auma®
Solutions for a world in motion

Multi-turn actuators
SAEx 25.1 – SAEx 40.1
SAREx 25.1 – SAREx 30.1
Control unit - electromechanical
with actuator controls
ACExC 01.2 on wall bracket

Control

→ Parallel

Profibus DP

Modbus RTU

Modbus TCP/IP

Foundation Fieldbus

HART

Profinet

Operation instructions

Assembly, operation, commissioning

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>).

Table of contents

1. Safety instructions

1.1. Prerequisites for the safe handling of the product

Standards/directives

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".

- Part 14: Electrical installations design, selection and erection.
- Part 17: Electrical installations inspection and maintenance.

Safety instructions/ warnings

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.

Qualification of staff

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.

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.

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.

Commissioning

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.

Operation

Prerequisites for safe and smooth operation:

- 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

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.

Maintenance

To ensure safe device operation, the maintenance instructions included in this manual must be observed.

Any device modification requires prior written consent of the manufacturer.

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
- Continuous submersion (observe enclosure protection)
- 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).

⚠ DANGER	**Indicates an imminently hazardous situation with a high level of risk. Failure to observe this warning results in death or serious injury.**
⚠ WARNING	**Indicates a potentially hazardous situation with a medium level of risk. Failure to observe this warning could result in death or serious injury.**
⚠ CAUTION	**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.**
NOTICE	**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. Short description

Multi-turn actuator

Definition in compliance with EN 15714-2/EN ISO 5210:

A multi-turn actuator is an actuator which transmits torque to a valve for at least one full revolution. It is capable of withstanding thrust.

Figure 1: Example, Multi-turn actuator SAEx 25.1

AUMA multi-turn actuators SAEx 25.1 – SAEx 40.1/SAREx 25.1 – SAREx 30.1 are driven by an electric motor and are capable of withstanding thrust in combination with output drive type A. For manual operation, a handwheel is provided. Switching off in end positions may be either by limit or torque seating. Actuator controls are required to operate or process the actuator signals.

Actuator controls

ACExC 01.2 actuator controls are used to operate AUMA actuators and are supplied ready for use. In combination with multi-turn actuators SAEx 25.1 – SAEx 40.1/SAREx 25.1 – SAREx 30.1, they are mounted separately on a wall bracket. For high nominal motor currents of the actuator, the switchgear of the actuator controls additionally require a control box.

Figure 2: Actuator controls and control box

[1] Actuator controls on wall bracket
[2] Control box

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

Local controls/ AUMA CDT

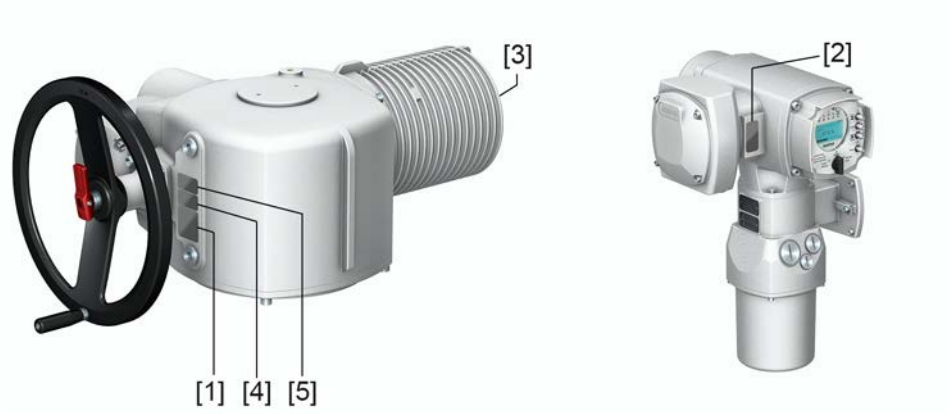
Operation, setting, and display can be performed directly at the actuator controls.

When set to local control, it is possible to

- operate the actuator via the local controls (push buttons and display) and perform settings (contents of these instructions).
- read in or out data or modify and save settings via AUMA CDT software (accessory), using a computer (laptop or PC). The connection between computer and actuator controls is wireless via Bluetooth interface (not included in these instructions).

2.2. Name plate

Figure 3: 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

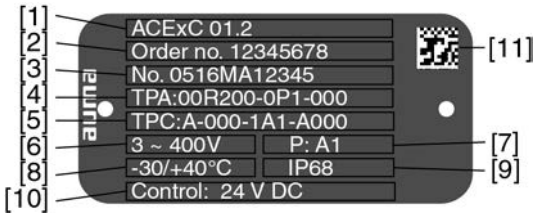
Figure 4: Actuator name plate (example)

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

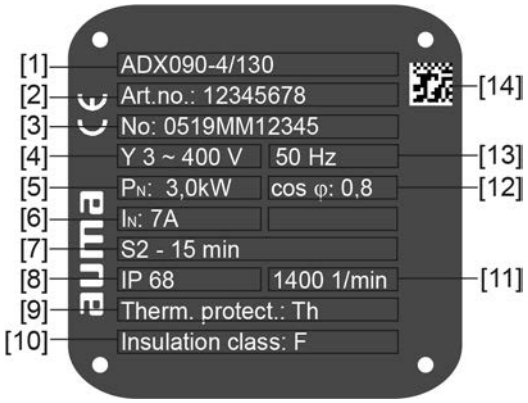
Figure 5: Actuator controls name plate



[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 6: Typenschild Motor (Beispiel)

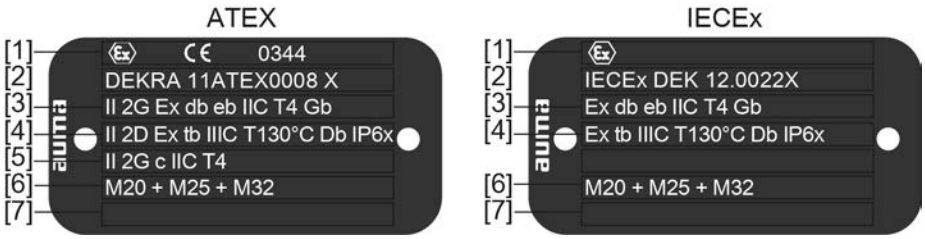


auma (= manufacturer logo); CE (= CE mark)

[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] DataMatrix-Code

Approval plate in explosion-proof version

Figure 7: Approval plates in explosion-proof version (examples)

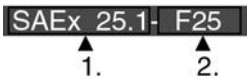


[1] Ex symbol, CE mark, number of test authority
[2] Ex certificate (number)
Classification:
[3] Electrical gas explosion protection
[4] Electrical dust explosion protection
[5] Non-electrical explosion protection
[6] Threads for line bushings at electrical connection
[7] Not used

Descriptions referring to name plate indications

Type designation

Figure 8: Type designation (example)



1. Type and size of actuator
2. Flange size

Type and size

These instructions apply to the following devices types and sizes:

- Type SAEx: Multi-turn actuators for open-close duty
  Sizes: 25.1, 30.1, 35.1, 40.1
- Type SA**R**Ex = Multi-turn actuators for modulating duty
  Sizes: 25.1, 30.1
- Type ACExC = AUMATIC actuator controls
  Size: 01.2

Protection types

Table 1:

Description of the protection types for multi-turn actuators	
Motor compartment	Ex **d** = flameproof enclosure
Switch compartment	Ex **e** = increased safety
Terminal compartment	Ex **e** = increased safety (motor connection compartment and K/KR electrical connection)
Gear housing	c = constructional safety
Position transmitter	Ex **i** = intrinsic safety (RWG 5020.2Ex)

Table 2:

Description of the protection types for actuator controls	
Actuator controls housing	Ex **d** = flameproof enclosure
Terminal compartment	Ex **e** = increased safety (with KP/KPH/KES electrical connection) Ex **d** = flameproof enclosure (with KES-d electrical connection)
Control box	Ex **e** = increased safety (outer housing) Ex **d** = flameproof enclosure (inner housing)
Terminal compartment of control box	Ex **e** = increased safety

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 3:

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 terminal plan

Position 9 following **TPA**: Position transmitter version

0 = Without position transmitter

A, B, J, K, L, N, R, T = Potentiometer

C, D, E, G, H, M, P, S, U = Electronic position 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 4:

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 9: Link to AUMA Assistant App:

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

3. Transport and storage

3.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Hovering load!

Death or serious injury.

→ Do NOT stand below hovering 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.

→ Actuators mounted to controls: Attach ropes or hooks for the purpose of lifting by hoist only to the actuator and NOT to the controls.

→ Respect total weight of combination (actuator, actuator controls, 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 10: Example: Lifting the actuator

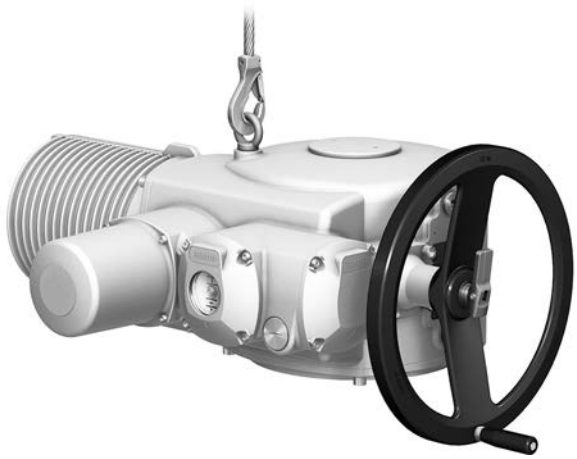


Table 5:

Weight for ACExC 01.2 actuator controls	
with electrical connection type:	Weight approx. [kg]
AUMA Ex plug/socket connector with screw-type terminals (KT)[1)]	14
AUMA Ex plug/socket connector with screw-type terminals (KP)	12
AUMA Ex plug/socket connector with terminal blocks (KES), increased safety Ex e	14
AUMA Ex plug/socket connector with terminal blocks (KES), increased safety Ex d	16.5

1) Standard

Table 6:

Weights of multi-turn actuators SAEx 25.1 – SAEx 40.1 / SAREx 25.1 – SAREx 30.1 with 3-phase AC motors		
Type designation Actuator	Motor type[1)]	Weight[2)] approx. [kg]
SAEx 25.1/ SAREx 25.1	ADX... 90-...	155
	ADX... 132-...	165
SAEx 30.1/ SAREx 30.1	ADX... 112-...	195
	ADX... 160-...	265
SAEx 35.1	ADX... 132-...	415
	ADX... 160-...	430
SAEx 40.1	ADX... 160-...	515

1) Refer to motor name plate
2) Indicated weight includes AUMA NORM multi-turn actuator with 3-phase AC motor, electrical connection in standard version, output drive type B1 and handwheel. For other output drive types, heed additional weights.

Table 7:

Weights for output drive type		
Type designation	Flange size	[kg]
A 25.2	F25	42
A 30.2	F30	69
A 35.2	F35	126
A 40.2	F40	202

Table 8:

Weights for output drive type		
Type designation	Flange size	[kg]
AF 25.2	F25	61
AF 30.2	F30	103
AF 35.2	F35	180
AF 40.2	F40	320

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.

4. Assembly

4.1. Mounting position

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

4.2. Handwheel fitting

Information For transport reason, handwheels with a diameter of 400 mm and larger are supplied separately within the scope of delivery.

NOTICE

Damage at the change-over mechanism due to incorrect assembly!

→ Only pivot change-over lever manually.

→ Do NOT use extensions as lever for operation.

→ First engage manual operation correctly, then mount handwheel.

1. Manually lift the red change-over lever while slightly turning the shaft back and forth until manual operation engages.

➥ Manual operation is properly engaged if the change-over lever can be shifted by approx. 85°.

Figure 11:

2. Push handwheel over the red change-over lever then onto the shaft.

Figure 12:

3. Release change-over lever (should snap back into initial position by spring action, if necessary, push it back manually).

4. Secure handwheel using the retaining ring supplied.
   Figure 13:

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

NOTICE

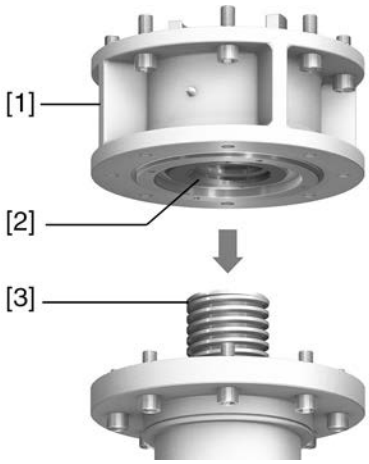
Corrosion due to damage to paint finish and condensation!

→ 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.

4.3.1. Design of output drive type A

Figure 14: Output drive type A



[1] Output mounting flange

[2] Stem nut with dog coupling

[3] Valve stem

Output mounting flange [1] with axial bearing stem nut [2] form one unit. Torque is transmitted to valve stem [3] via stem nut [2].

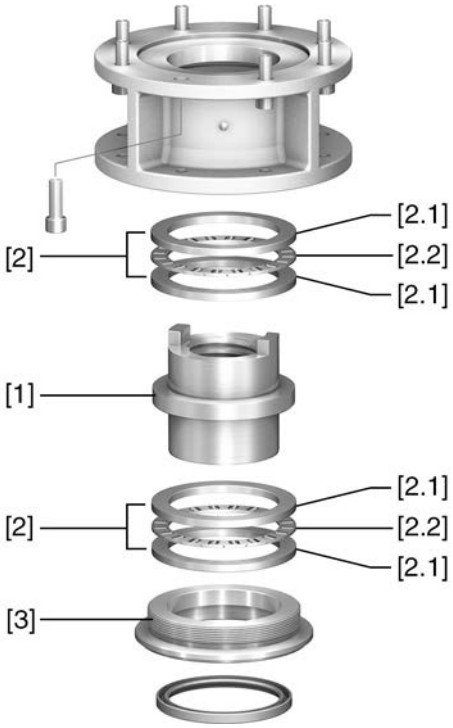
To adapt the actuators to available output drive types A with flanges F10 and F14 (year of manufacture 2009 and earlier), an adapter is required. The adapter can be ordered from AUMA.

4.3.1.1. Stem nut for output drive type A: finish machining

This working step is only required if stem nut is supplied unbored or with pilot bore.

Information For exact product version, please refer to the order-related technical data sheet or the AUMA Assistant App.

Figure 15: Output drive type A



[1] Stem nut
[2] Axial needle roller bearing
[2.1] Axial bearing washer
[2.2] Axial needle roller and cage assembly
[3] Spigot ring

Procedure

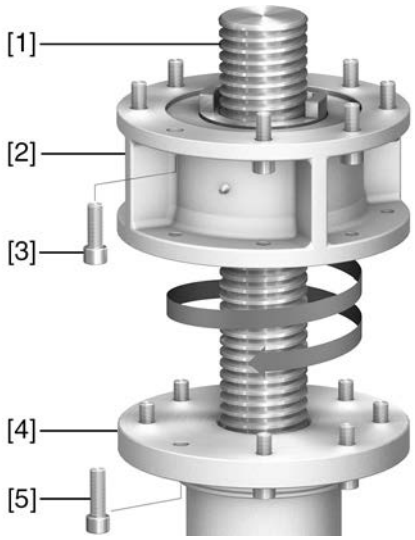
1. Remove spigot ring [3] from output drive.
2. Remove stem nut [1] together with axial needle roller bearings [2].
3. Remove axial bearing washers [2.1] and axial needle roller and cage assemblies [2.2] from stem nut [1].

   Information: For output drive types A from size 35.2 and larger: Record the order of axial bearing washers [2.1].
4. Drill and bore stem nut [1] and cut thread.
5. Clean the machined stem nut [1].
6. Apply sufficient Lithium soap EP multi-purpose grease to axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1], ensuring that all hollow spaces are filled with grease.
7. Place greased axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1] onto stem nut [1].

   Information: For output drive types A from size 35.2: Observe correct order of axial bearing washers [2.1].
8. Re-insert stem nut [1] with axial needle roller bearings [2] into output drive.
9. Screw in spigot ring [3] until it is firm against the shoulder.

4.3.1.2. Multi-turn actuator with output drive type A: mount

Figure 16: Assembly of output drive type A



[1] Valve stem
[2] Output drive type A
[3] Screws to actuator
[4] Valve flange
[5] Screws to output drive

Procedure

1. If output drive type A is already mounted to the multi-turn actuator: Loosen screws [3] and remove output drive type A [2].
2. Apply a small quantity of grease to the valve stem [1].
3. Place output drive type A on valve stem and turn until it is flush on the valve flange.
4. Turn output drive type A until alignment of the fixing holes.
5. Fasten screws [5] between valve and output drive type A without completely tightening them.
6. Fit multi-turn actuator on the valve stem so that the stem nut dogs engage into the output drive sleeve.

➥ The flanges are flush with each other if properly engaged.

7. Adjust multi-turn actuator until alignment of the fixing holes.
8. Fasten multi-turn actuator with screws [3].
9. Fasten screws [3] crosswise with a torque according to table.

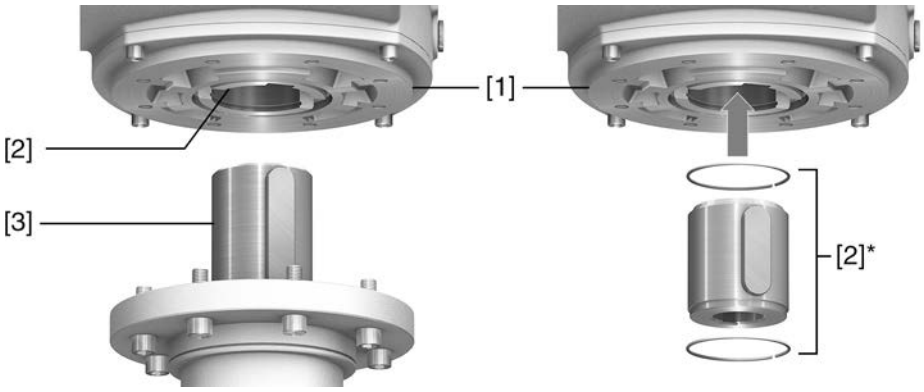
Table 9:

Tightening torques for screws		
Threads	Tightening torque [Nm]	
	Strength class	
	8.8	A2-80
M16	214	200
M20	431	392
M30	1,489	1,422
M36	2,594	2,481

10. Turn multi-turn actuator with handwheel in direction OPEN until valve flange and output drive type A are firmly placed together.
11. Tighten screws [5] between valve and output drive type A crosswise applying a torque according to table.

4.3.2. Design of output drive types B and E

Figure 17: Output drive type B



[1] Multi-turn actuator flange

[2] For output drive types B/B1/B2 hollow shaft with keyway

[2]* For output drive types B3/B4/E, an output drive sleeve is fitted into the hollow shaft

[3] Gearbox/valve shaft with parallel key

Information

Spigot at valve flanges should be loose fit.

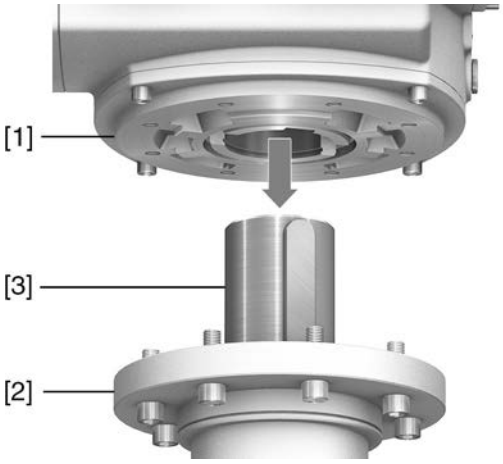
For output drive types B/B1/B2, the connection to the valve or the gearbox is made by directly placing the multi-turn actuator hollow shaft onto the input shaft of the valve or gearbox.

For output drive types B3/B4/E, the connection is made via output drive sleeve which is inserted into the bore of the hollow 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

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

Figure 18: 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.

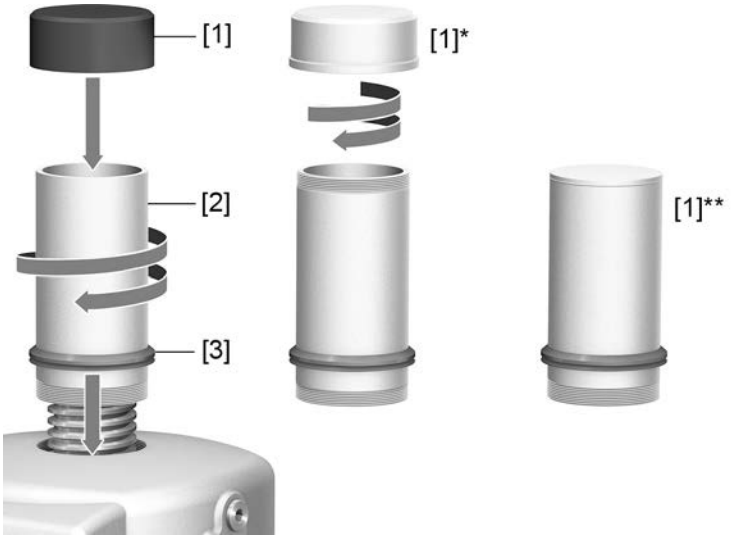
Table 10:

Tightening torques for screws		
Threads	Tightening torque [Nm]	
	Strength class	
	8.8	A2-80
M16	214	200
M20	431	392
M30	1,489	1,422
M36	2,594	2,481

4.4. Accessories for assembly

4.4.1. Stem protection tube for rising valve stem

Figure 19: Assembly of the stem protection tube



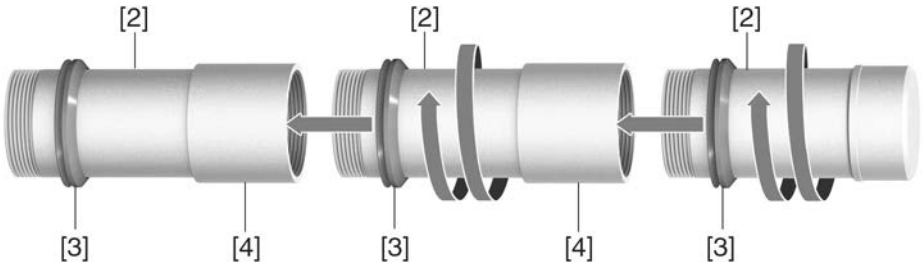
[1] Protective cap for stem protection tube (fitted)
[1]* Option for size 25.1: Protective cap made of steel (screwed)
[1]** Option from size 30.1: Protective cap made of steel (welded)
[2] Stem protection tube
[3] V-seal

Procedure

1. Seal all threads with hemp, Teflon tape, or thread sealing material.

2. Screw stem protection tube [2] into thread and tighten it firmly.
   Information: For stem protection tubes made of two or more segments, all parts have to be thoroughly screwed together.

   Figure 20: Protection tube made of segments with threaded sleeves (SA 25.1/30.1: >900 mm)



   [2] Segment of stem protection tube
   [3] V-seal
   [4] Threaded sleeve

3. Push down the sealing ring [3] onto the housing.
   Information: For mounting segments, push down seals of segments down to the sleeve (connecting piece).

4. Check whether protective cap [1] for stem protection tube is available, in perfect condition and tightly placed on or screwed to the tube.

NOTICE

Risk of bending or oscillation of protection tubes exceeding a length of 2 m!

Risk of damage at stem and/or protection tube.

→ Secure protection tubes exceeding 2 m by an appropriate support.

---

5. Electrical connection

5.1. Basic information

⚠ WARNING

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).

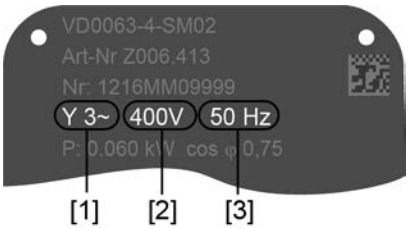
Permissible networks (supply networks)

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 21: Motor name plate (example)



[1] Type of current

[2] Mains voltage

[3] Mains frequency (for 3-phase and 1-phase AC motors)

External supply of the electronics

For external electronics supply, the power supply of actuator controls must have an enhanced isolation against mains voltage in compliance with IEC 61010-1 and the output power has to be limited to 150 VA in compliance with IEC 61010-1.

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 11:

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	1,000 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 12:

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)
Reversing contactor A4 (in control box)	up to 30 kW	125A (gL/gG)
Reversing contactor A5 (in control box)	up to 55 kW	200A (gL/gG)
Reversing contactor A6 (in control box)	up to 75 kW	315A (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

Bei Verwendung von Sicherungsautomaten muss der Anlaufstrom (I_A) des Motors beachtet werden (siehe elektrisches Datenblatt). Wir empfehlen für Sicherungsautomaten die Auslösecharakteristik D oder K nach IEC 60947-2. Für die Absicherung von Steuerungen mit Thyristoren empfehlen wir Schmelzsicherungen statt Sicherungsautomaten zu verwenden, der Einsatz von Sicherungsautomaten ist aber grundsätzlich zulässig.

We recommend refraining from using residual current devices (RCD). However, if an RCD is used within the mains, the residual current device must be of type B.

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 13:

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

If actuator controls are mounted separately from actuator (actuator controls on wall bracket): Consider length and cross section of connecting cable when defining the protection required.

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.

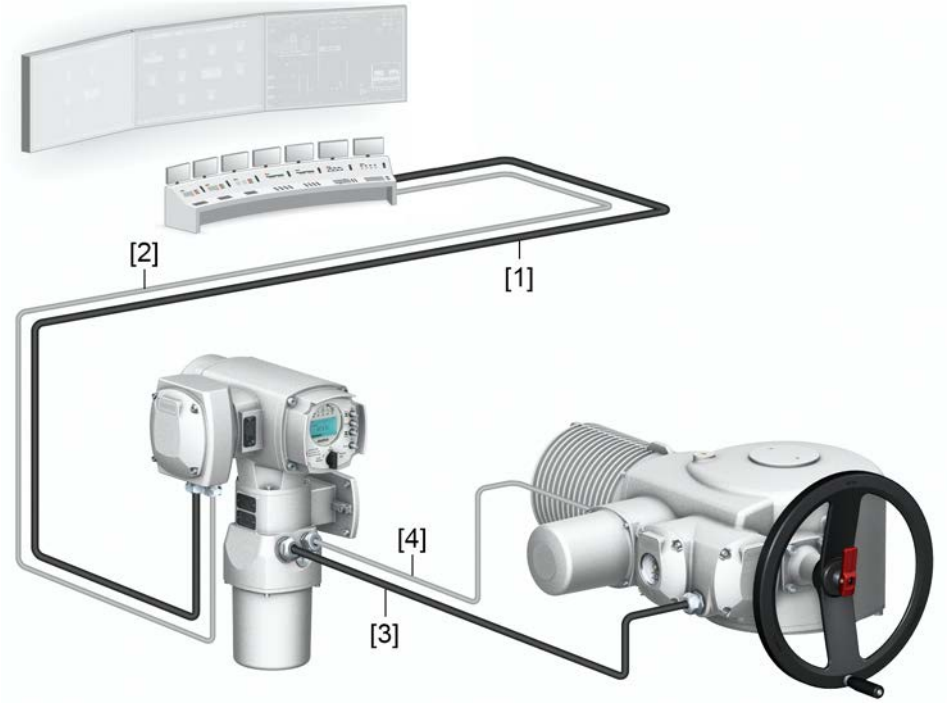
Cable installation in accordance with EMC

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 for wall bracket and control box

Figure 22: Example of cable installation for controls on wall bracket (without control box)



[1] Power supply, e.g. 3~/PE/400V/50 Hz
[2] Customer connection (XK) control contacts/signals
[3] Motor connection/motor control
[4] Feedback signals from actuator
[5] Elektronischer Stellungsgeber RWG (Option) – eigensicherer Stromkreis

Wall bracket

The actuator controls are mounted separately from the actuator on a wall bracket.

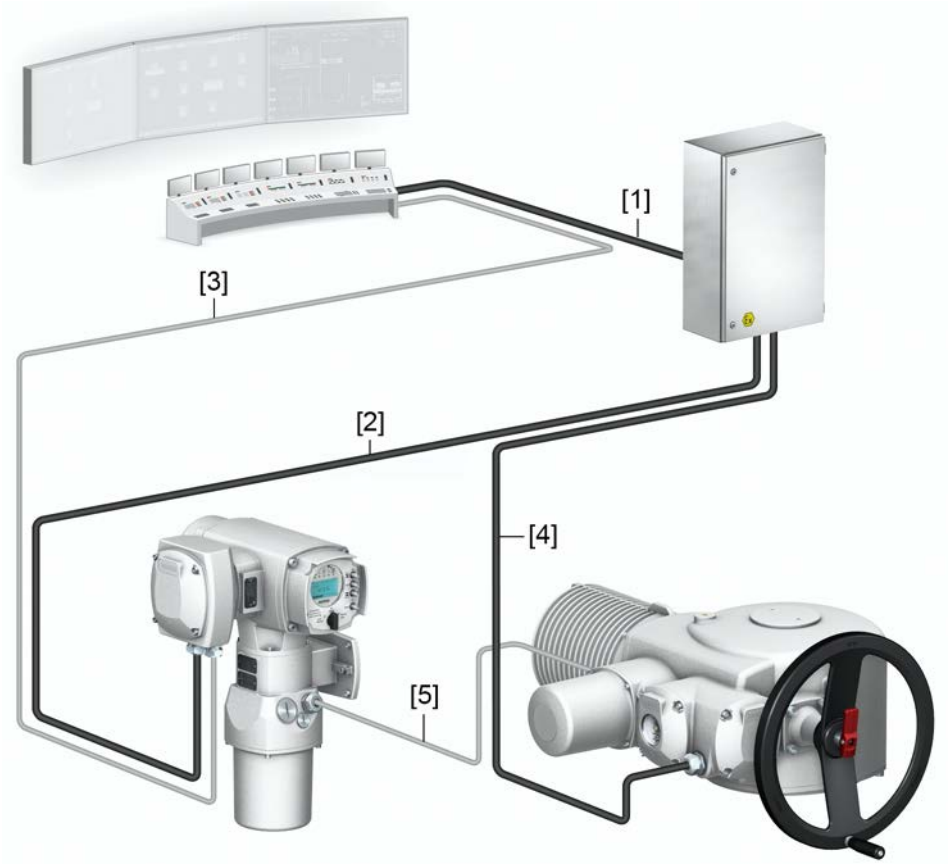
- The permissible cable length between actuator controls on wall bracket and the actuator amounts to 100 m maximum.
- We recommend using an AUMA cable set “LSW".

- If the actuator is equipped with a position transmitter (RWG, potentiometer):
  - Use suitable flexible and screened connecting cables.
  - Earth cable shield at both ends.
  - Permissible cable length in combination with a potentiometer is 10 m.
  - A separate cable has to be used if an RWG electronic position transmitter is provided (intrinsically safe current circuit). This cable must NOT be connected via actuator controls.
- When using connecting cables, e.g. of the heater or switch, requiring direct wiring from the actuator to the XK customer plug (XA-XM-XK, refer to wiring diagram), these connecting cables must be subject to an insulation test in compliance with EN 50178. Connecting cables of position transmitters (EWG, RWG, IWG, potentiometer) do not belong to this group. They may **not** be subjected to an insulation test.

Control box

For actuators with high nominal motor current (AUMA power class switchgear from category A4), a control box is additionally required. Switchgear (reversing contactors) will then be installed in the control box and not within the actuator controls. Control box is mounted separately on the wall.

Figure 23: Example of cable installation with control box

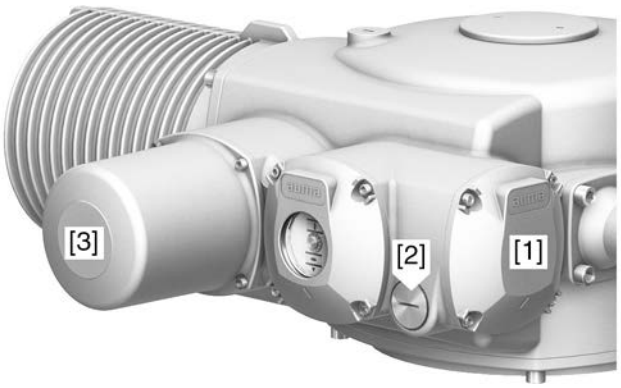


[1] Power supply, e.g. 3~/PE/400V/50 Hz
[2] Power supply of actuator controls (switchgear control)
[3] Customer connection (XK) control contacts/signals
[4] Motor connection/motor control
[5] Feedback signals from actuator
[6] Electronic position transmitter RWG (option) – intrinsically safe electric circuit

For the power supply cable, fuses have to be provided for short-circuit protection by the customer. The fuses have to be adapted to the cross section of the cable, the thermal overload relay in the control box, the switch contacts and the motor data (refer to motor name plate).

5.3. Electrical connection of actuator

Figure 24: Connection arrangement at actuator



[1] Motor connection compartment
[2] Cable entry for motor connection
[3] Electrical connection for power connections (figure shows KT version)

5.3.1. Motor connection

5.3.1.1. Motor connection compartment: open

Figure 25: Open motor connection compartment

[1] Cover
[2] Screws for cover
[3] O-ring
[4] Cable gland

DANGER

Electric shock due to presence of hazardous voltage!

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

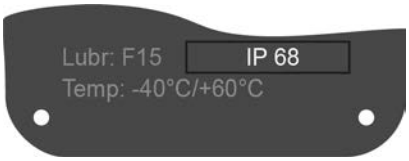
→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove cover [1].
   Information: The terminal compartment is designed for explosion protection Ex e (increased safety)

2. Insert cable gland suitable for connecting cable.
   Information: When selecting cable glands observe type of protection (with Ex e bzw. Ex d approval) and type of 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 26: Name plate, example with enclosure protection IP68



5.3.1.2. Motor cables: connect

Table 14:

Terminal cross sections and terminal tightening torques			
Type	Speed	Terminal cross sections	Tightening torques
SAEx 25.1 SAREx 25.1	4 – 22	0.5 – 16 mm^2	2.0 Nm
	32 – 90	2.5 – 35 mm^2	3.5 Nm
SAEx 30.1 SAREx 30.1	4 – 22	4 – 16 mm^2	1.2 – 2.4 Nm
	32 – 45	10 – 35 mm^2	4.0 – 5.0 Nm
	63 – 90	16 – 70 mm^2	6.0 – 12 Nm
SAEx 35.1	4 – 5.6	4 – 16 mm^2	1.2 – 2.4 Nm
	8 – 22	10 – 35 mm^2	4.0 – 5.0 Nm
	32 – 45	16 – 70 mm^2	6.0 – 12 Nm
SAEx 40.1	4 – 11	10 – 35 mm^2	4.0 – 5.0 Nm
	16 – 32	16 – 70 mm^2	6.0 – 12 Nm

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

⚠ WARNING

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

Risk of electric shock.

→ Connect all protective earth conductors.

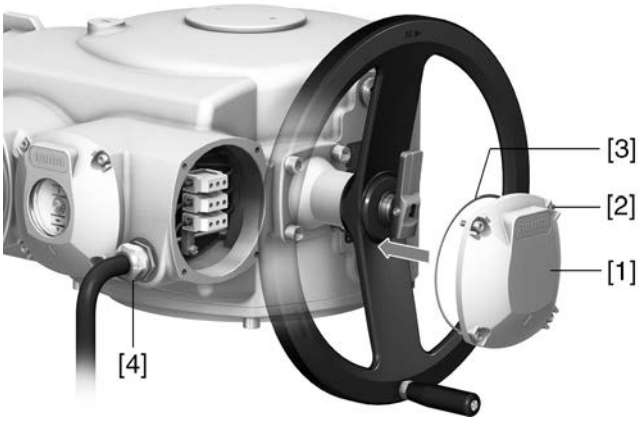
→ Connect PE connection to external protective earth conductor of connecting cables.

→ Start running the device only after having connected the protective earth conductor.

6. Firmly tighten protective earth to PE connection (symbol: ⏚).
7. For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).

5.3.1.3. Motor connection compartment: close

Figure 27: Close motor connection compartment



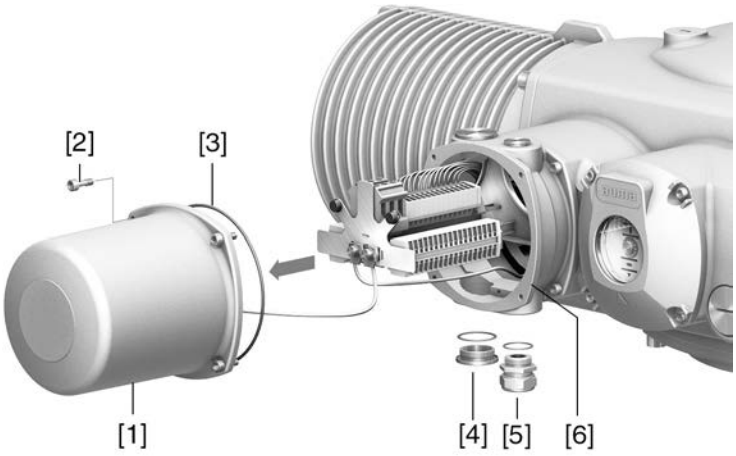
[1] Cover
[2] Screws for cover
[3] O-ring
[4] Cable gland

1. Clean sealing faces of cover [1] and housing.
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.

5.3.2. Electrical connection (K/KR)

5.3.2.1. Terminal compartment: open

Figure 28: Open terminal compartment (for control contacts)



[1] Cover
[2] Screws
[3] O-ring
[4] Blanking plugs
[5] Cable gland
[6] Terminal frame (KR) – option

DANGER

Electric shock due to presence of hazardous voltage!

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

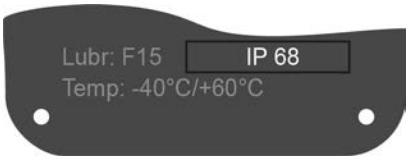
→ Disconnect device from the mains before opening.

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

   Information: The terminal compartment is designed in protection type Ex e (increased safety).

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 type of protection IP… stated on the name plate is only ensured if suitable cable glands are used.
   Figure 29: Name plate, example with enclosure protection IP68



   Information: For shielded cables: Use EMV cable glands.

3. Seal cable entries which are not used with approved plugs suitable for the required protection type.

5.3.2.2. Cable connection

Table 15:

Terminal cross sections and terminal tightening torques		
Type	Terminal cross sections	Tightening torques
Power terminals (U, V, W)	max. 10 mm² (flexible or solid)	1.5 – 1.8 Nm
PE connection	max. 10 mm² (flexible or solid)	3.0 – 4.0 Nm
Control contacts (1 to 50)	2.5 mm² (flexible or 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.
3. Strip wires.
4. For flexible cables: Use end sleeves according to DIN 46228.
5. Connect cables according to order-related wiring diagram.

⚠ WARNING

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

Risk of electric shock.

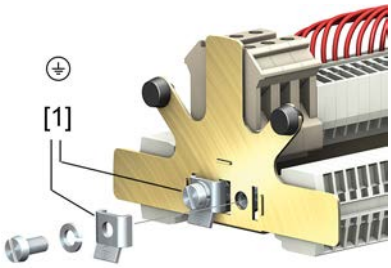
→ Connect all protective earth conductors.

→ 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 30: PE connection

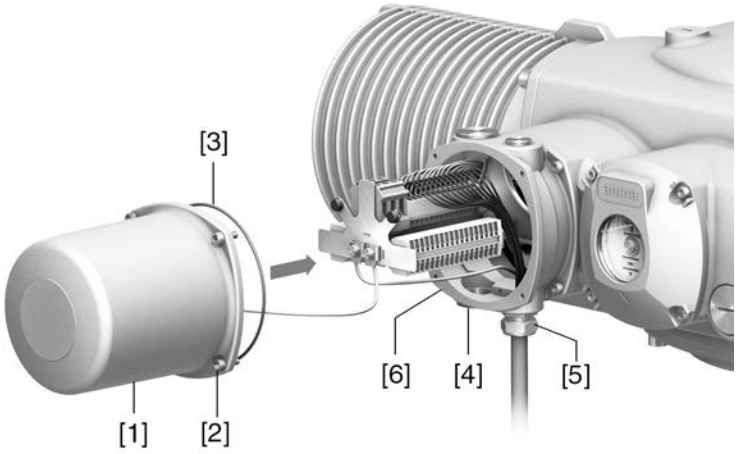


[1] U-bracket for PE connection

7. For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).

5.3.2.3. Terminal compartment: close

Figure 31: Close terminal compartment (for control contacts)



[1] Cover
[2] Screws
[3] O-ring
[4] Blanking plugs
[5] Cable gland
[6] Terminal frame (KR) – option

1. Clean sealing faces of cover [1] and terminal 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.

⚠ 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.

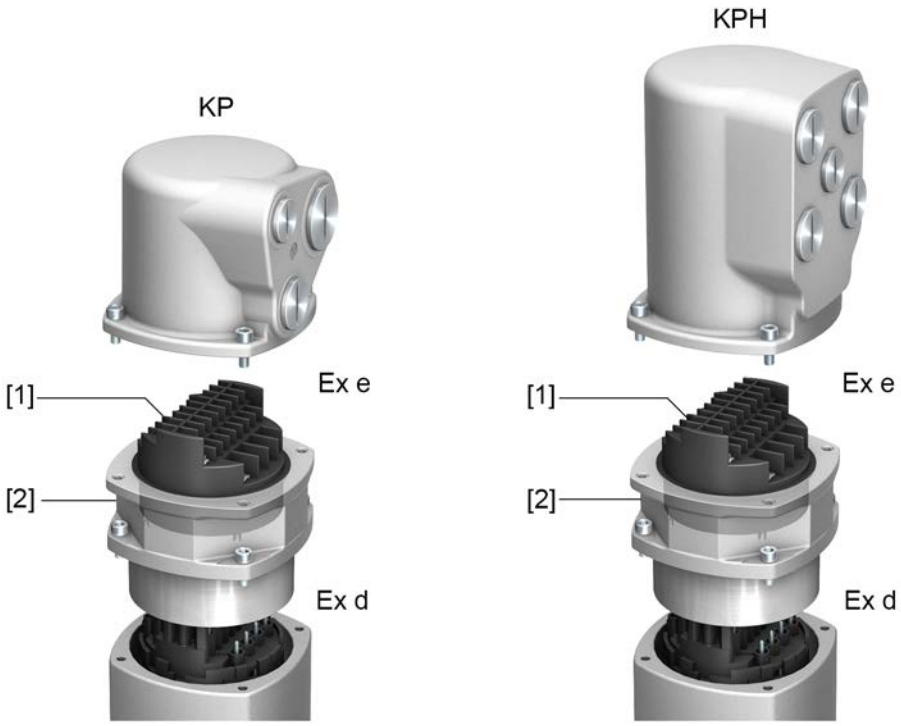
→ Do not jam cover during fitting.

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

5.4. Electrical connection of actuator controls

5.4.1. KP/KPH electrical connection

Figure 32: 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.

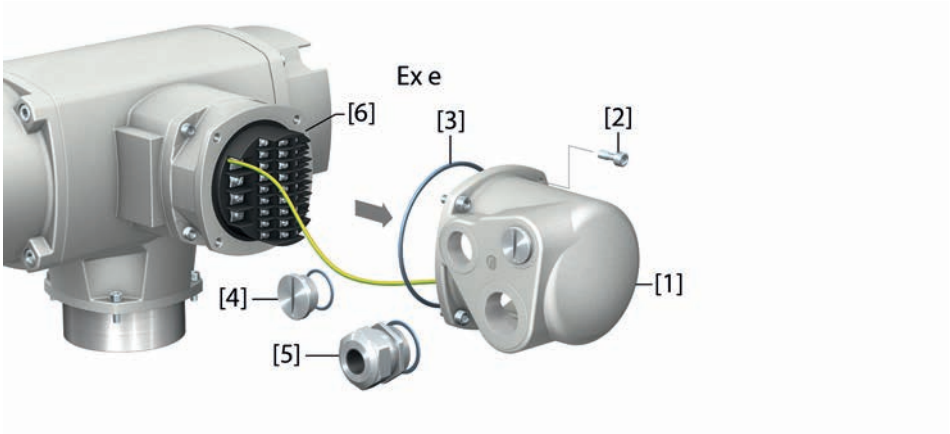
Technical data

Table 16:

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

5.4.1.1. Terminal compartment: open

Figure 33: 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

DANGER

Electric shock due to presence of hazardous voltage!

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

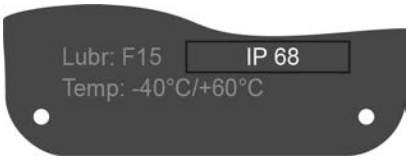
→ Disconnect device from the mains before opening.

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 34: 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.

5.4.1.2. Cable connection

Table 17:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U1, V1, W1) Protective earth connection ⏚ (PE)	With small clamp washers: 1.5 – 4.0 mm^2 (flexible or solid)	0.9 – 1.1 Nm
	With large clamp washers: 2.5 – 6 mm^2 (flexible or solid)	
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 mm^2: 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).

⚠ WARNING

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

Risk of electric shock.

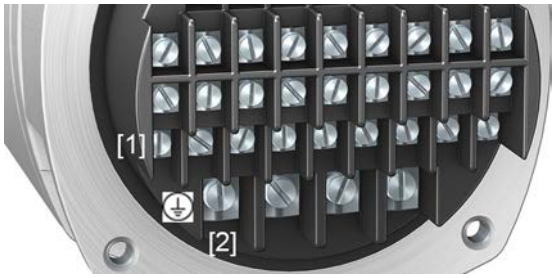
→ Connect all protective earth conductors.

→ 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.

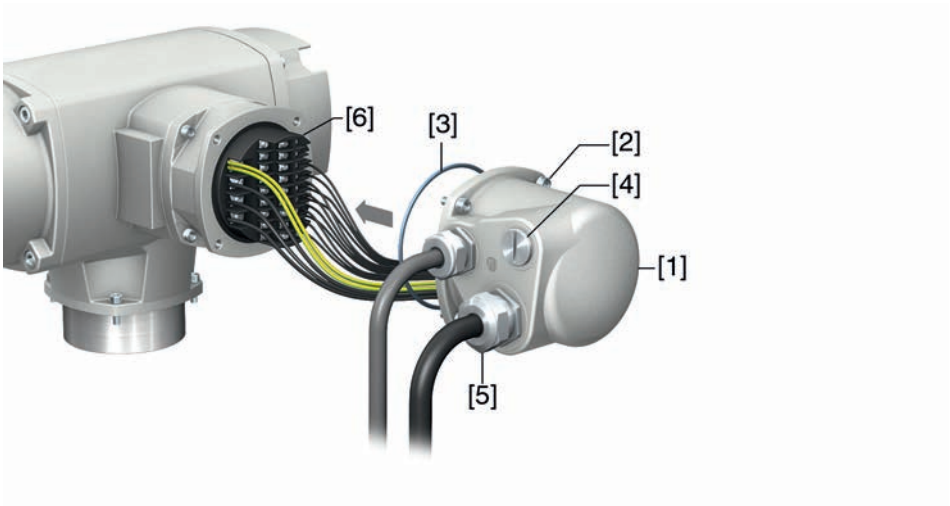
Figure 35: PE connection



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

5.4.1.3. Terminal compartment: close

Figure 36: Close terminal compartment



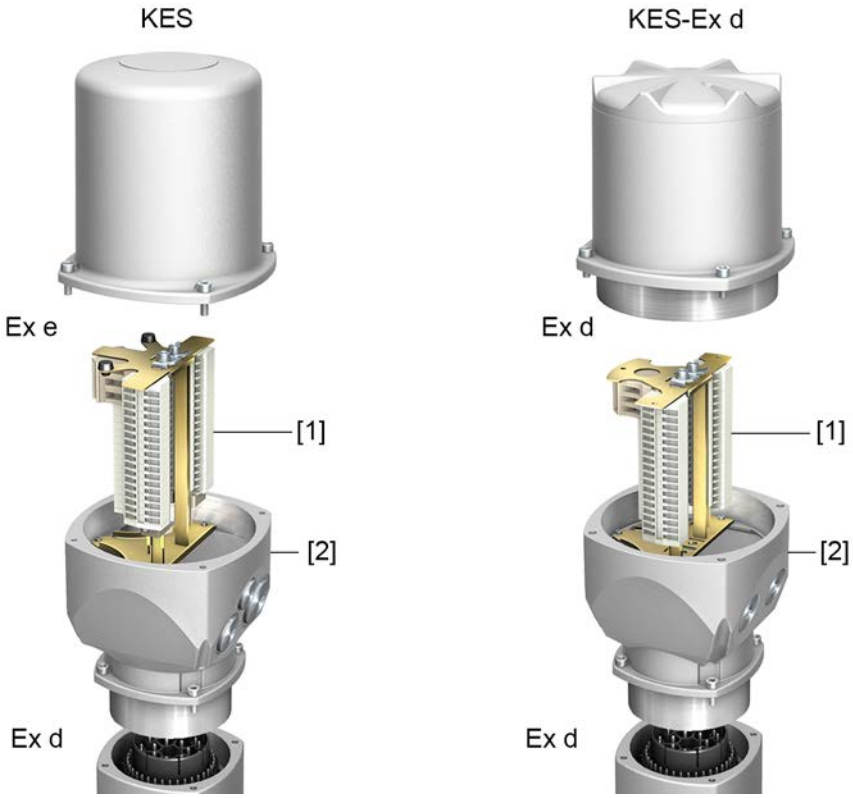
[1] Cover (figure shows KP version)
[2] Screws for cover
[3] O-ring
[4] Blanking plugs
[5] Cable gland
[6] Flameproof frame

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.

5.4.2. KES electrical connection

Figure 37: 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.

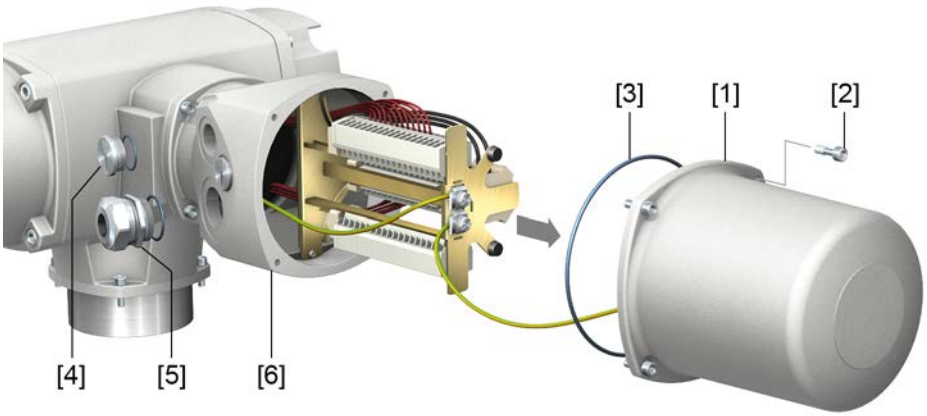
Technical data

Table 18:

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

5.4.2.1. Terminal compartment: open

Figure 38: 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

DANGER

Electric shock due to presence of hazardous voltage!

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

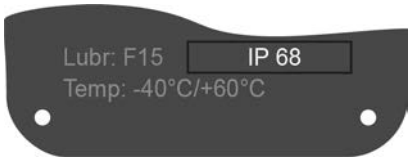
→ Disconnect device from the mains before opening.

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 39: 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.

5.4.2.2. Cable connection

Table 19:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U, V, W)	max. 10 mm² (flexible or solid)	1.5 – 1.8 Nm
PE connection	max. 10 mm² (flexible or solid)	3.0 – 4.0 Nm
Control contacts (1 to 50)	max. 2.5 mm² flexible, or max. 4 mm² 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.

⚠ WARNING

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

Risk of electric shock.

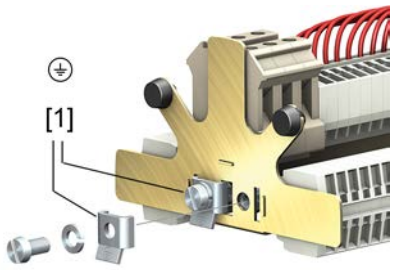
→ Connect all protective earth conductors.

→ 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: ⏚).

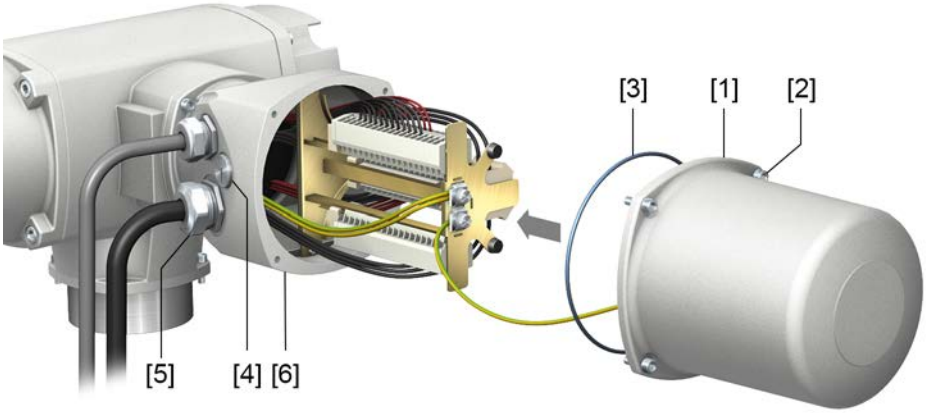
Figure 40: Protective earth (PE)



[1] U-bracket for PE connection

5.4.2.3. Terminal compartment: close

Figure 41: 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!

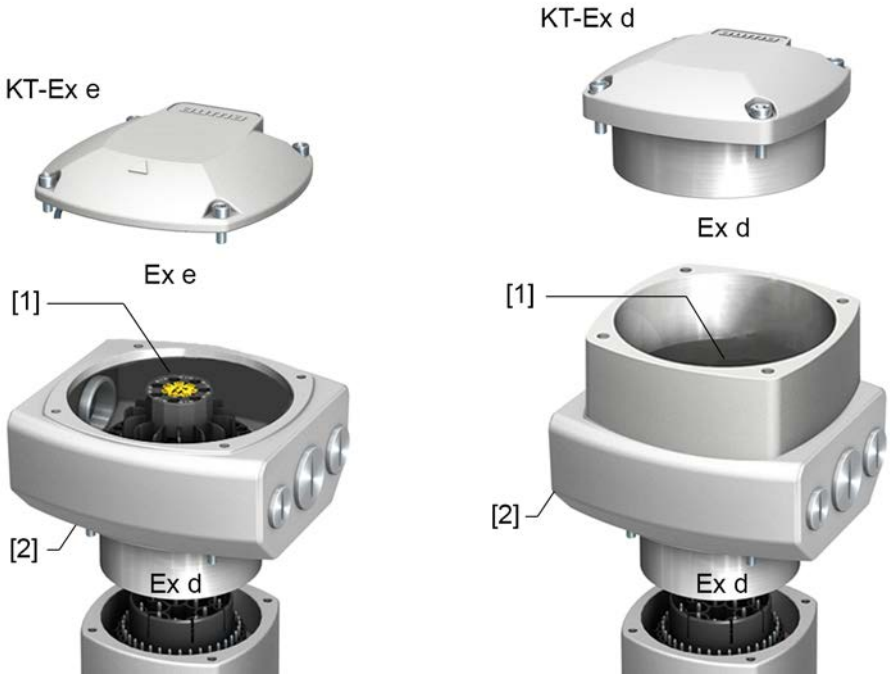
Risk of death or serious injury.

→ 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.

5.4.3. KT/KM electrical connection

Figure 42: 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

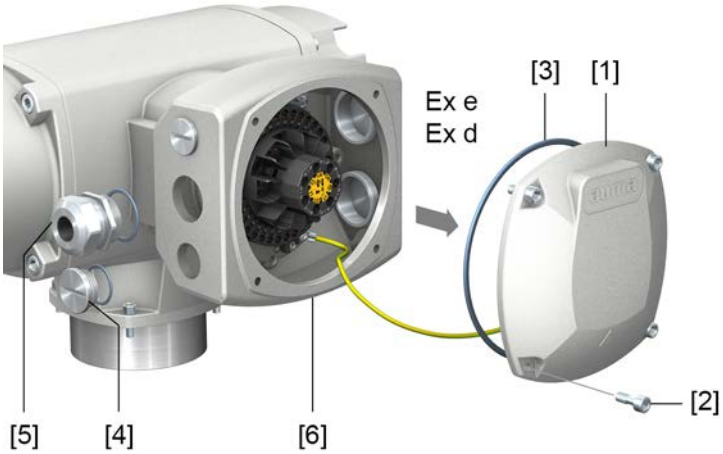
Table 20:

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.

5.4.3.1. Terminal compartment: open

Figure 43: Open 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 (example)
[6] KT-Ex e connection frame

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

DANGER

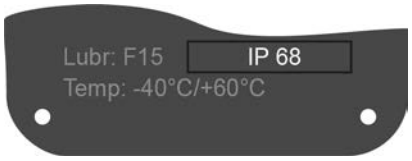
Electric shock due to presence of hazardous voltage!

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 44: 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.

5.4.3.2. Cable connection

Table 21:

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

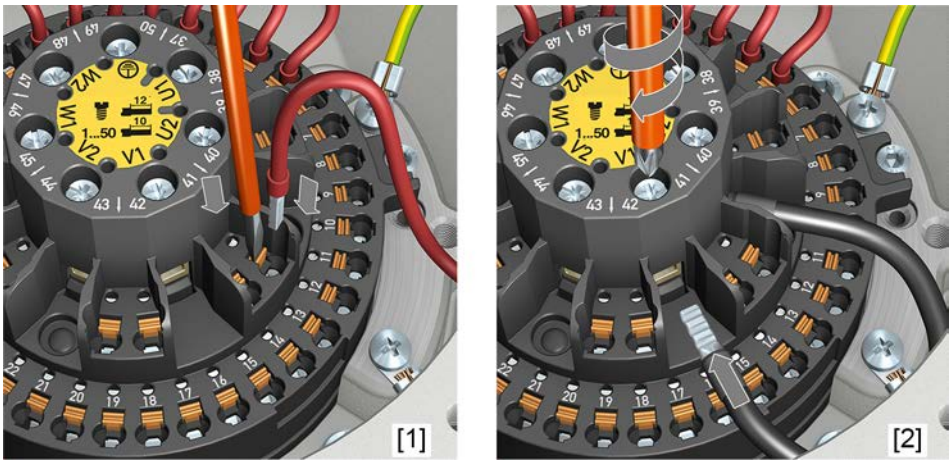
Procedure

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 (twin wire end sleeve).
6. Connect cables according to order-related wiring diagram.

Figure 45: 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.

⚠ WARNING

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

Risk of electric shock.

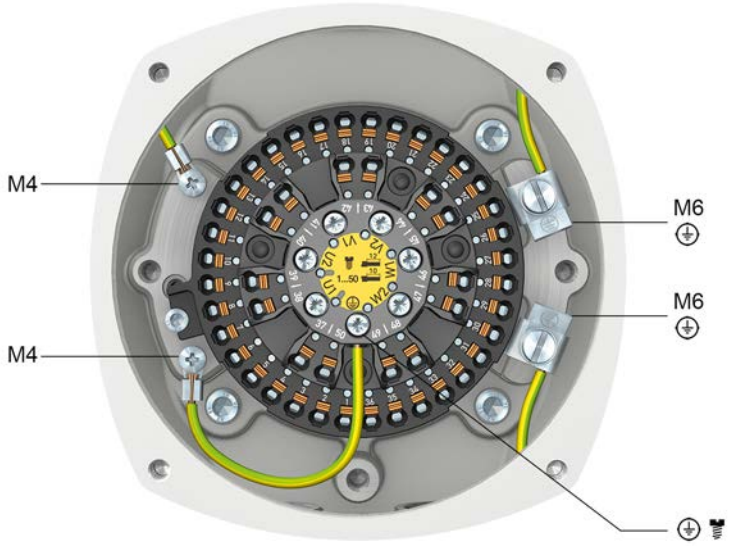
→ Connect all protective earth conductors.

→ 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 46: Protective earth connections within connection frame



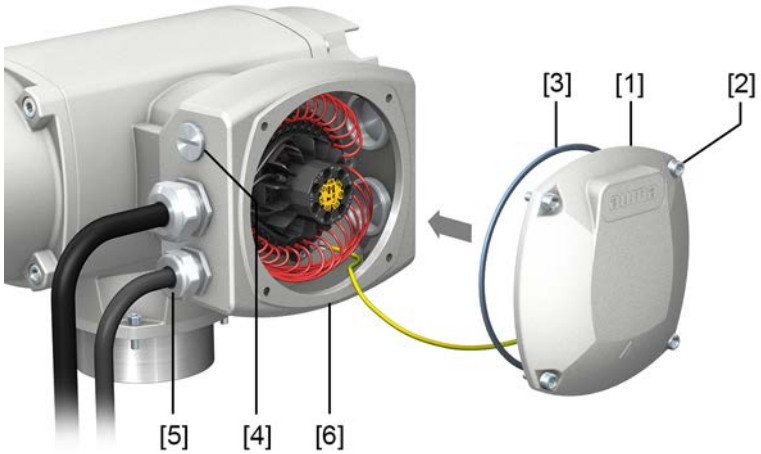
M6 Customer protective earth connection for M6 ring lug or with U-bracket for up to two wires.

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.

5.4.3.3. Terminal compartment: close

Figure 47: 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):

⚠ 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.

---

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

5.5. External earth connection

Figure 48: Earth connection for multi-turn actuator

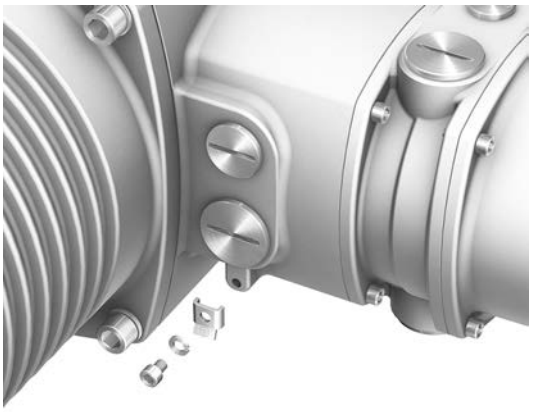


Figure 49: Earth connection for wall bracket

Application External earth connection (U-bracket) for connection to equipotential compensation.

Table 22:

Terminal cross sections and earth connection tightening torques		
Conductor type	Terminal cross sections	Tightening torques
Solid wire and stranded	6 mm² to 16 mm²	3 – 4 Nm
Fine stranded	4 mm² to 10 mm²	3 – 4 Nm
For fine stranded (flexible) wires, connection is made via cable lugs/ring terminals. When connecting two individual wires with a U-bracket, cross sections have to be identical.		

5.6. Accessories for electrical connection

5.6.1. Parking frame

Figure 50: Parking frame, example with Ex plug/socket connector and cover

Application

Parking frame for safe storage of a disconnected plug or cover.

For protection against touching the bare contacts and against environmental influences.

⚠ WARNING

Explosion hazard!

Risk of death or serious injury.

→ Prior to opening the device (removing the plug) ensure that the device is free of gas and voltage!

→ Do NOT switch on voltage in potentially explosive atmospheres.

6. Operation

6.1. Manual operation

For purposes of setting and commissioning, in case of motor or power failure, the actuator may be operated manually. Manual operation is engaged by an internal change-over mechanism.

6.1.1. Engage manual operation

Information

When using brake motors, note that the motor is disengaged during manual operation. For this reason, the brake motor cannot sustain any load during manual operation. The load must be sustained via the handwheel.

NOTICE

Damage at the change-over mechanism due to faulty operation!

→ Engage manual operation only during motor standstill.

→ Only pivot change-over lever manually.

→ Do NOT use extensions as lever for operation.

1. Pivot change-over lever manually to approx. 85° while slightly turning the handwheel back and forth until manual operation engages.

   Figure 51:

2. Release change-over lever (should snap back into initial position by spring action, if necessary, push it back manually).

   Figure 52:

3. Turn handwheel in desired direction.
   → To close the valve, turn handwheel clockwise:
   ➥ Drive shaft (valve) turns clockwise in direction CLOSE.

   Figure 53:

6.1.2. Manual operation: disengage

Manual operation is automatically disengaged when motor is started again. The handwheel does not rotate during motor operation.

6.2. Motor operation

NOTICE

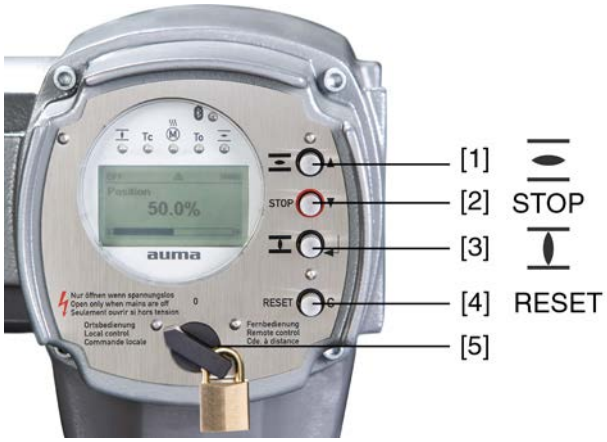
Valve damage due to incorrect basic setting!

→ 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 54: 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

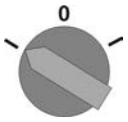
CAUTION

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

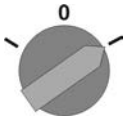
Risk of immediate actuator operation when switching on!

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).

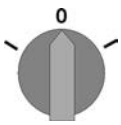
Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SET-POINT). For further information, please refer to the Manual (Operation and setting).

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)

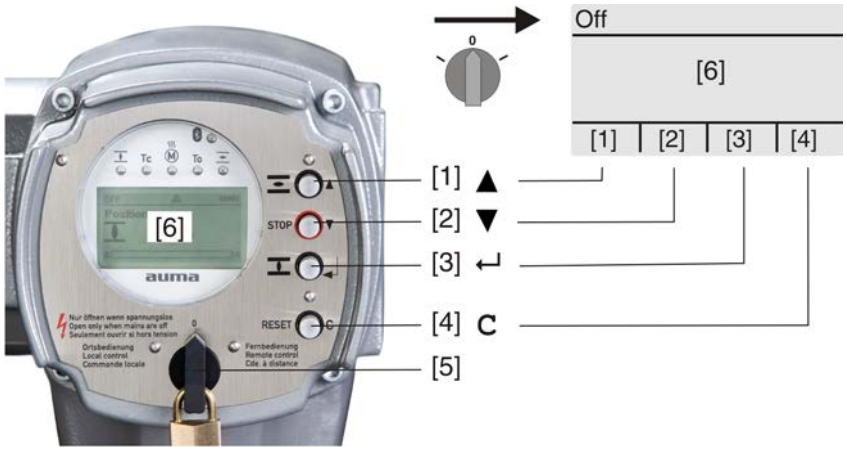
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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 55:



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

Table 23: 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

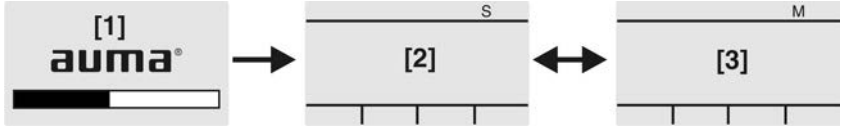
Backlight

- 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 56: Groups



[1] Startup menu
[2] Status menu
[3] Main menu

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

Figure 57: Marking with ID

S ID starts with S = status menu

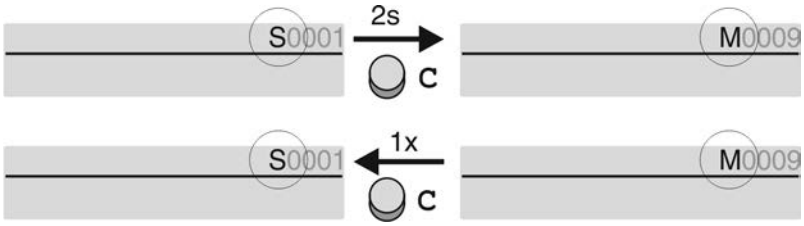
M ID starts with M = main menu

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 58: Select menu groups



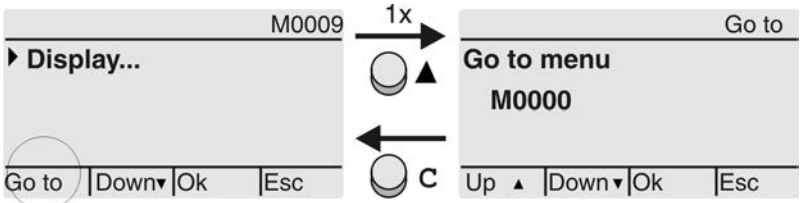
You return to the status menu if:

- 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 59: 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.

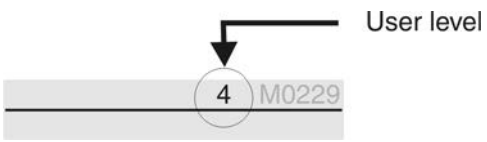
6.4. User level, password

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 60: 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 24:

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.

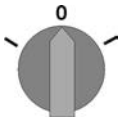
Example: If the user is signed in as Specialist (4), he/she can change passwords as for password levels (1) through (4).

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).

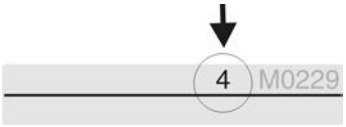


2. Press push button **C** Setup and hold it down for approx. 3 seconds.

➥ 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

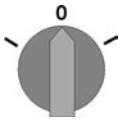
The display language can be selected.

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.

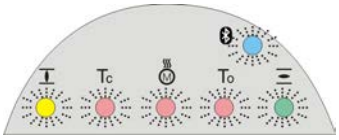
7. Indications

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 61: LED test



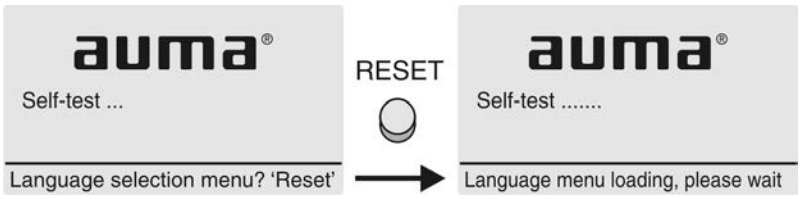
Language selection

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 62: Self-test

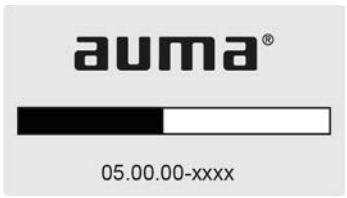


The language selection menu follows the startup menu.

Startup menu

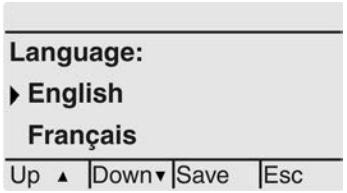
The current firmware version is displayed during the startup procedure:

Figure 63: 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 64: Language selection



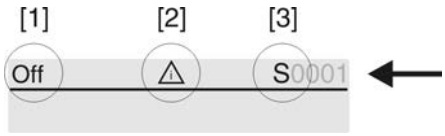
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

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 65: 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 66: 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

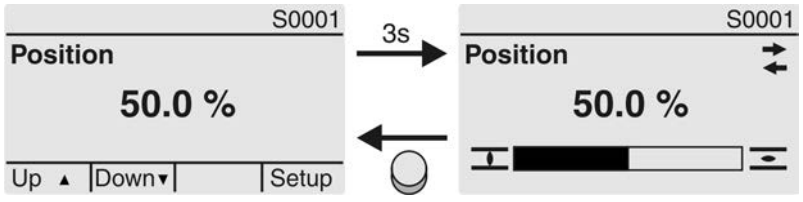
Display indications depend on the actuator version.

Valve position (S0001)

This indication is only available if a position transmitter (potentiometer, EWG, RWG or MWG) is installed in the actuator.

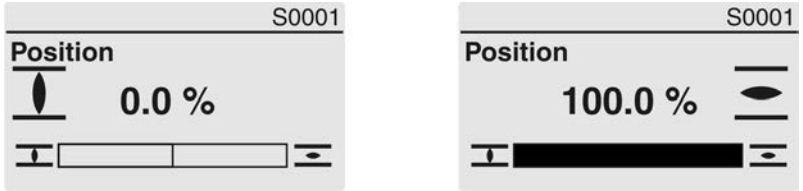
- S0001 on the display indicates the valve position in % of the travel.
- The bar graph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 67: Valve position and direction of operation



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

Figure 68: End position CLOSED/OPEN reached



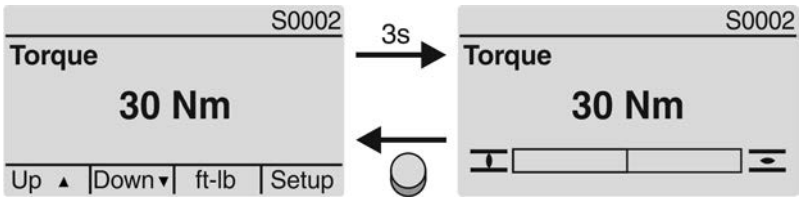
0% Actuator is in end position CLOSED
100% Actuator is in end position OPEN

Torque (S0002)

The indication is only available if the actuator is equipped with an MWG (magnetic limit and torque transmitter).

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

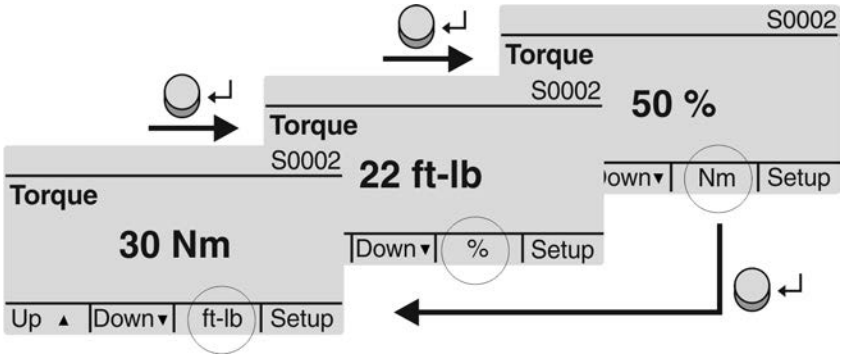
Figure 69: Torque



Select unit

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

Figure 70: 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:

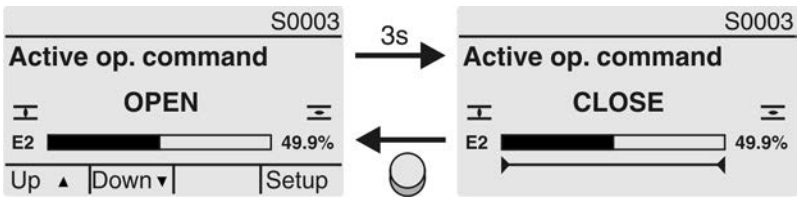
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bar graph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points 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 71: Display for OPEN - CLOSE control



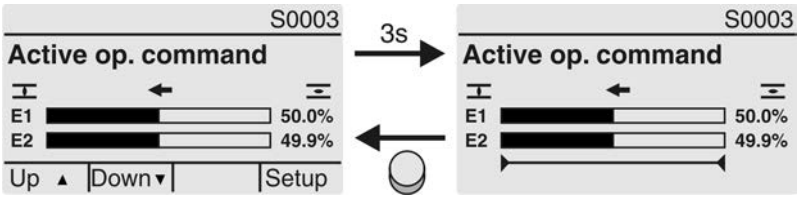
E2 Actual position value

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 72: Indication for setpoint control (positioner)



E1 Position setpoint

E2 Actual position value

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

Table 25: 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

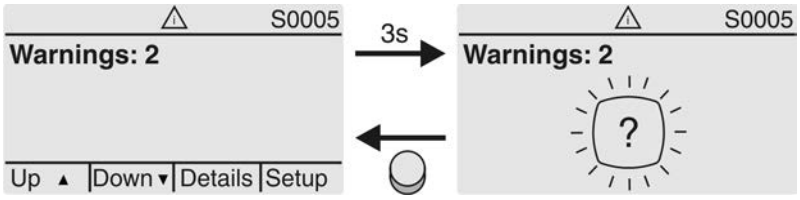
These indications are available if the parameter Diagnostic classific. M0539 is set to AUMA.

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 74: Warnings



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

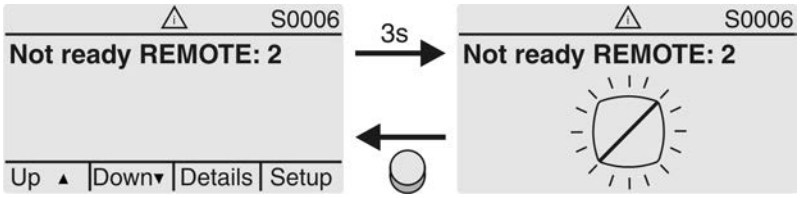
Not ready REMOTE (S0006)

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 75: Not ready REMOTE indications



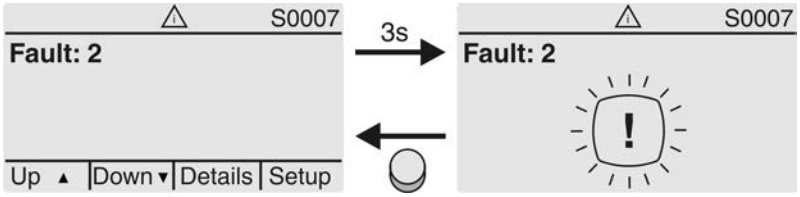
For further information, please also refer to <Corrective action>.

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 76: 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.

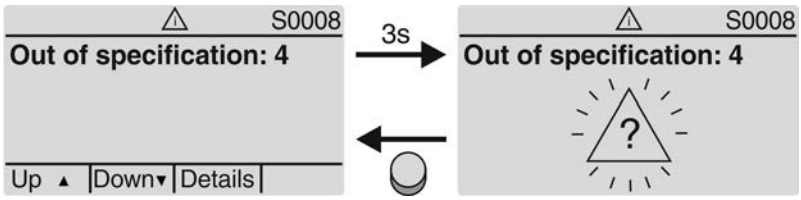
Out of Specification (S0008)

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 77: Out of specification



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

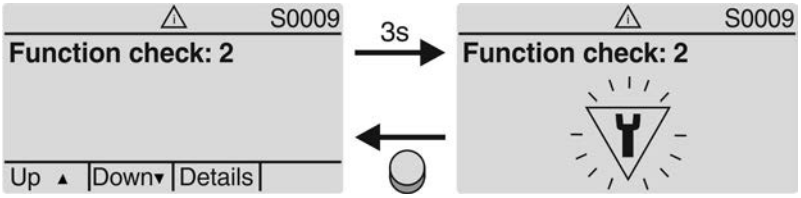
Function check (S0009)

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 78: Function check



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

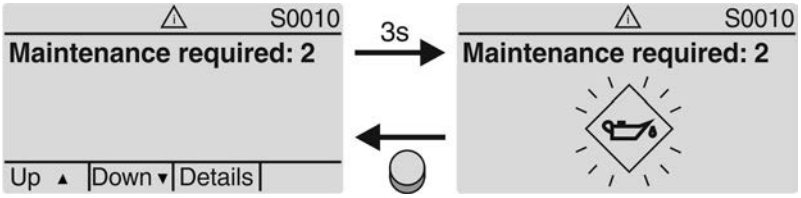
Maintenance required (S0010)

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 79: Maintenance required



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

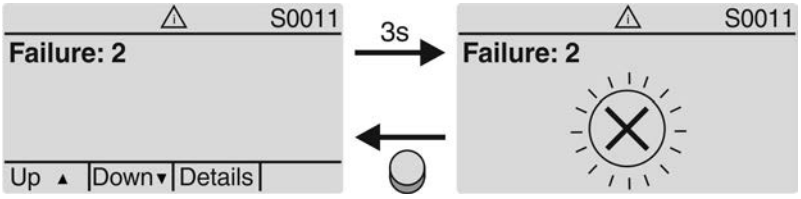
Failure (S0011)

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

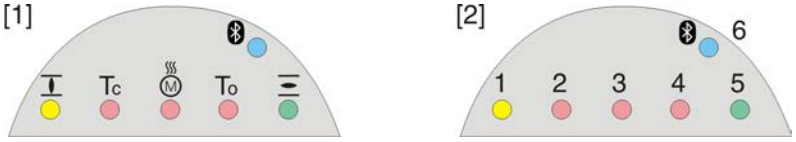
Figure 80: Failure



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

7.3. Indication lights of local controls

Figure 81: 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

Defaut 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).

7.4. Optional indications

7.4.1. Mechanical position indication via indicator mark

Figure 82: Mechanical position indicator

[1] End position OPEN reached
[2] End position CLOSED reached
[3] Indicator mark at cover

Characteristics

- Independent of power supply
- Used as running indication: Indicator disc rotates during actuator operation and continuously indicates the valve position
  (For “clockwise closing ” version, the symbols ⏤/⏥ rotate in counterclockwise direction for operations in direction CLOSE)
- Indicates that end positions (OPEN/CLOSED) have been reached
  (Symbols ⏤ (OPEN)/ ⏥ (CLOSED) point to the indicator mark ▲ at cover)

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 26: 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)

Requirements

If the actuator is equipped with a position transmitter (potentiometer, RWG or EWG), an analogue position feedback signal is available.

Valve position

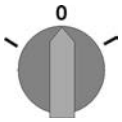
Signal: E2 = 0/4 – 20 mA (galvanically isolated)

Designation in the wiring diagram: AOUT1 (position) AOUT2 (position)

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 °C.

3. Perform basic settings.

9.1. Heat-up time for low temperature version

Please note that for low temperature versions, the controls require a heat-up time.

This heat-up time applies if both actuators and actuator controls are not live and temperature falls below the permissible operation and storage temperature of –30 °C. Under these conditions and after connection to the voltage supply, the following heat-up times must be complied with prior to commissioning:

For –30 °C = 5 min.

For –40 °C = 40 min.

For –60 °C = 80 min.

9.2. 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

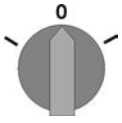
Setting values:

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
6. Press ↵ Edit.
   ➥ Display indicates: ▸ Specialist (4)

User login

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 ▸.

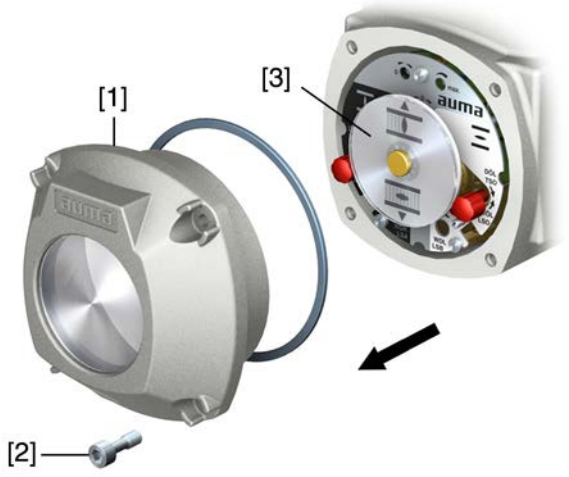
Change settings

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.

9.3. Switch compartment: open

The switch compartment must be opened to perform the following settings.

1. Loosen screws [2] and remove cover [1] from the switch compartment.



2. If indicator disc [3] is available:

   Remove indicator disc [3] using a spanner (as lever).
   Information: To avoid damage to paint finish, use spanner in combination with soft object, e.g. fabric.

9.4. 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.

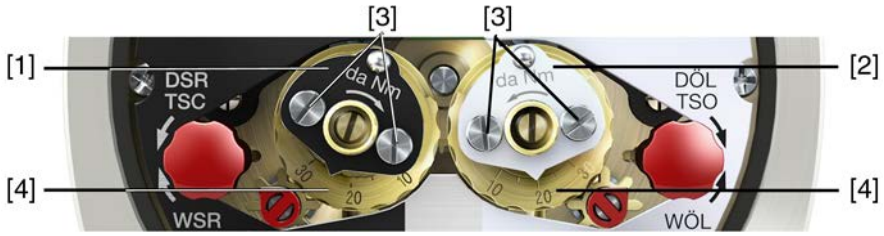
NOTICE

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.

Figure 83: Torque measuring heads



[1] Torque switching head black in direction CLOSE
[2] Torque switching head white in direction OPEN
[3] Lock screws
[4] Torque dials

1. Loosen both lock screws [3] at the indicator disc.
2. Turn torque dial [4] to set the required torque (1 da Nm = 10 Nm). Example:

- Black torque switching head set to approx. 25 da Nm ≙ 250 Nm for direction CLOSE
- White torque switching head set to approx. 20 da Nm ≙ 200 Nm for direction OPEN

3. Fasten lock screws [3] again.

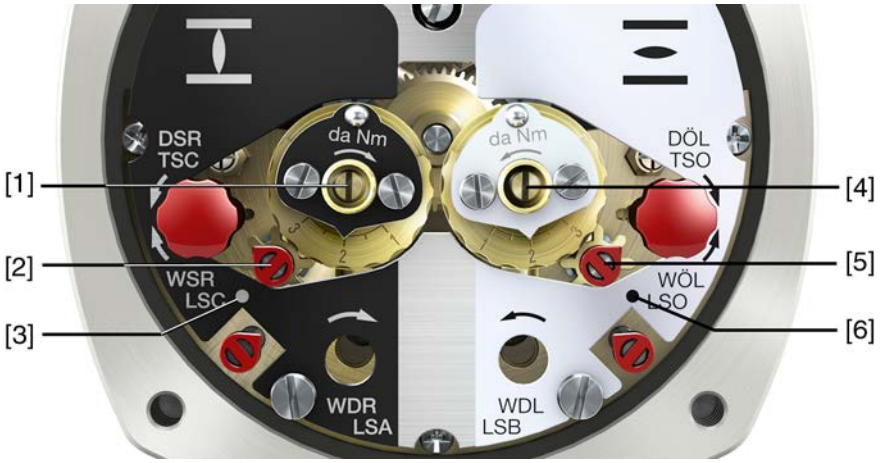
   Information: Maximum tightening torque: 0.3 – 0.4 Nm

➥ The torque switch setting is complete.

9.5. Limit switching: set

The limit switching records the travel. When reaching the preset position, switches are operated.

Figure 84: Setting elements for limit switching



Black section:

[1] Setting spindle: End position CLOSED

[2] Pointer: End position CLOSED

[3] Mark: End position CLOSED is set

White section:

[4] Setting spindle: End position OPEN

[5] Pointer: End position OPEN

[6] Mark: End position OPEN is set

9.5.1. End position CLOSED (black section): set

1. Engage manual operation.
2. Turn handwheel clockwise until valve is closed.
3. Turn handwheel by approximately half a turn (overrun) in the opposite direction.
4. **Press down** and turn setting spindle [1] with screw driver in direction of the arrow and observe the pointer [2]: While a ratchet click is felt and heard, the pointer [2] moves 90° every time.
5. As soon as the pointer [2] is 90° from mark [3]: Continue turning slowly.
6. As soon as the pointer [2] moves to mark [3]: Stop turning and release setting spindle.

➥ The end position CLOSED setting is complete.

7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.5.2. End position OPEN (white section): set

1. Engage manual operation.
2. Turn handwheel counterclockwise until valve is open.
3. Turn handwheel by approximately half a turn (overrun) in the opposite direction.
4. **Press down** and turn setting spindle [4] with screw driver in direction of the arrow and observe the pointer [5]: While a ratchet click is felt and heard, the pointer [5] moves 90° every time.
5. As soon as the pointer [5] is 90° from mark [6]: Continue turning slowly.
6. As soon as the pointer [5] moves to mark [6]: Stop turning and release setting spindle.

➥ The end position OPEN setting is complete.

7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.6. Test run

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

9.6.1. Direction of rotation at mechanical position indicator: 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.

Information Switch off before reaching the end position.

1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Switch on actuator in direction CLOSE and observe the direction of rotation on the mechanical position indication:

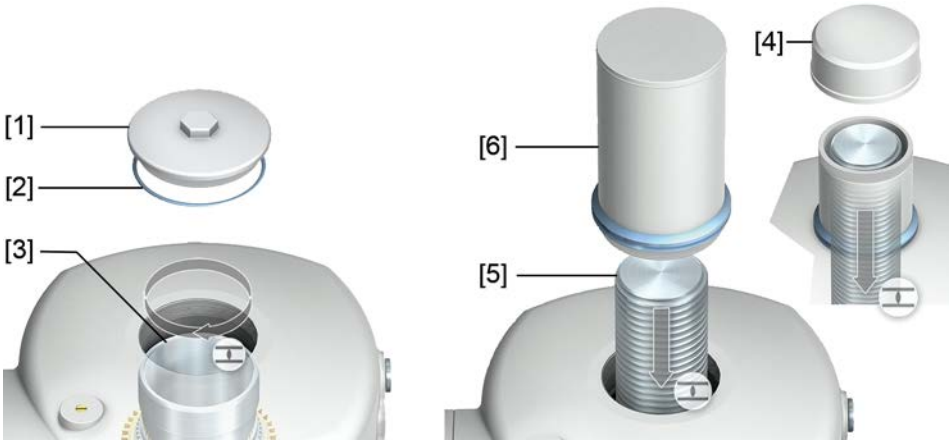
   → **For mechanical position indication via indicator mark:** (not self-adjusting)

   ➥ The direction of rotation is correct if the actuator operation in direction **CLOSE** and the symbols (▽/△) turn **counterclockwise**:

   Figure 85: Direction of rotation ▽/△ (for “clockwise closing version”)

9.6.2. Direction of rotation at hollow shaft/stem: check

Figure 86: Direction of rotation of the hollow shaft/stem for operation in direction CLOSE (“clockwise closing” version)



[1] Threaded plug
[2] Seal
[3] Hollow shaft
[4] Protective cap for stem protection tube
[5] Stem
[6] Stem protection tube

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.

Check direction of rotation

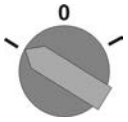
1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Depending on the version: Unscrew threaded plug [1] with seal [2], protective cap [4] or stem protection tube [6].
3. Switch on actuator in direction CLOSE and observe direction of rotation at hollow shaft [3] or stem [5]:

➥ The direction of rotation is correct if the actuator moves in direction **CLOSE** and the hollow shaft in **clockwise** direction, or the stem moves downward.

4. Correctly fit/screw on threaded plug [1] with seal [2], protective cap [4] for stem protection tube [6], fasten thread.

9.6.3. 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.

9.6.4. Reference operation position feedback: perform

For actuators with position feedback (RWG, potentiometer), a reference operation has to be performed once the limit switching setting was changed to ensure that the position feedback (0/4 – 20 mA) supplies correct values:

→ Operate actuator electrically (via the push buttons OPEN and CLOSE of the local controls) once to end position OPEN and once to end position CLOSED.

9.7. Switch compartment: close

✔ If options (e.g. potentiometer, position transmitter) are available: Only close switch compartment once all optional equipment has been successfully set.

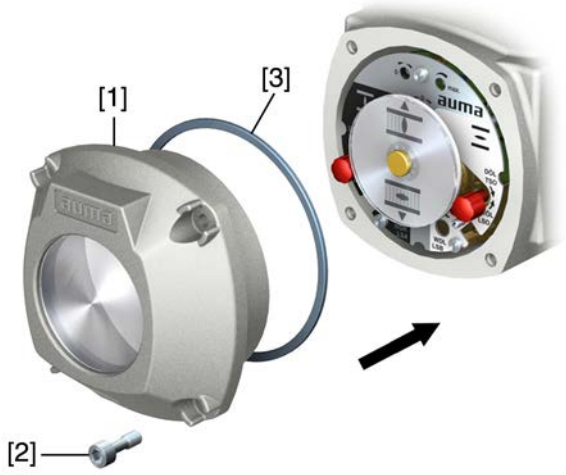
NOTICE

Corrosion due to damage to paint finish

→ Touch up damage to paint finish after work on the device.

1. Clean sealing faces of housing and cover.
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.

   Figure 87:



4. Place cover [1] on switch compartment.
5. Fasten screws [2] evenly crosswise.

10. Commissioning (optional equipment settings)

10.1. Potentiometer

The potentiometer is used as travel sensor and records the valve position.

Setting elements

The potentiometer is housed in the actuator switch compartment. The switch compartment must be opened to perform any settings. Refer to <Switch compartment: open>.

Setting is made via potentiometer [1].

Figure 88: View on control unit

[1] Potentiometer

10.1.1. Potentiometer: set

Information

Due to the ratio of the reduction gearing, the complete resistance range/stroke is not always covered. Therefore, external adjustment (setting potentiometer) must be provided.

1. Move valve to end position CLOSED.
2. Turn potentiometer [1] clockwise to the stop.

➥ End position CLOSED corresponds to 0 %

➥ End position OPEN corresponds to 100 %

3. Turn potentiometer [1] slightly in opposite direction.
4. Perform fine-tuning of the zero point at external setting potentiometer (for remote indication).

10.2. RWG electronic position transmitter

The electronic position transmitter RWG records the valve position. On the basis of the actual position value measured by the potentiometer (travel sensor), it generates a current signal between 4 – 20 mA.

Information

RWG 5020 Ex electronic position transmitter is designed as an intrinsically safe electric circuit Ex ib according to IEC 60079-11.

⚠ WARNING

Intrinsically safe electric circuit, risk of explosion!

Risk of death or serious injury.

→ Observe the applicable installation regulations relating to explosion protection when connecting.

→ Do NOT lead cables via the connections of AUMA actuator controls.

Technical data

Table 27: RWG 5020

Data	2-wire system
Output current I_a	4 – 20 mA
Power supply U_V [1)]	10 – 28.5 V DC
Short-circuit current I_K [1)]	< 200 mA
Power P [1)]	< 0.9 W
Max. load R_B	(U_V – 10 V)/20 mA
Impact of power supply	0.1 %
Load influence	0.1 % (R_B = 0...600 Ω)
Temperature impact	< 0.1 ‰/K
Transmitter potentiometer	5 k
Ambient temperature	– 60 °C [2)]/–40 °C bis +60 °C [3)]
Explosion protection	II2G Ex ib IIC T4
EC type test certificate	PTB 03 ATEX 2176

1) Power supply via external, intrinsically safe (Ex ia or Ex ib) power supply unit with type test certificate meeting the technical requirements of RWG 5020 Ex.
2) For heater in switch compartment
3) Ambient temperature depending on temperature range of the actuator: Refer to name plate

Setting elements

The RWG is housed in the actuator switch compartment. The switch compartment must be opened to perform any settings. Refer to <Switch compartment: open>.

Setting is made via three potentiometers [1], [2] and [3].

Figure 89: View on control unit when switch compartment is open

[1] Potentiometer (travel sensor)
[2] Potentiometer min. (4 mA)
[3] Potentiometer max. (20 mA)
[4] Measuring points 4 – 20 mA

The output current (measuring range 0 – 20 mA) can be checked at the measuring points [4].

10.2.1. Measuring range: set

For measuring range setting, voltage must be applied at the position transmitter.

1. Move valve to end position CLOSED.
2. Connect measuring equipment for 0 – 20 mA to the measuring points [4].
3. Turn potentiometer [1] clockwise to the stop.
4. Turn potentiometer [1] slightly in opposite direction.
5. Turn potentiometer [2] clockwise until output current starts to increase.
6. Turn back potentiometer [2] until a value of approx. 4.1 mA is reached.

➥ This ensures that the signal remains above the dead and live zero point.

7. Move valve to end position OPEN.
8. Set potentiometer [3] to end value 20 mA.

9. Approach end position CLOSED anew and check minimum value (4.1 mA). If necessary, correct the setting.

Information If the maximum value cannot be reached, the selection of the reduction gearing must be checked.

10.3. Intermediate positions: set

Actuators equipped with DUO limit switching contain two intermediate position switches. One intermediate position may be set for each running direction.

Figure 90: Setting elements for limit switching

Black section:

[1] Setting spindle: Running direction CLOSE

[2] Pointer: Running direction CLOSE

[3] Mark: Intermediate position CLOSED is set

White section:

[4] Setting spindle: Running direction OPEN

[5] Pointer: Running direction OPEN

[6] Mark: Intermediate position OPEN is set

Information After 177 turns (control unit for 2 – 500 turns/stroke) or 1,769 turns (control unit for 2 – 5,000 turns/stroke), the intermediate switches release the contact.

10.3.1. Running direction CLOSE (black section): set

1. Move valve in direction CLOSE to desired intermediate position.
2. If you override the tripping point inadvertently: Turn valve into the opposite direction and approach intermediate position again in direction CLOSE.

   Information: Always approach the intermediate position in the same direction as in later electrical operation.
3. **Press down** and turn setting spindle [1] with screw driver in direction of the arrow and observe the pointer [2]: While a ratchet click is felt and heard, the pointer [2] moves 90° every time.
4. As soon as the pointer [2] is 90° from mark [3]: Continue turning slowly.
5. As soon as the pointer [2] moves to mark [3]: Stop turning and release setting spindle.

➥ The intermediate position setting in running direction CLOSE is complete.

6. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

10.3.2. Running direction OPEN (white section): set

1. Move valve in direction OPEN to desired intermediate position.

2. If you override the tripping point inadvertently: Move valve in opposite direction and approach intermediate position again in direction OPEN (always approach the intermediate position in the same direction as in later electrical operation).
3. **Press down** and turn setting spindle [4] with screw driver in direction of the arrow and observe the pointer [5]: While a ratchet click is felt and heard, the pointer [5] moves 90° every time.
4. As soon as the pointer [5] is 90° from mark [6]: Continue turning slowly.
5. As soon as the pointer [5] moves to mark [6]: Stop turning and release setting spindle.

➥ The intermediate position setting in running direction OPEN is complete.

6. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

10.4. Mechanical position indicator: set

1. Fit indicator disc onto shaft.
2. Move valve to end position CLOSED.
3. Turn lower indicator disc until symbol ⊥ (CLOSED) is in alignment with the ▲ mark on the cover.

4. Move actuator to end position OPEN.
5. Hold lower indicator disc in position and turn upper disc with symbol ⊤ (OPEN) until it is in alignment with the ▲ mark on the cover.

6. Move valve to end position CLOSED again.
7. Check settings:

   If the symbol ⊥ (CLOSED) is no longer in alignment with ▲ mark on the cover:

   7.1 Repeat setting procedure.

   7.2 Check whether the appropriate reduction gearing has been selected, if required.

11. Corrective action

11.1. Faults during commissioning

Table 28:

Faults during operation/commissioning		
Fault	Description/cause	Remedy
Mechanical position indicator cannot be set.		Exchange reduction gearing.
In spite of correct setting of mechanical limit switching, actuator operates into the valve or actuator end position.	The overrun was not considered when setting the limit switching. The overrun is generated by the inertia of both the actuator and the valve and the delay time of the actuator controls.	• 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)
Measuring range 0/4 – 20 mA or maximum value 20 mA at position transmitter cannot be set or supplies an incorrect value.	Reduction gearing is not suitable for turns/stroke of the actuator.	Exchange reduction gearing.
Limit and/or torque switches do not trip.	Switch is defective or switch setting is incorrect.	Check setting, if required, reset end positions. Refer to <Check switches> and replace the switches if required.

Switch check

The red test buttons [1] and [2] are used for manual operation of the switches:

1. Turn test button [1] in direction of the TSC arrow: Torque switch CLOSED trips.
2. Turn test button [2] in direction of the TSO arrow: Torque switch OPEN trips.

If the actuator is equipped with a DUO limit switching (option), the intermediate position switches (LSA and LSB) will be operated at the same time as the torque switches.

1. Turn test button [1] in direction of the LSC arrow: Limit switch CLOSED trips.
2. Turn test button [2] in direction of the LSO arrow: Limit switch OPEN trips.

11.2. 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 29:

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 30:

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	• 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	• 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: • 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.

Warnings and Out of specification		
Indication on display	Description/cause	Remedy
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. • 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.	• 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 fault[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 31:

Faults and Failure		
Indication on display	Description/cause	Remedy
Configuration error	Collective signal 11: Configuration error has occurred.	Drucktaster ↵ Details drücken, um Einzelmeldungen zu sehen. For a description of the individual signals, refer to Manual (Operation and setting).
Config. error REMOTE	Collective signal 22: Configuration error has occurred.	Drucktaster ↵ Details drücken, um Einzelmeldungen zu sehen. 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: • Issue operation command in direction OPEN. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.

Faults and Failure		
Indication on display	Description/cause	Remedy
Torque fault OPEN	Torque fault in direction OPEN	Perform one of the following measures: • Issue operation command in direction CLOSE. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.
Phase fault	• 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.	• Check mains voltage. For 3-phase/1-phase AC current, the permissible variation of the mains voltage is ±10 % (option ±30 %). The permissible variation of the mains voltage is ±5 % • Check parameter Tripping time M0172, extend time frame if required.
Thermal fault	Motor protection tripped	• Cool down, wait. • If the fault indication display persists after cooling down: - 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.
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:	Drucktaster ↵ Details drücken, um Einzelmeldungen zu sehen. 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 32:

Not ready REMOTE and Function check (collective signal 04)		
Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: • Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SETPOINT operation simultaneously) • A setpoint is present and the positioner is not active	• Check operation commands (reset/clear all operation commands and send one operation command only). • Set parameter Positioner to Function active. • Check setpoint. Drucktaster ↵ Details drücken, um Einzelmeldungen zu sehen. 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.	• 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.	• 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

11.3. Fuses

11.3.1. Fuses within the actuator controls

F1/F2

Table 33:

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 34:

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 35:

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)

11.3.2. Fuse replacement

11.3.2.1. Replace fuses F1/F2

Information: Only valid for version with electrical connection of KES or KT type

DANGER

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. Remove electrical connection from actuator controls.

Figure 91:

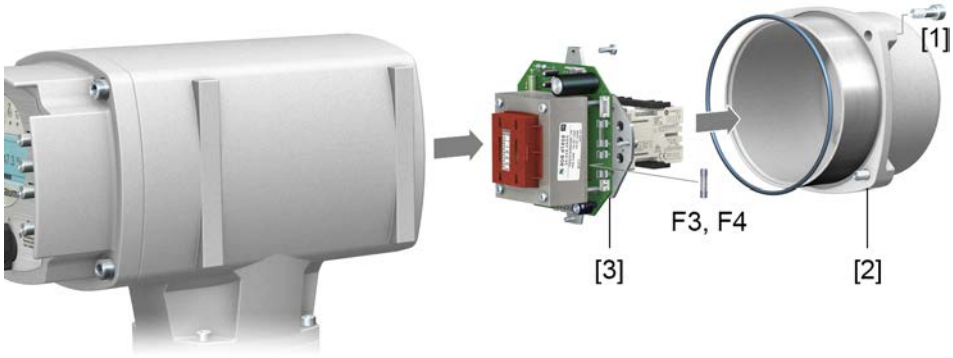
2. Pull fuse holder out of pin carrier, open fuse cover and replace old fuses by new ones.

11.3.2.2. Test/replace fuses F3/F4

Information: For version with electrical connection type KP/KPH, the fuses (F1/F2) are also located on the PSU board.

1. Loosen screws [1] and remove cover [2] on the rear of the actuator controls.

   Figure 92:



Check fuses.

2. The power supply unit has measurement points (solder pins) allowing to perform a resistance (continuity) measurement:

Table 36:

Checking	Measuring points
F1	MTP1 – MTP2
F2	MTP3 – MTP4
F3	MTP5 – MTP6
F4	MTP7 – MTP8

3. To replace defective fuses: Carefully loosen power supply unit [3] and pull out. (The fuses are on the equipped part of the power supply board.)

NOTICE

Cable damage due to pinching!

Risk of functional failures.

→ Carefully assemble power supply unit to avoid pinching the cables.

11.3.3. Fuses within the control box

DANGER

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. Open control box.
2. Set disconnect switch [Q1] to position ⊘ (OFF).
3. Loosen screws [1] until the cover may be turned to open the flameproof enclosure.

   Information: A rod can be placed in the grooves of the cover to facilitate opening.

Figure 93: Control box

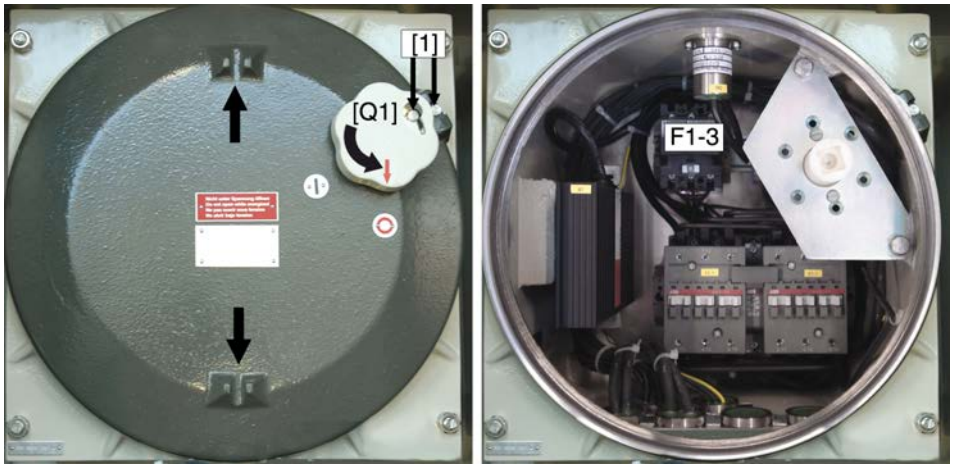


Table 37:

Fuses	Description
F1–3	Isolating switch (3-pole) Size/type: 10 x 38 mm aM 16 A, slow-blow, 500 V
Further compontents	
K2.1/K1.1	Contactors
Q1	Disconnect switch (3-pole)
R6.1 H (option) R6.2 H (option)	Heaters for control box, 100 W each
R7 H (option)	Heater for flameproof enclosure, 100 W
TR1 (Option) TR2 (Option)	Thermostat for heaters within the control box 14 °C/4 °C Thermostat for heater within the flameproof enclosure 14 °C/4 °C

11.3.4. 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 trippped) 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 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 ▷ Diagnostic 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.

12. Servicing and maintenance

CAUTION

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

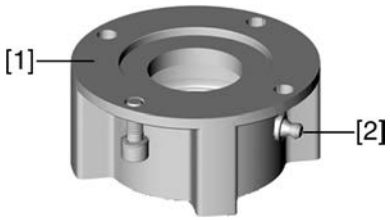
AUMA offers extensive service such as servicing and maintenance as well as customer product training. For the relevant contact addresses, please refer to <Addresses> in this document or to the Internet (www.auma.com)

12.1. 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, screw plugs, blanking plugs, etc. have to be checked for correct fit and sealing. If required, tighten cable glands and blanking plugs with torque in compliance with the manufacturer's specifications.
- 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.
- For devices with output drive type A: Press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with a grease gun.
  Figure 94: Output drive type A



[1] Output drive type A
[2] Grease nipple

- Lubrication of the valve stem must be done separately.
  Exception: For output drive type A in version with stem lubrication (option), the stem is lubricated together with the output drive.

Table 38:

Grease quantities for bearing of output drive type A				
Output drive type	A 25.2	A 30.2	A 35.2	A 40.2
Quantity [g] 1)	30	40	50	60

1) For grease with density r = 0.9 kg/dm³

For enclosure protection IP68

After submersion:

- Check actuator.
- In case of ingress of water, locate leaks and repair. Dry device correctly and check for proper function.

12.2. 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.

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

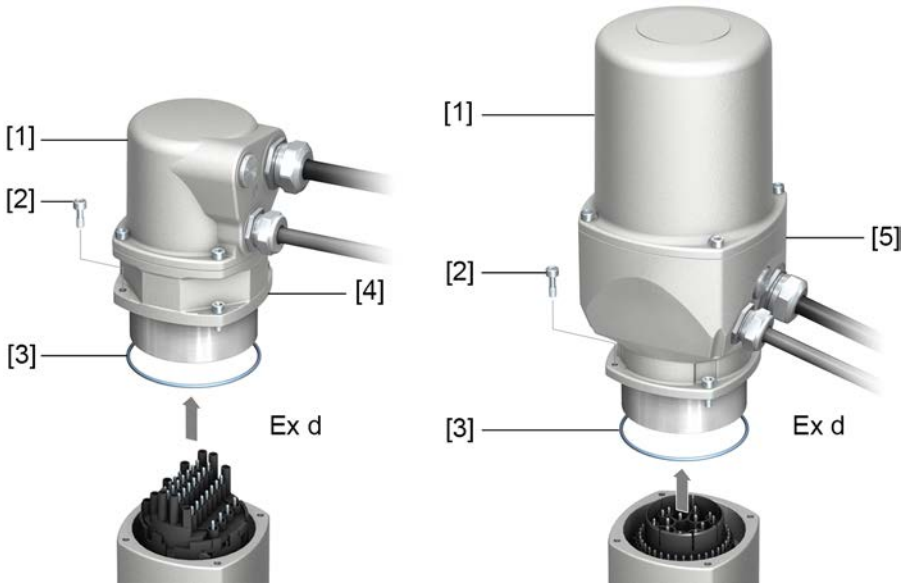
⚠ WARNING

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 95: 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.

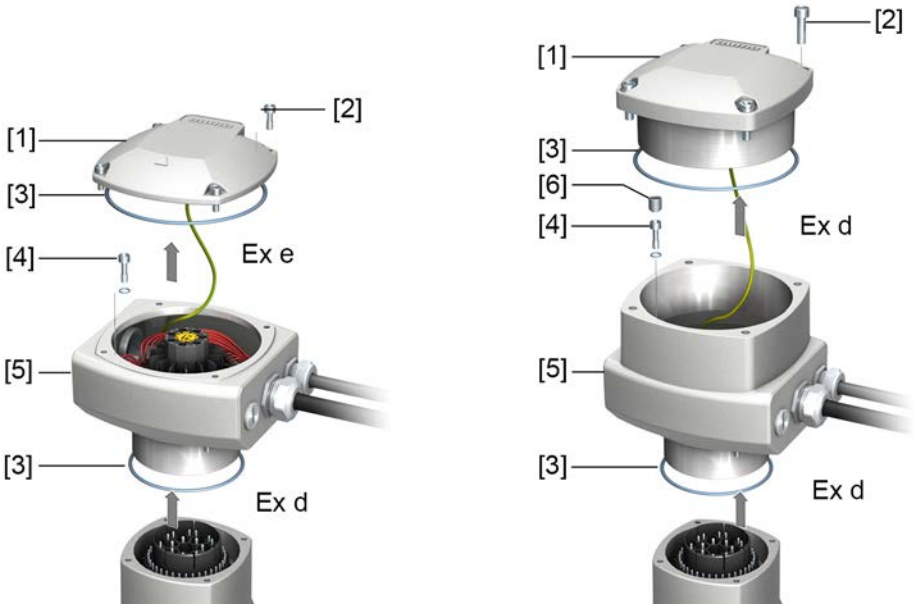
3. Seal open plug/socket connection, e.g. using AUMA protection cover and parking frame.

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.

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

Figure 96: KT/KM electrical connection



[1] Cover
[2] Screws for cover
[3] O-ring
[4] Screws (with gaskets) within connection frame
[5] Connection frame
[6] Grub screws within connection frame

⚠ WARNING

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.

12.3. Maintenance

Maintenance intervals

In compliance with EN 60079-17, Ex certified products either require repeated testing at an interval of 3 years or continuous monitoring by trained personnel.

Manual operation

During maintenance, the mechanical parts of the handwheel activation, in particular motor coupling and retaining spring, must be checked. Replace the parts in case of visible wear.

Lubrication

- In the factory, the gear housing is filled with grease.
- Additional lubrication of the gear housing is not required during operation.
- Grease change is performed during maintenance
  - Generally after 4 to 6 years for modulating duty.
  - Generally after 6 to 8 years if operated frequently (open-close duty).
  - Generally after 10 to 12 years if operated infrequently (open-close duty).
- We recommend replacing the seals when changing the grease.

Notes relating to 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 EU 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.
- The process temperature range must be within the range of the specified ambient temperature.
- 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).
- Consult manufacturer for indications regarding flameproof joints.
- Repair interventions on flameproof joints is not permitted.
- 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.

12.4. 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.

13. 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).

13.1. 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.	
Specific conditions of use	The specific conditions of use are listed on the certificates supplied.	
Type of duty	Standard:	SAEx: Short-time duty S2 - 15 min, classes A and B according to EN 15714-2 SAREx: Intermittent duty S4 - 25 %, class C according to EN 15714-2
	Option:	SAEx: Short-time duty S2 - 30 min, class A and class B according to EN 15714-2 SAREx: Intermittent duty S4 - 50 %, class C according to EN 15714-2
	For nominal voltage and +40 °C ambient temperature and at running or 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: ±10 % Permissible variation of mains frequency: ±5 % (for 3-phase AC and 1-phase AC current)	
Overvoltage category	Category III according to IEC 60364-4-443	
Insulation class	Standard:	F, tropicalized
	Option:	H, tropicalized
Motor protection	Standard:	PTC thermistors (according to DIN 44082)
	Option:	Thermoswitches (NC) in the actuator and thermal overload relay in controls
Self-locking	Self-locking: Output speeds up to 90 rpm (50Hz) or 108 rpm (60Hz) and from size SAEx 35.1 for output speeds up to 22 rpm (50Hz) or 26 (60Hz) NOT self-locking: SAEx 35.1 for output speeds from 32 rpm (50Hz) or 38 rpm (60Hz) and size SAEx 40.1 for output speed 32 rpm (50Hz) or 38 (60Hz) 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 V – 480 V AC (externally supplied)
	Power depending on the size 12.5 – 25 W	
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.	
	Options:	Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm
Electrical connection	Controls:	Terminal connection (K/KR)
	Motor:	Terminals within motor connection compartment
Threads for cable entries	Standard:	Metric threads
	Option:	Pg-threads, NPT-threads, G-threads
Valve attachment	Standard:	B1 according to EN ISO 5210
	Options:	A, B2, B3, B4 according to EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338
	Special valve attachments: AF, AK, AG, B3D, ED, DD, (IB1 or IB3 only size 25.1, larger sizes on request) A prepared for permanent lubrication of stem	

Electromechanical control unit		
Limit switching	Counter gear mechanism for end positions OPEN and CLOSED Turns per stroke: 2 to 500 (standard) or 2 to 5,000 (option)	
	Standard:	Single switch (1 NC and 1 NO) for each end position, not galvanically isolated
	Options:	Tandem switch (2 NC and 2 NO) for each end position, switches galvanically isolated Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switches (DUO limit switching), adjustable for each direction of operation
Torque switching	Torque switching adjustable for directions OPEN and CLOSE	
	Standard:	Single switch (1 NC and 1 NO) for each direction, not galvanically isolated
	Option:	Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated
Switch contact materials	Standard:	Silver (Ag)
	Option:	Gold (Au), recommended for low voltage actuator controls
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA (electronic position transmitter)	
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED	
Running indication	Blinker transmitter (optional for modulating actuators)	
Heater in switch compartment	Standard:	Self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC
	Options:	24 – 48 V AC/DC (for actuators with 3-phase AC/1-phase AC/DC motors) or 380 – 400 V AC (for actuators with 3-phase AC motors)
	A resistance type heater of 5 W, 24 V AC is installed in the actuator in combination with AMExC or ACExC actuator controls.	

Service conditions		
Use	Indoor and outdoor use permissible	
Mounting position	Any position	
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level on request	
Ambient temperature	Standard:	–30 °C to +40/+60 °C
	Options:	–40 °C to +40 °C/+60 °C –50 °C to +40 °C/+60 °C –60 °C to +40 °C/+60 °C
	For exact version, refer to actuator name plate.	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range	
Enclosure protection according to EN 60529	Standard:	IP68 with AUMA 3-phase AC motor
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during continuous immersion	
	For exact version, refer to actuator name plate.	
Pollution degree	Pollution degree 4 (when closed) according to EN 50178	
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. Valid for multi-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls). 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.
		KX-G: Same as KX, however aluminium-free version (outer parts)
Coating	Double layer powder coating	

Service conditions		
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Other colours available on request
Lifetime	AUMA multi-turn actuators meet or exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.	

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)

Technical data for limit and torque switches		
Mechanical lifetime	2 x 10^6 starts	
Silver plated contacts:		
U min.	30 V AC/DC	
U max.	250 V AC/DC	
I min.	20 mA	
Rated voltage/current	AC-15:	5 A at 250 V AC
	DC-13:	0.15 A at 250 V DC
Gold plated contacts		
U min.	5 V	
U max.	30 V	
I min.	4 mA	
I max.	400 mA	

Technical data for blinker transmitter	
Mechanical life-time	10^7 starts
Silver plated contacts:	
U min.	10 V AC/DC
U max.	250 V AC/DC
I max. AC current	5 A at 250 V (resistive load) 5 A at 250 V (inductive load, cos phi ≈ 0.8)
I max. DC current	0.25 A at 250 V (resistive load)

13.2. Technical data Actuator controls

Features and functions		
Explosion protection	Refer to name plate	
Power supply	Refer to name plates at actuator controls and motor Permissible variation of mains voltage: ±10 % Permissible variation of mains voltage: ±30 % (option) Permissible variation of mains frequency: ±5 %	
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.	
Current consumption	Current consumption of controls depending on mains voltage: For permissible variation of mains voltage of ±10 %: • 100 to 120 V AC = max. 740 mA • 208 to 240 V AC = max. 400 mA • 380 to 500 V AC = max. 250 mA • 515 to 690 V AC = max. 200 mA For permissible variation of mains voltage of ±30 %: • 100 to 120 V AC = max. 1,200 mA • 208 to 240 V AC = max. 750 mA • 380 to 500 V AC = max. 400 mA • 515 to 690 V AC = max. 400 mA	
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	
Switchgear	Standard:	Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2
	Options:	Reversing contactors (mechanically and electrically interlocked) for AUMA power class A3
		Thyristor unit for mains voltage up to 500 V AC (recommended for modulating actuators) for AUMA power classes B1, B2 and B3
	The reversing contactors are designed for a lifetime of 2 million starts. For applications requiring a high number of starts, we recommend the use of thyristor units. For the assignment of AUMA power classes, please refer to electrical data on actuator.	
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).	
Control voltage/current consumption for control inputs	Standard:	24 V DC, current consumption: approx. 10 mA per input
	Options:	48 V DC, current consumption: approx. 7 mA per input 60 V DC, current consumption: approx. 9 mA per input 100 – 125 V DC, current consumption : approx. 15 mA per input 100 – 120 V AC, current consumption : approx. 15 mA per input
	All input signals must be supplied with the same potential.	

Features and functions		
Status signals (output signals)	Standard:	• 6 programmable output contacts: - 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 - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)
	Options:	• 6 programmable output contacts: - 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) • 12 programmable output contacts: - 10 potential-free NO contacts, 5 with one common each, max. 250 V AC, 1 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 6 potential-free change-over contacts without one common, per contact max. 250 V AC, 5 A (resistive load) • 10 programmable output contacts: - 10 potential-free change-over contacts without one common, per contact max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 4 mains failure proof potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load), 1 potential-free NO contact, 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: - 4 mains failure proof potential-free NO contacts, max. 250 V AC, 5 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load), • 12 programmable output contacts: - 8 mains failure proof potential-free NO contacts, max. 250 V AC, 1 A (resistive load), 2 potential-free NO contacts, max. 250 V AC, 1 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load) • 12 programmable output contacts: - 8 mains failure proof potential-free NO contacts, max. 250 V AC, 5 A (resistive load), 4 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load), All output signals must be supplied with the same potential.
Voltage output	Standard:	Auxiliary voltage 24 V DC: max. 100 mA for supply of control inputs, galvanically isolated from internal voltage supply.
	Option:	Auxiliary voltage 115 V AC: max. 30 mA for supply of control inputs, galvanically isolated from internal voltage supply (Not possible in combination with PTC tripping device)
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	

Features and functions		
Local controls	Standard:	• Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET - 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: - 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:	• Special colours for the indication lights: - 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: • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)	
Application functions	Standard:	• 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:	• Positioner: - 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 • Multiport valve: Up to 16 positions, signals (pulse or edge), accuracy < 0.2 % • Automatic deblocking: Up to 5 operation trials, travel time in opposite direction can be set
Safety functions	Standard:	• EMERGENCY operation (programmable behaviour) - Digital input: Low active - Reaction can be selected: STOP, run to end position CLOSED, run to end position OPEN, run to intermediate position - Torque monitoring can be by-passed during EMERGENCY operation. - Thermal protection can be by-passed during EMERGENCY operation (only in combination with thermoswitch within actuator, not with PTC thermistor).
	Options:	• Enabling local controls via digital input Enable LOCAL. Thus, actuator operation can be enabled or disabled via push buttons on the local controls. • Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via two digital inputs • PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time
Monitoring functions	• 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 • Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current)	

Features and functions		
Diagnostic functions	• Electronic device ID with order and product data • Operating data logging: A resettable counter and a lifetime counter each for: - Motor running time, number of starts, torque switch trippings in end position CLOSED, limit switch trippings in end position CLOSED, torque switch trippings in end position OPEN, limit switch trippings in end position OPEN, torque faults CLOSE, torque faults OPEN, motor protection trippings • Time-stamped event report with history for setting, operation and faults • Status signals according to NAMUR recommendation NE 107: "Failure", "Function check", "Out of specification", "Maintenance required" • Torque characteristics (for version with MWG in actuator): - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately. - Torque characteristics stored can be shown on the display.	
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
Electrical connection	Standard:	AUMA Ex plug/socket connector with screw-type terminals (KP), max. 38 control terminals / max. supply voltage 525 V AC
	Options:	• AUMA Ex plug/socket connector with terminal blocks (KES), increased safety Ex e • AUMA Ex plug/socket connector with terminal blocks (KES), flameproof enclosure Ex d • AUMA Ex plug/socket connector (KT); screw-type motor terminals; push-in type control terminals
Threads for cable entries	Standard:	Metric threads
	Options:	Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate	

Service conditions			
Use	Indoor and outdoor use permissible		
Mounting position	Any position		
Installation altitude	≤ 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 Terminal compartment additionally sealed against interior of actuator controls (double sealed)		
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: Maximum 8 m head of water • Duration of continuous immersion in water: Maximum 96 hours • Up to 10 operations during continuous immersion • Modulating duty is not possible during continuous immersion. 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	

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)	

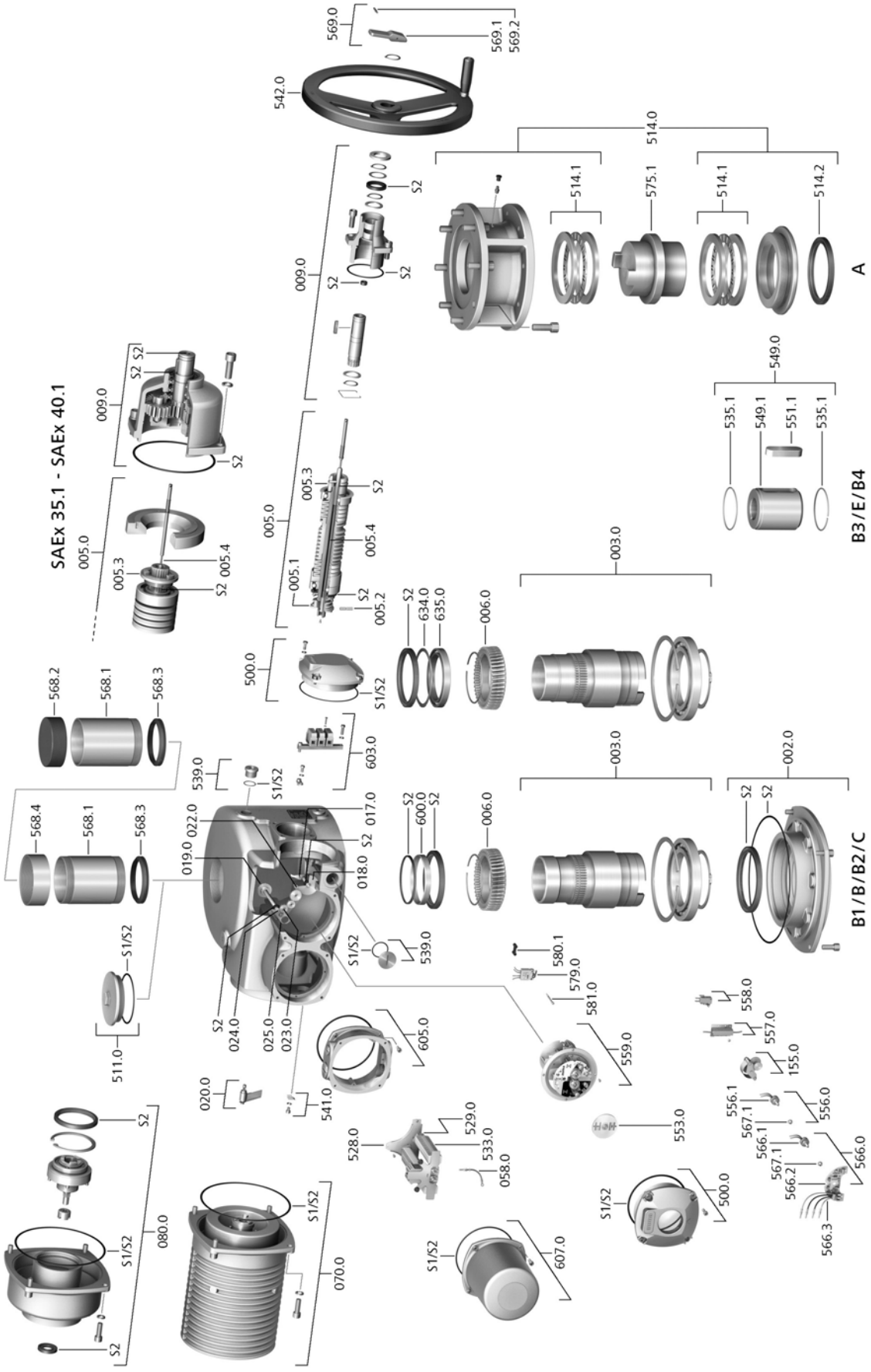
13.3. Technical data Control box

Features and functions		
Explosion protection	Standard:	ATEX: II 2G Ex de IIB T4 Gb IECEx: Ex de IIB T4 Gb
	For exact version, refer to control box name plate	
Certificates and standards	Certificates are attached to the device. All standards applied and their respective issues are indicated on these certificates.	
Specific conditions of use	The specific conditions of use are listed on the certificates supplied.	
Mains voltage, mains frequency	Refer to name plate	
Threads for cable entries	Standard:	Metric threads
	Options:	Pg-threads, NPT-threads, G-threads

Service conditions	
Use	Indoor and outdoor use permissible
Mounting position	Suspended
Enclosure protection according to EN 60529	IP66
Ambient temperature	–20 °C to +60 °C
Corrosion protection, housing material	Stainless steel

14. Spare parts

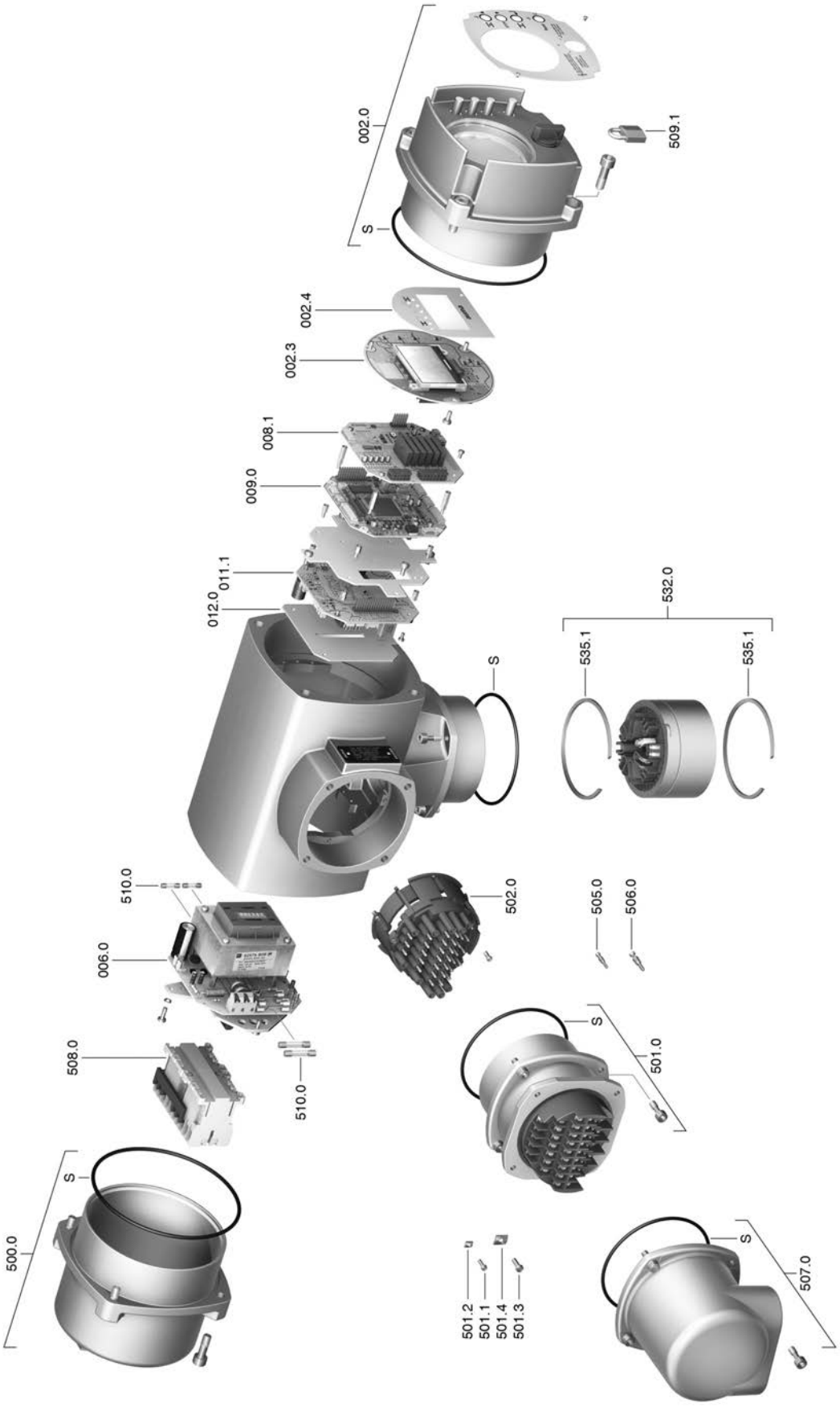
14.1. Multi-turn actuators SAEx 25.1 – SAEx 40.1/SAREx 25.1 – SAREx 30.1



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	549.0	Output drive type B3/E/B4	Sub-assembly
003.0	Former hollow shaft (for bearing bush 600.0)	Sub-assembly	549.1	Output drive sleeve B3/E/B4	Sub-assembly
003.0	New hollow shaft (for ball bearing 635.0)	Sub-assembly	551.1	Parallel key	
005.0	Drive shaft		553.0	Mechanical position indicator	
005.1	Motor coupling		556.0	Potentiometer as position transmitter	Sub-assembly
005.2	Coupling pin	Sub-assembly	556.1	Potentiometer without slip clutch	Sub-assembly
005.3	Manual drive coupling		557.0	Heater	
005.4	Pull rope	Sub-assembly	558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
006.0	Worm wheel		559.0	Electromechanical control unit with switches, including torque switching heads	Sub-assembly
009.0	Manual gearing	Sub-assembly	566.0	Position transmitter RWG	Sub-assembly
017.0	Torque lever	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	Sub-assembly
018.0	Gear segment	Sub-assembly	566.2	Position transmitter board for RWG	Sub-assembly
019.0	Crown wheel		566.3	Cable set for RWG	Sub-assembly
020.0	Swing lever		567.1	Slip clutch for potentiometer	
022.0	Drive pinion II for torque switching		568.1	Stem protection tube (without cap)	
023.0	Output drive wheel for limit switching	Sub-assembly	568.2	Protective cap for stem protection tube	Sub-assembly
024.0	Drive wheel for limit switching	Sub-assembly	568.3	V-seal	Sub-assembly
025.0	Locking plate	Sub-assembly	568.4	Threaded sleeve (for SAEx/SAREx 25.1 and 30.1)	
058.0	Wire for protective earth	Sub-assembly	569.0	Change-over lever assy	Sub-assembly
070.0	Motor	Sub-assembly	569.1	Change-over lever	Sub-assembly
080.0	Planetary gearing for motor drive (for ADX.90 motor)	Sub-assembly	569.2	Notched pin	Sub-assembly
155.0	Reduction gearing	Sub-assembly	575.1	Stem nut (without thread)	Sub-assembly
500.0	Cover	Sub-assembly	579.0	Switch for limit/torque	Sub-assembly
511.0	Threaded plug	Sub-assembly	580.1	Spacer	
514.0	Output drive type A (without stem nut)		581.0	Stud bolts for switches	
514.1	Axial needle roller bearing		600.0	Bearing bush (for former hollow shaft)	
514.2	Radial seal for output drive type A		603.0	Motor connection	
528.0	Terminal frame (without terminals)	Sub-assembly	605.0	Frame for electrical connection	
529.0	End clamp	Sub-assembly	607.0	Cover	
533.0	Terminals for motor/controls	Sub-assembly	634.0	Shim washer (for new hollow shaft)	
535.1	Snap ring	Sub-assembly	635.0	Ball bearing (for new hollow shaft)	
539.0	Screw plug	Sub-assembly	S1	Seal kit, small	Set
541.0	Protective earthing		S2	Seal kit, large	Set
542.0	Handwheel with ball handle	Sub-assembly			

14.2. Actuator controls ACExC 01.2 KP/KPH



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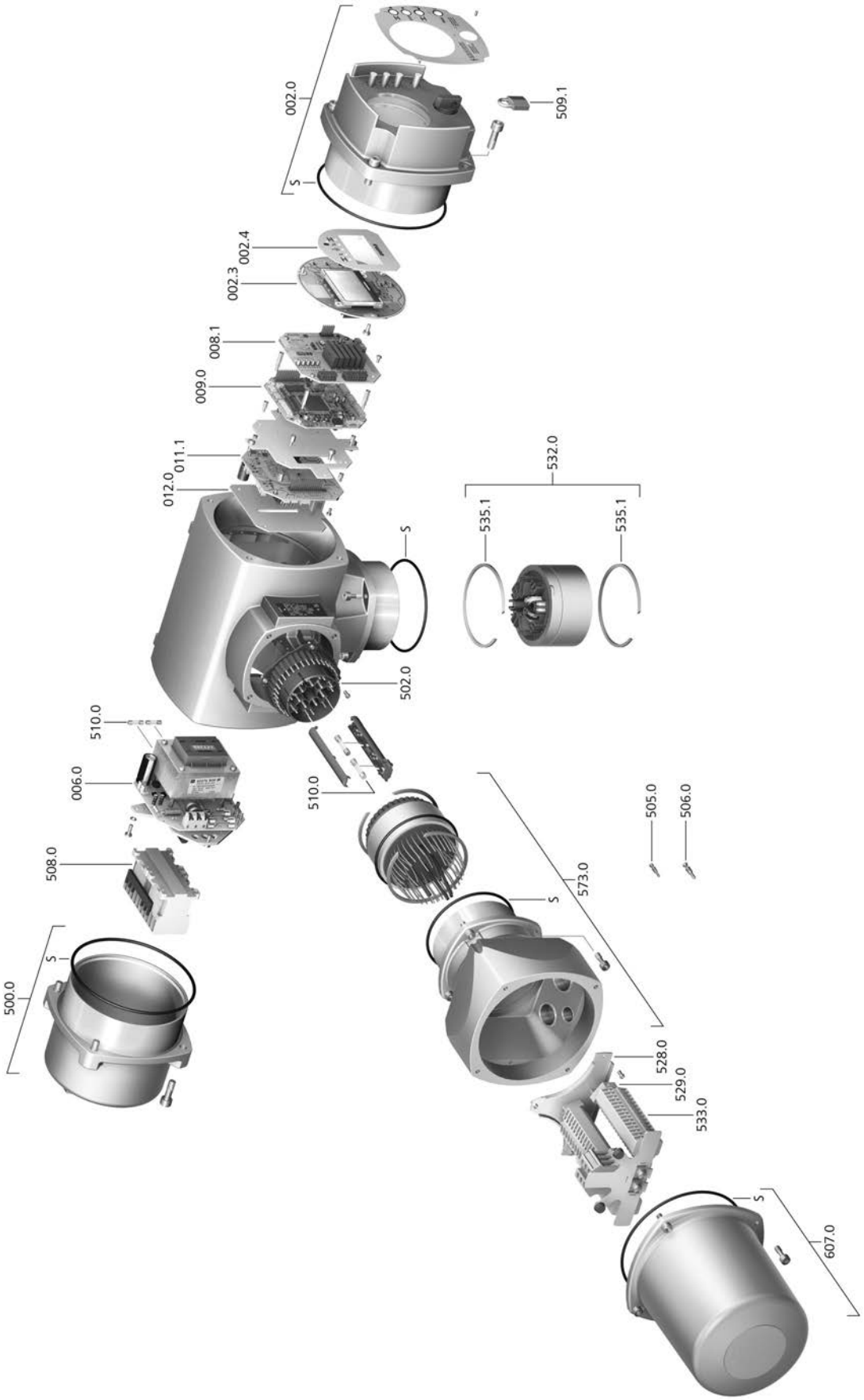
Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	I/O board	
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	Cover	Sub-assembly
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

14.3. Actuator controls AUMATIC ACExC 01.2 KES



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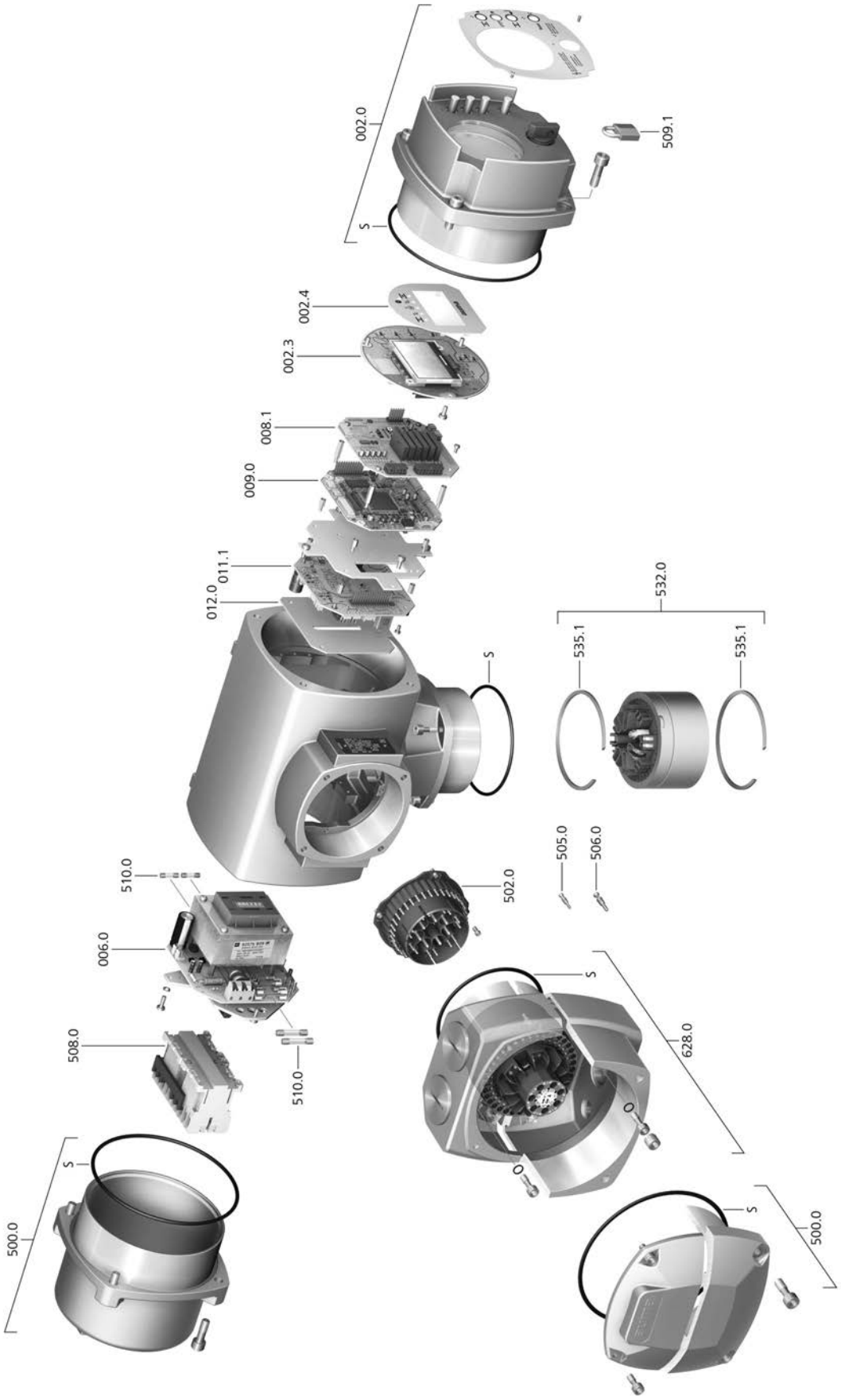
Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	I/O board	
008.1	Fieldbus board	Sub-assembly
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	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

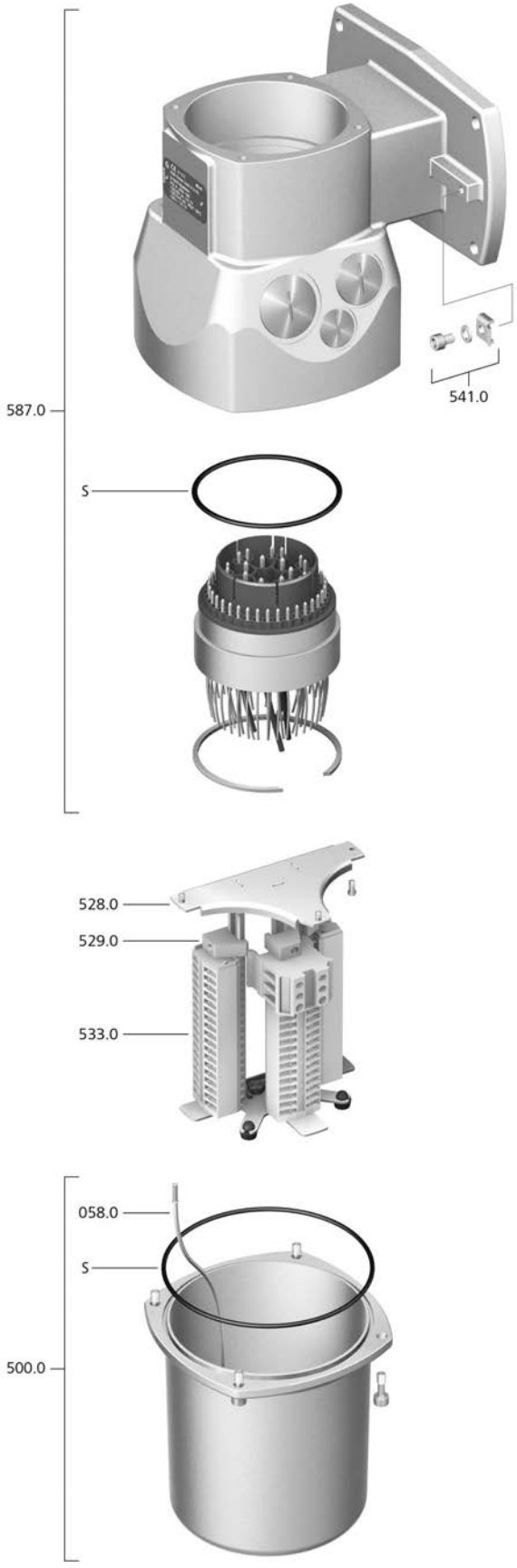
14.4. Actuator controls ACExC 01.2 KT/KM



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

14.5. ExC wall bracket



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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	

Index

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