions with terminal compartment in Ex d (flameproof enclosure): Fasten grub screws [6] (tightening torque approx. 10 Nm).

Information: The flameproof enclosure is only guaranteed provided the grub screws are fastened [6].

12. Fit cover [1] and fasten screws [2] evenly crosswise.

11.3. Maintenance

- In the factory, the gear housing is filled with grease.
- Additional lubrication of the gear housing is not required during operation.
- Perform maintenance with grease change after approximately 5 years.
- We recommend replacing the seals when changing the grease.
- After maintenance, perform leak tightness test at actuator and electrical connections.
The mobile leakage tester PV 1691 by AUMA can be used for leak tightness test.

Notes regarding the maintenance

- Perform visual inspection of actuator. Ensure that no outside damage or changes are visible.
- Electrical connection cables must be placed properly and in perfect condition.
- Thoroughly touch up any possible damage to painting to prevent corrosion. Original paint in small quantities can be supplied by AUMA.
- Cable entries, cable glands, plugs etc. have to be checked for correct tightness and sealing. Consider torques according to manufacturer's details. If required, replace the components. Only use components which have an own EC type examination certificate.
- Check whether Ex connections are fastened correctly.
- Take care of possible discolouration of the terminals and wires. This would indicate an increased temperature.
- For Ex housings, pay special attention to a possible collection of water. This may originate from "breathing" due to severe temperature variations (e. g. change of night and day), from damaged seals etc. Remove any water immediately.
- Check the flame path gaps of flameproof enclosures for dirt and corrosion.
- Since the dimensions of all flameproof joints are strictly defined and inspected, no mechanical work (such as grinding) shall be performed on them. The joint surfaces have to be cleaned chemically (e. g. with Esso-Varsol).
- Prior to fitting, preserve joint surfaces with an acid-free corrosion protection agent (e. g. Esso Rust-BAN 397).
- Ensure that all housing covers are handled carefully and that the seals are checked.
- All cable and motor protection components have to be checked.
- If defects impairing the safety are detected during maintenance, repair measures have to be initiated without delay.
- Any kind of surface coating for the joint surfaces is not permitted.
- When replacing parts, sealing elements, etc. only original spare parts shall be used.

11.4. Disposal and recycling

Our devices have a long lifetime. However, they have to be replaced at one point in time. The devices have a modular design and may, therefore, easily be separated and sorted according to materials used, i.e.:

- various metals
- plastics
- greases and oils

The following generally applies:

- Greases and oils are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the national regulations for waste disposal.

12. Technical data

Information The following tables include standard and optional features. For detailed information on the customer-specific version, refer to the order-related data sheet. The technical data sheet can be downloaded from the Internet in both German and English at <http://www.auma.com> (please state the order number).

12.1. Technical data Multi-turn actuators

Features and functions	
Explosion protection	Refer to name plate
Certificates and standards	Certificates are attached to the device. All standards applied and their respective issues are indicated on these certificates.
Particular conditions of use	The particular conditions of use are listed on the certificates supplied.
Type of duty (Multi-turn actuators for open-close duty)	Standard: Short-time duty S2 - 15 min, classes A and B according to EN 15714-2
	Option: Short-time duty S2 - 30 min, classes A and B according to EN 15714-2
	For nominal voltage and +40 °C ambient temperature and at run torque load.
Type of duty (Multi-turn actuators for modulating duty)	Standard: Intermittent duty S4 - 25 %, class C according to EN 15714-2
	Option: Intermittent duty S5 - 25% (insulation class H required), class C according to EN 15714-2
	For nominal voltage and +40 °C ambient temperature and at modulating torque load.
Motors	3-ph AC asynchronous motor, type IM B9 according to IEC 60034-7, cooling procedure IC410 according to IEC 60034-6
Mains voltage, mains frequency	Refer to motor name plate Permissible variation of mains voltage: $\pm 10\%$ Permissible variation of mains frequency: $\pm 5\%$ (for 3-phase and 1-phase AC current)
Overvoltage category	Category III according to IEC 60364-4-443
Insulation class	Standard: F, tropicalized
	Option: H, tropicalized (with 3-phase AC motor)
Motor protection	Standard: PTC thermistors (according to DIN 44082) PTC thermistors additionally require a suitable tripping device in the actuator controls.
	Option: Thermoswitches (NC) According to EN 60079-14, a thermal overcurrent protection device (e.g. motor protection switch) must be installed for explosion-proof actuators in addition to the thermoswitches.
Self-locking	Self-locking: Output speeds up to 90 rpm (50 Hz), 108 rpm (60 Hz) NOT self-locking: Output speeds from 125 rpm (50 Hz), 150 rpm (60 Hz) Multi-turn actuators are self-locking if the valve position cannot be changed from standstill while torque acts upon the output drive.
Motor heater (option)	Voltages: 110 – 120 V AC, 220 – 240 V AC or 380 – 480 V AC
	Power depending on the size 12.5 – 25 W
Manual operation (option)	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.
Indication for manual operation (option)	Indication whether manual operation is active/not active via single switch (1 change-over contact)
Electrical connection	The AUMA Ex plug/socket connector is part of the cable set with wall bracket which must be ordered separately and which is customised for connection. Terminal compartment additionally sealed against interior (double sealed)
Valve attachment	Standard: B1 according to EN ISO 5210
	Option: B3, B4, D according to EN ISO 5210; B2 on request B, D, E according to DIN 3210
	Special valve attachments: B3D, DD

Electronic control unit	
Non-Intrusive setting	Magnetic limit and torque transmitter (MWG) Turns per stroke: 1 to 500 (standard) or 10 to 5,000 (option)
Position feedback signal	Via actuator controls
Torque feedback signal	Via actuator controls
Running indication	Blinking signal via actuator controls
Heater in switch compartment	Resistance type heater with 5 W, 24 V AC

Service conditions	
Use	For continuous underwater use as well as indoor and outdoor use.
Enclosure protection according to EN 60529	Increased enclosure protection IP68-C8. The maximum permissible head of water is 8 m.
Mounting position	Any position
Installation altitude	≤ 2,000 m above sea level > 2,000 m above sea level on request
Ambient temperature	-30 °C to +40 °C/+60 °C
Humidity	Up to 100 % relative humidity across the entire permissible temperature range
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)
Vibration resistance according to IEC 60068-2-6	2 g, from 10 to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Not valid in combination with gearboxes.
Corrosion protection	KX-G: Suitable for use in freshwater (Im1), seawater (Im2) and on seafloor (Im3), aluminium-free version (outer parts)
Coating	Double layer powder coating
Colour	Standard: AUMA silver-grey (similar to RAL 7037)
	Option: Available colours on request
Lifetime	AUMA multi-turn actuators meet or exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.
Sound pressure level	< 72 dB (A)

Further information	
EU Directives	ATEX Directive: (2014/34/EU) Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)

12.2. Technical data Actuator controls

Features and functions	
Explosion protection	Refer to name plate
External supply of the electronics (option)	24 V DC: +20 %/-15 %, Current consumption: Basic version approx. 250 mA, with options up to 500 mA For external electronics supply, the power supply of integral controls must have an enhanced isolation against mains voltage in compliance with IEC 61010-1 and the output power be limited to 150 VA.
Overvoltage category	Category III according to IEC 60364-4-443
Rated power	The actuator controls are designed for the nominal motor power, refer to motor name plate
Control	6 digital inputs: OPEN, STOP, CLOSE, EMERGENCY (via opto-isolator, thereof OPEN, STOP, CLOSE with one common and EMERGENCY without common, respect minimum pulse duration for modulating actuators).

Features and functions		
Status signals (output signals)	Standard:	<ul style="list-style-type: none"> 6 programmable output contacts: <ul style="list-style-type: none"> 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Default configuration: End position CLOSED, end position OPEN, selector switch REMOTE, SIL function active, SIL fault, torque fault CLOSE, torque fault OPEN 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) Standard assignment: Collective fault signal (torque fault, phase failure, motor protection tripped) Analogue output signal for position feedback <ul style="list-style-type: none"> Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)
	Options:	<ul style="list-style-type: none"> 6 programmable output contacts: <ul style="list-style-type: none"> 5 change-over contacts with one common, max. 250 V AC, 1 A (resistive load), 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) 6 programmable output contacts: <ul style="list-style-type: none"> 6 potential-free change-over contacts without one common, per contact max. 250 V AC, 5 A (resistive load) <p>All output signals must be supplied with the same potential.</p>
Analogue output (option)	2 analogue outputs: With position transmitter option: Output of travel and torque as continuous values between 0/4 and 20 mA	
Analogue input (option)	2 analogue inputs: With positioner/process controller option: Input of actual position value/actual process value as continuous values between 0/4 and 20 mA	
Local controls	Standard:	<ul style="list-style-type: none"> Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) Push buttons OPEN, STOP, CLOSE, RESET <ul style="list-style-type: none"> Local STOP The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.) 6 indication lights: <ul style="list-style-type: none"> End position and running indication CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue) Graphic LC display: illuminated
	Options:	<ul style="list-style-type: none"> Special colours for the indication lights: <ul style="list-style-type: none"> End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), end position OPEN (red)
Bluetooth Communication interface	Bluetooth class II chip, version 2.1: With a range up to 10 m in industrial environments, supports the SPP Bluetooth profile (Serial Port Profile). Required accessories: <ul style="list-style-type: none"> AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices) 	
Application functions	Standard:	<ul style="list-style-type: none"> Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time) Start and end of stepping mode as well as ON and OFF times can be set individually for directions OPEN and CLOSE, 1 to 1,800 seconds Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable Running indication blinking: can be set
	Option:	<ul style="list-style-type: none"> Positioner: <ul style="list-style-type: none"> Position setpoint via analogue input 0/4 – 20 mA Programmable behaviour on loss of signal Automatic adaptation of dead band (adaptive behaviour selectable) Split Range operation MODE input for selecting between OPEN-CLOSE and setpoint control PID process controller: with adaptive positioner, via 0/4 – 20 mA analogue inputs for process setpoint and actual process value

Features and functions		
Monitoring functions	<ul style="list-style-type: none"> Valve overload protection: adjustable, results in switching off and generates fault signal Motor temperature monitoring (thermal monitoring): results in switching off and generates fault indication Monitoring the heater within actuator: generates warning signal Monitoring of permissible on-time and number of starts: adjustable, generates warning signal Operation time monitoring: adjustable, generates warning signal Phase failure monitoring: results in switching off and generates fault signal 	
Motor protection evaluation	Standard:	PTC tripping device in combination with PTC thermistors within actuator motor
	Option:	Thermal overload relay in controls combined with thermoswitches within actuator
Threads for cable entries	Standard:	Metric threads
	Options:	Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate	

Further options for version with MWG in actuator	
Setting of limit and torque switching via local controls	
Torque feedback signal	
Wiring diagram	Refer to name plate

Service conditions		
Use	Indoor and outdoor use permissible	
Mounting position	Any position	
Installation altitude	$\leq 2\,000$ m above sea level $> 2,000$ m above sea level, on request	
Ambient temperature	Refer to name plate of actuator controls	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range	
Enclosure protection according to EN 60529	IP68	
	According to AUMA definition, enclosure protection IP68 meets the following requirements: <ul style="list-style-type: none"> Depth of water: Maximum 8 m head of water Duration of continuous immersion in water: Maximum 96 hours For exact version, refer to actuator controls name plate.	
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)	
Vibration resistance according to IEC 60068-2-6	1 g, from 10 Hz to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. (Not valid in combination with gearboxes)	
Corrosion protection	Standard:	KS Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Coating	Double layer powder coating Two-component iron-mica combination	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Available colours on request

Accessories	
Wall bracket	For fixing actuator controls mounted separately from the actuator, including plug/socket connector, connecting cable on request Cable length between actuator and actuator controls is max. 100 m.
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)

Further information	
Weight	Approx. 12 kg (including Ex-plug/socket connector with screw-type terminals)
Directives	ATEX Directive: (2014/34/EU) Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)

13. Spare parts

13.1. Multi-turn actuators SA(V)Ex 07.2-UW – SA(V)Ex 16.2-UW/SAR(V)Ex 07.2-UW – SAR(V)Ex 16.2-UW



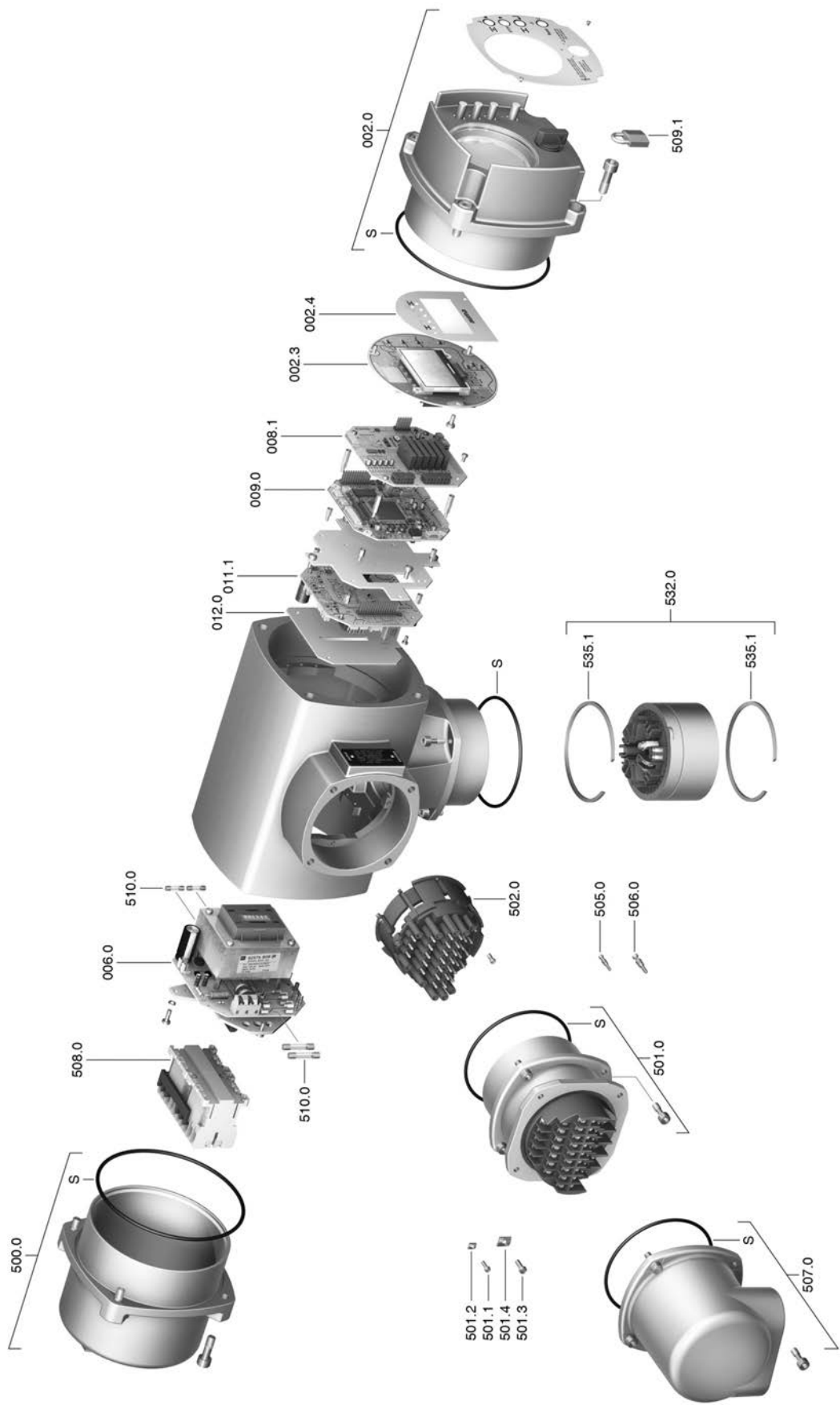
B3 / E / B4

B1/B2

Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type	Ref. no.	Designation	Type
002.0	Bearing flange	Sub-assembly	506.0	Pin for motor	Sub-assembly
003.0	Solid shaft B1/B2/DD/B3D	Sub-assembly	507.0	Cover for electrical connection	Sub-assembly
005.0	Drive shaft	Sub-assembly	511.0	Threaded plug	Sub-assembly
005.1	Motor coupling		516.0	Output drive type D	Sub-assembly
006.0	Worm wheel		516.1	Output drive shaft D	
009.0	Manual gearing	Sub-assembly	535.1	Snap ring	
017.0	Torque lever	Sub-assembly	539.0	Screw plug	Sub-assembly
018.0	Gear segment		542.0	Handwheel with ball handle	Sub-assembly
019.0	Crown wheel		549.0	Output drive type B3/E/B4	Sub-assembly
022.0	Drive pinion II for torque switching	Sub-assembly	549.1	Output drive sleeve B3/E/B4	Sub-assembly
023.0	Output drive wheel for limit switching	Sub-assembly	551.1	Parallel key	
024.0	Drive wheel for limit switching	Sub-assembly	554.0	Socket carrier for motor plug/socket connector with cable harness	Sub-assembly
025.0	Locking plate	Sub-assembly	557.0	Heater	
058.0	Cable for protective earth	Sub-assembly	559.0	Electronic control unit with magnetic limit and torque transmitter (MWG)	Sub-assembly
070.0	Motor (only for V... motors incl. ref. no. 079.0)	Sub-assembly	583.0	Motor coupling on motor shaft	Sub-assembly
079.0	Planetary gearing for motor drive (only for V... motors)	Sub-assembly	583.1	Pin for motor coupling	
500.0	Cover	Sub-assembly	584.0	Retaining spring for motor coupling	Sub-assembly
501.0	Socket carrier (complete with sockets)	Sub-assembly	627.0	MWG 05.03 cover	
501.1	Screw for control terminal		634.0	Shim washer (size 16.2 only)	
501.2	Washer for control terminal		635.0	Ball bearing	
501.3	Screw for power terminal		639.0	Retaining ring (size 16.2 only)	
501.4	Washer for power terminal		641.0	Shaft protection assy	
502.0	Pin carrier without pins	Sub-assembly	642.0	Bellows assy	
504.0	Socket for motor	Sub-assembly	S1	Seal kit, small	Set
505.0	Pin for controls	Sub-assembly	S2	Seal kit, large	Set

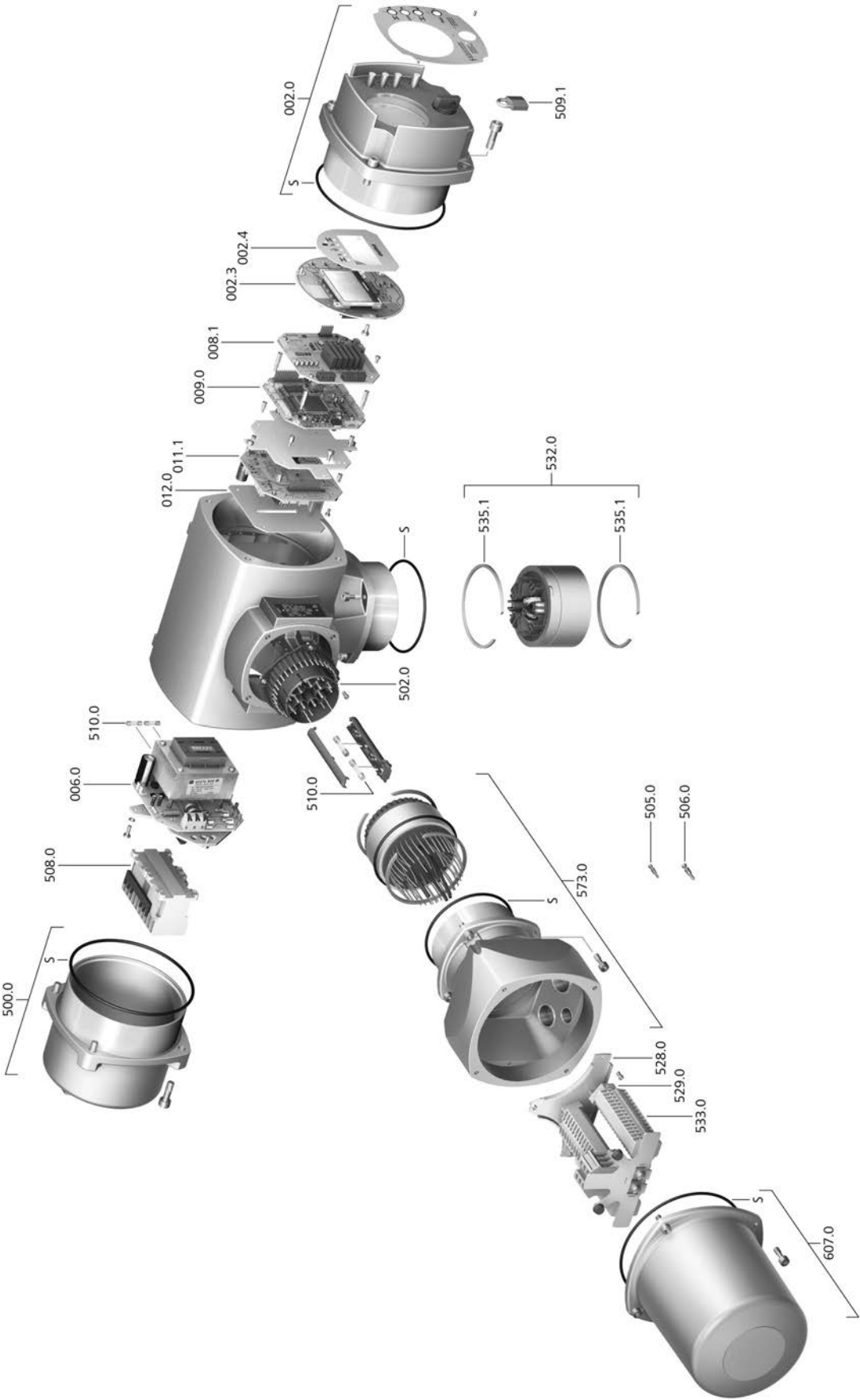
13.2. Actuator controls ACExC 01.2 KP/KPH



Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	I/O board	
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	Cover	Sub-assembly
501.0	Ex plug/socket connector with screw-type terminals (KP, KPH)	Sub-assembly
501.1	Screw for control terminal	
501.2	Washer for control terminal	
501.3	Screw for power terminal	
501.4	Washer for power terminal	
502.0	Pin carrier (without pins)	
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Cover for electrical connection	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	Sub-assembly
510.0	Fuse kit	Set
532.0	Cable conduit (actuator connection)	Sub-assembly
535.1	Retaining ring	
S	Seal kit	Set

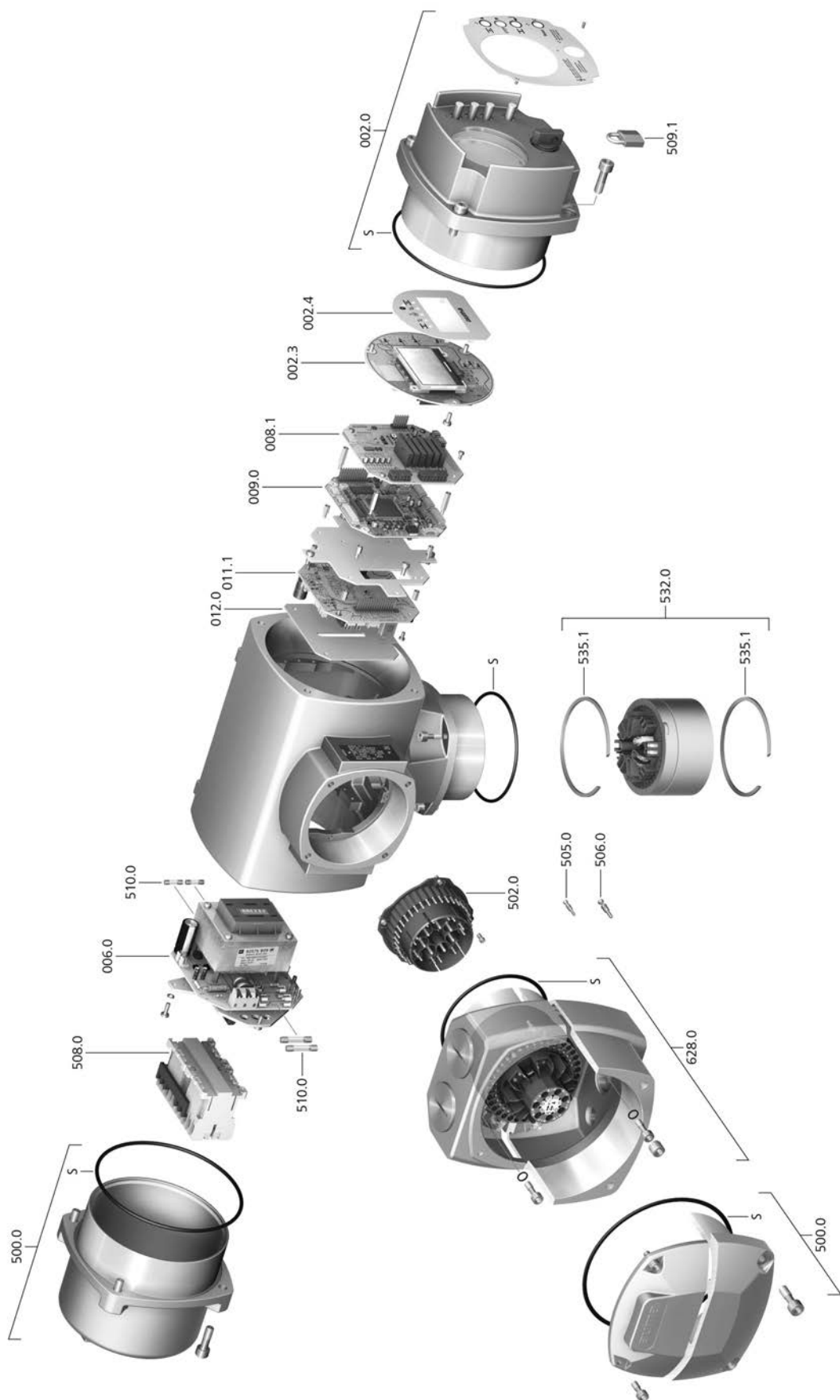
13.3. Actuator controls AUMATIC ACExC 01.2 KES



Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	I/O board	
008.1	Fieldbus board	Sub-assembly
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	Cover	Sub-assembly
502.0	Pin carrier (without pins)	
505.0	Pin for controls	
506.0	Pin for motor	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
510.0	Fuse kit	Sub-assembly
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End clamp	
532.0	Cable conduit (actuator connection)	Sub-assembly
533.0	Terminals for motor/controls	
535.1	Retaining ring	
573.0	Ex plug/socket connector with terminal blocks (KES)	Sub-assembly
607.0	Cover	
S	Seal kit	Set

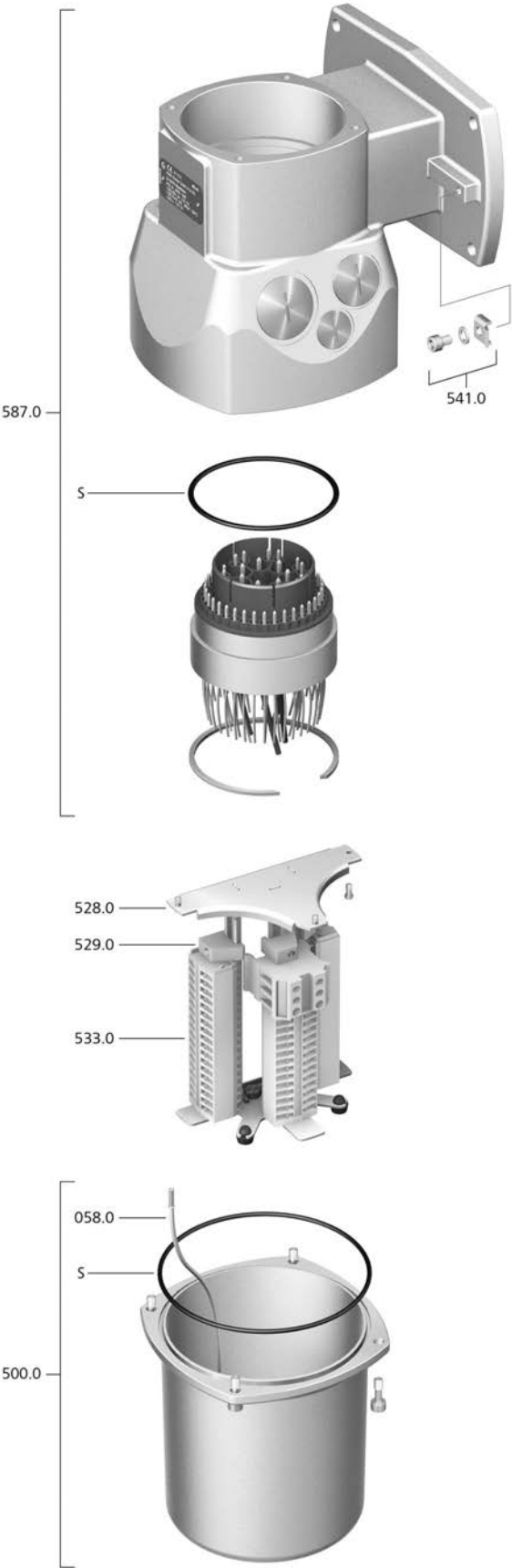
13.4. Actuator controls ACExC 01.2 KT/KM



Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	I/O board	
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	Cover	Sub-assembly
502.0	Pin carrier without pins	
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	Sub-assembly
510.0	Fuse kit	Kit
532.0	Line bushing (actuator connection)	
535.1	Retaining ring	
628.0	Ex plug/socket connector (KT, KM)	
S	Seal kit	Set

13.5. ExC wall bracket



Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

Ref. no.	Designation	Type
058.0	Wire for protective earth	Sub-assembly
500.0	Cover	Sub-assembly
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End piece	Sub-assembly
533.0	Terminals for motor/controls	Sub-assembly
541.0	Protective earthing	Sub-assembly
587.0	Wall bracket	
S	Seal	

14. Certificates

Information Certificates are valid as from the indicated date of issue. Subject to changes without notice. The latest versions are attached to the device upon delivery and also available for download at <http://www.auma.com>.

14.1. Declaration of Incorporation and EU Declaration of Conformity

AUMA Riester GmbH & Co. KG
Aumastr. 1
79379 Müllheim, Germany
www.auma.com

Tel +49 7631 809-0
Fax +49 7631 809-1250
info@uma.com



EU Declaration of Conformity / Declaration of Incorporation in compliance with Machinery Directive

for electric actuators of the following types:

SAEx 07.2, SAEx 07.6, SAEx 10.2, SAEx 14.2, SAEx 14.6, SAEx 16.2,
SAREx 07.2, SAREx 07.6, SAREx 10.2, SAREx 14.2, SAREx 14.6, SAREx 16.2
SQEx 05.2, SQEx 07.2, SQEx 10.2, SQEx 12.2, SQEx 14.2
SQREx 05.2, SQREx 07.2, SQREx 10.2, SQREx 12.2, SQREx 14.2

in versions:

AUMA NORM
AUMA MATIC AMExC 01.1

AUMA SEMIPACT SEMExC 01.1, SEMExC 02.1
AUMATIC ACExC 01.2

AUMA Riester GmbH & Co. KG as manufacturer declare herewith, that the above mentioned actuators meet the basic requirements of the following Directives:

2014/34/EU (ATEX Directive)
2014/30/EU (EMC Directive)

2006/42/EC (Machinery Directive)

The following harmonised standards in terms of the specified directives have been applied:

Directive 2014/34/EU

EN 60079-0:2012 / A11:2013
EN 60079-1:2014
EN 60079-7:2007

EN 60079-11:2012
EN 13463-1:2009
EN 13463-5:2011

EN 1127-1:2011

EC type test certificate:

DEKRA 11ATEX0008 X
DEKRA 13ATEX0016 X
DEKRA Certification B.V., 6825 MJ Arnhem, Netherlands
EU identification number 0344

The standards stipulated in the EC type test certificate were partially replaced by new issues. AUMA Riester GmbH declare the compliance with the requirements of the new issues of standards, since the modified requirements of the new issues of standards are irrelevant for the products stipulated above.

Notification relating to quality assurance within production:

DEKRA 12ATEXQ1217
DEKRA Certification B.V., 6825 MJ Arnhem, Netherlands
EU identification number 0344

Directive 2014/30/EU

EN 61000-6-4:2007 / A1:2011

EN 61000-6-2:2005 / AC:2005

Directive 2006/42/EC

EN ISO 12100:2010
EN 60204-1:2006 / A1:2009 / AC:2010

EN ISO 5210:1996
EN ISO 5211:2001

AUMA actuators are designed for the operation of industrial valves. Putting into service is prohibited until the final machinery has been declared in conformity with the provisions of Directive 2006/42/EC.

The following basic requirements in compliance with Annex I of the Directive are respected:

Appendix I, articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4

The manufacturer shall be obligated to electronically submit the documents for the partly completed machinery to national authorities on request. The relevant technical documentation pertaining to the machinery described in Annex VII, part B has been prepared.

Authorised person for documentation: Peter Malus, Aumastrasse 1, 79379 Müllheim, Germany

Furthermore, the essential health and safety requirements in compliance with Directive 2014/35/EU (Low Voltage Directive) are fulfilled by applying the following harmonised standards, as far as applicable for the products:

EN 60034-1:2010 / AC:2010
EN 50178:1997

Müllheim, 2016-09-01

Dr. J. Hoffmann, Managing Director

This declaration does not contain any guarantees. The safety instructions in product documentation supplied with the devices must be observed. Non-concerted modification of the devices voids this declaration.

Y006.331/003/en/1.16

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