



Part-turn actuators

SQEx 05.2 – SQEx 14.2

SQREx 05.2 – SQREx 14.2

Control unit: electronic (MWG)

with actuator controls

ACExC 01.2 Non-Intrusive

Control

Parallel

Profibus DP

→ Profinet

Modbus RTU

Modbus TCP/IP

Foundation Fieldbus

HART



Read operation instructions first.

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

Target group:

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

Reference documents:

- Manual (Operation and setting) of actuator controls ACExC 01.2 Profinet
- Manual (Fieldbus device integration) of actuator controls ACExC 01.2 Profinet

Reference documents are available on the Internet at: <http://www.auma.com>.

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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.
- Electrostatic charging** Highly efficient charge generating processes (processes more efficient than manual friction) on the device surface must be excluded at any time, since they will lead to propagating brush discharges and therefore to ignition of a potentially explosive atmosphere.
- This also applies to fireproof coatings or covers available as an option.
- Ignition dangers** Gearboxes were subjected to an ignition hazard assessment in compliance with the currently applicable standard according to ISO 80079-36/ -37. Hot surfaces, mechanically generated sparks as well as static electricity and stray electric currents were identified and assessed as major potential ignition sources. Protective measures to prevent the likelihood that ignition sources arise were applied to the gearboxes. This includes in particular lubrication of the gearbox, the IP protection codes and the warnings and notes contained in these operation instructions.
- 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 prior to working on the device using an appropriate thermometer and wearing protective gloves.

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

AUMA part-turn actuators SQEx 05.2 – SQEx 14.2/SQREx 05.2 – SQREx 14.2 are designed for the operation of industrial valves, e.g. butterfly valves and ball valves.

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 regard 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 underwater use (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.

Specific conditions of use

The particular conditions of use are listed on the certificates supplied. Among others, this includes the following conditions:

- Refer to [page 5, Electrostatic charging](#) for further references to minimise the risk of electrostatic charging within a potentially explosive atmosphere.
- For information regarding the dimensions of the flameproof joints, contact the manufacturer.
- Special fasteners according to IEC 60079-0 to seal flameproof enclosures must have the following strength classes:
 - Minimum A*-70 for all special fasteners, excluding screws for fixing motors of VKX type
 - Minimum A*-80 for screws for fixing motors of VKX type
- For fixing the screws, please also refer to [page 86, Tightening torques for screws](#).

1.3. Warnings and notes

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



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



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



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



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

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

1.4. References and symbols

The following references and symbols are used in these instructions:

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

 Symbol for CLOSED (valve closed)

 Symbol for OPEN (valve open)

M ▷ **Via the menu to parameter**

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

➔ **Result of a process step**

Describes the result of a preceding process step.

2. Short description

Part-turn actuator Definition in compliance with EN 15714-2/EN ISO 5211:

A part-turn actuator is an actuator which transmits a torque to the valve for less than one full revolution. It need not be capable of withstanding thrust.

AUMA part-turn actuator Figure 1: AUMA SQEx 10.2 part-turn actuator



- [1] Part-turn actuator with motor and handwheel
- [2] Actuator controls
- [3] Local controls with display, (a) selector switch and (b) push button
- [4] Valve attachment

AUMA part-turn actuators SQEx 05.2 – SQEx 14.2/SQREx 05.2 – SQREx 14.2 are driven by an electric motor. 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.

For non-intrusive version (control unit: electromechanical version), limit and torque setting is made via switches within the actuator.

For non-intrusive version (control unit: electronic version), limit and torque setting is made via the actuator controls, neither actuator nor the actuator controls housing have to be opened. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also capable of supplying analogue torque feedback signals/torque indication and analogue position feedback signals/position indication at the actuator controls output.

Actuator controls The actuator controls ACExC 01.2 may be mounted directly to the actuator or separately on a wall bracket.

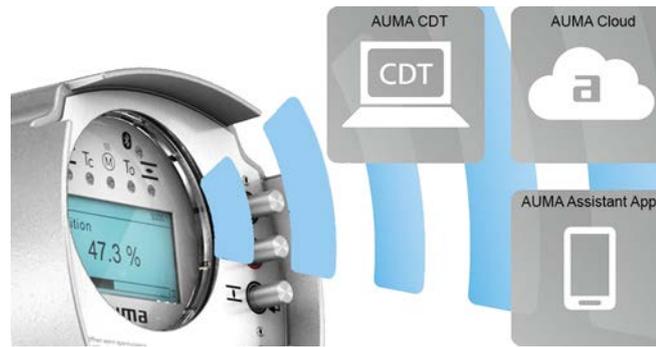
The actuator can be operated via the push buttons on the local controls of the actuator controls or settings can be made in the actuator controls menu. The display shows information on the actuator as well as the menu settings.

The functions of the actuator controls include standard valve control in OPEN-CLOSE duty, positioning, process control, logging of operating data, diagnostic functions right through control via various interfaces (e.g. fieldbus, Ethernet and HART).

App and software

Using the **AUMA CDT** software for Windows-based computers (notebooks or tablets) and the **AUMA Assistant App**, actuator data can be uploaded and read, settings can be modified and stored. The connection between computer and AUMA actuator is established wireless via Bluetooth interface. With the **AUMA Cloud**, we provide an interactive platform to collect and assess e.g. detailed device data of all actuators within a plant.

Figure 2: Communication via Bluetooth



AUMA CDT



AUMA CDT is a user-friendly setting and operation program for AUMA actuators.

AUMA CDT software can be downloaded free of charge from our website www.auma.com.

AUMA Cloud



The AUMA Cloud is the driving element of the digital AUMA world, acting as interactive platform for efficient maintenance of AUMA actuators at moderate cost. The AUMA Cloud collects all device data of all actuators within one site and provides a clear overview at a glance. Detailed analysis provides valuable information on potential maintenance requirements. Additional functions foster smooth asset management.

AUMA Assistant App



The AUMA Assistant App enables remote setting and remote diagnostics of AUMA actuators via Bluetooth using either smartphone or tablet.

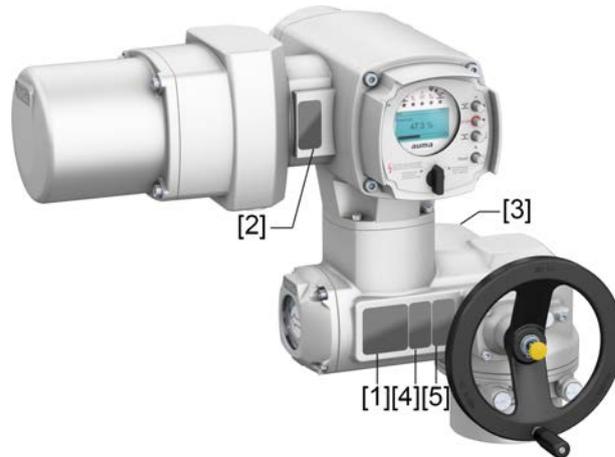
The AUMA Assistant App can be downloaded free of charge from the Play Store (Android) or App Store (iOS).

Figure 3: Link to AUMA Assistant App



3. Name plate

Figure 4: Arrangement of name plates



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

Actuator name plate

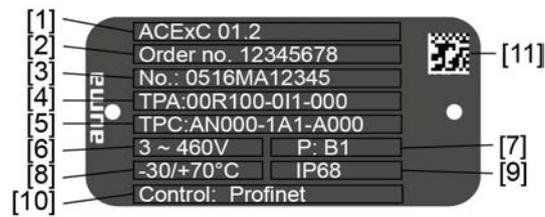
Figure 5: Actuator name plate (example)



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

- [1] Name of manufacturer
- [2] Address of manufacturer
- [3] **Type designation**
- [4] **Order number**
- [5] **Serial number**
- [6] Operating time in [s] for a part-turn movement of 90°
- [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

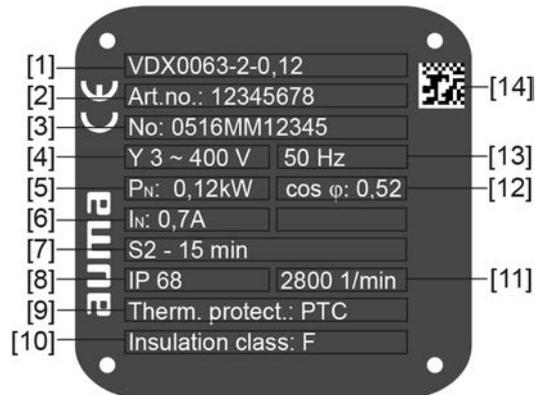


auma (= manufacturer logo)

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

Motor name plate

Figure 6: Motor name plate (example)

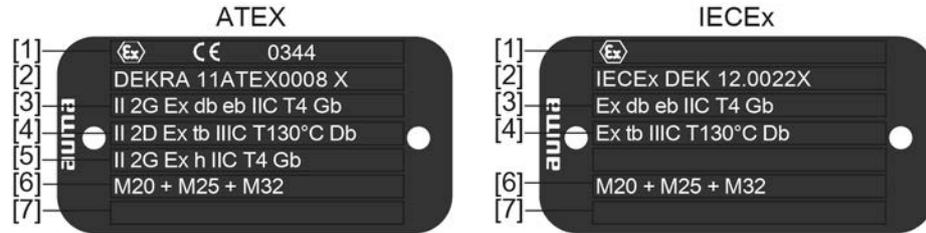


auma (= manufacturer logo); **CE** (= CE mark)

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

Approval plate in explosion-proof version

Figure 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

Table 1:

Description of type designation (with the example of SQEx 07.2-F10)			
SQEx	07.2	-F10	
SQEx			Type SQEx = Part-turn actuators for open-close duty Type SQREx = Part-turn actuators for modulating duty
	07.2		Size These instructions apply to sizes 05.2, 07.2, 10.2, 12.2, 14.2
		F10	Flange size

Table 2:

Description of actuator controls type designation (with the example of ACExC 01.2)			
ACExC	01.2		
ACExC			Type AC = AUMATIC actuator controls ExC = explosion-proof version
	01.2		Size 01.2

Ex marking

Table 3:

Marking for explosion protection (example of /-a3b1)				
-	a	3	b	1
-	Not used			
	a	Motor type a = VDX or SDX: 3-phase AC motor = VWX or SWX: 1-phase AC motor		
		3	Protection type of electrical connection 3 = Terminal compartment Ex e increased safety 4 = Terminal compartment Ex d flameproof enclosure	
			b	Protection type of position transmitter a = Without intrinsically safe electric circuit b = Electric circuit Ex i Intrinsic safety (RWG 5020.2Ex)
				1 Protection type of fieldbus 1 = Without intrinsically safe Ex ic fieldbus connection 3= Ex ic intrinsically safe fieldbus connection

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.

Serial number Actuator

Table 4:

Description of serial number (example of 0520NS12345)			
05	20	NS12345	
05	Positions 1+2: Assembly in week = week 05		
	20	Positions 3+4: Year of manufacture = 2020	
		NS12345	Internal number for unambiguous product identification

Actuator terminal plan Position 9 after **TPA**: Position transmitter version
I, Q = MWG (Magnetic limit and torque transmitter)

AUMA power class for switchgear The switchgear used in the actuator controls (reversing contactors/thyristors) are classified according to AUMA power classes (e.g. A1, B1, ...). The power class defines the max. permissible rated power (of the motor) the switchgear has been designed for. The rated power (nominal power) of the actuator motor is indicated in kW on the motor name plate. For the assignment of the AUMA power classes to the nominal power of the motor types, refer to the separate electrical data sheets.
 For switchgear without assignment to any power classes, the actuator controls name plate does not indicate the power class but the max. rated power in kW.

Control

Table 5:

Control examples (indications on actuator controls name plate)	
Input signal	Description
Profinet	Control via Profinet interface
Profinet/24 V DC	Control via Profinet interface and control voltage for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)

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 8: Link to AUMA Assistant App:



For further Service & Support, Software/Apps/... refer to www.auma.com

4. Transport and storage

4.1. Transport

Actuator For transport to place of installation, use sturdy packaging.



Suspended load!

Death or serious injury.

- Do NOT stand below suspended load.
- Attach ropes or hooks for the purpose of lifting by hoist only to housing and NOT to handwheel.
- Actuators mounted on valves: Attach ropes or hooks for the purpose of lifting by hoist to valve and NOT to actuator.
- Actuators mounted to gearboxes: Attach ropes or hooks for the purpose of lifting by hoist only to the gearbox using eyebolts and NOT to the actuator.
- 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 9: Example: Lifting the actuator



Weights

Table 6:

Weight for ACExC 01.2 actuator controls	
with electrical connection type:	Weight approx. [kg]
AUMA Ex plug/socket connector with integral terminal connection (terminal frame) and enlarged terminal compartment.	>14

Table 7:

Weights for part-turn actuators SQEx 05.2 – SQEx 14.2 / SQREx 05.2 – SQREx 14.2 with 3-phase AC motors		
Type designation	Weight ¹⁾	Weight with base and lever ²⁾
Actuator	approx. [kg]	approx. [kg]
SQEx 05.2/ SQREx 05.2	29	34
SQEx 07.2/ SQREx 07.2	29	34
SQEx 10.2/ SQREx 10.2	34	38
SQEx 12.2/ SQREx 12.2	42	50
SQEx 14.2/ SQREx 14.2	51	62

- 1) Indicated weight includes AUMA NORM part-turn actuator with 3-phase AC motor, electrical connection in standard version, unbored coupling and handwheel. For other output drive types, consider additional weights.
- 2) Indicated weight includes AUMA NORM part-turn actuator with 3-phase AC motor, electrical connection in standard version, and handwheel, including base and lever. For other output drive types, consider additional weights.

Table 8:

Weights for part-turn actuators SQEx 05.2 – SQEx 14.2 / SQREx 05.2 – SQREx 14.2 with 1-phase AC motors		
Type designation	Weight ¹⁾	Weight with base and lever ²⁾
Actuator	approx. [kg]	approx. [kg]
SQEx 05.2/ SQREx 05.2	33	39
SQEx 07.2/ SQREx 07.2	33	39
SQEx 10.2/ SQREx 10.2	39	43
SQEx 12.2/ SQREx 12.2	47	55
SQEx 14.2/ SQREx 14.2	56	67

- 1) Indicated weight includes AUMA NORM part-turn actuator with 1-phase AC motor, electrical connection in standard version, unbored coupling and handwheel. For other output drive types, consider additional weights.
- 2) Indicated weight includes AUMA NORM part-turn actuator with 1-phase AC motor, electrical connection in standard version, and handwheel, including base and lever. For other output drive types, consider additional weights.

4.2. Storage

NOTICE

Risk 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 $-30\text{ }^{\circ}\text{C}$.
 - On request, actuators controls may be transported in specific cases and for short duration at temperatures down to $-60\text{ }^{\circ}\text{C}$.
-

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.

5. Assembly

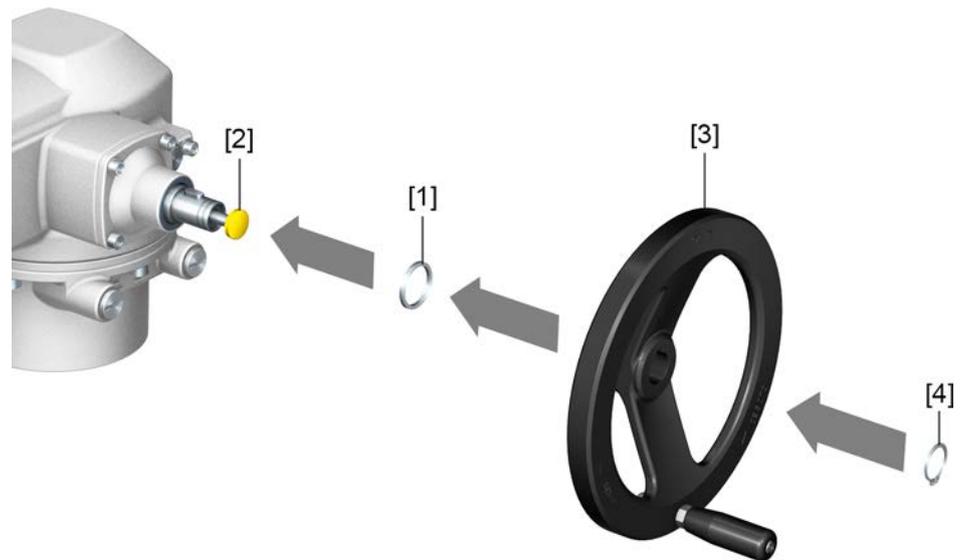
5.1. Mounting position

When using grease as lubricant, the product described herein can be operated in any mounting position.

When using oil instead of grease within the actuator gear housing, perpendicular mounting position is specified whereby the flange is pointing downward. The type of lubricant used is indicated on the actuator name plate (short designation **F**...= grease; **O**...= oil).

5.2. Handwheel fitting

Figure 10: Handwheel



- [1] Spacer
- [2] Input shaft
- [3] Handwheel
- [4] Retaining ring

- How to proceed**
1. If required, fit spacer [1] on input shaft [2].
 2. Slip handwheel [3] onto input shaft.
 3. Secure handwheel [3] with retaining ring [4].

Information: The retaining ring [4] (together with these operation instructions) is stored in a weatherproof bag, which is attached to the device prior to delivery.

5.3. Mount actuator to valve

NOTICE

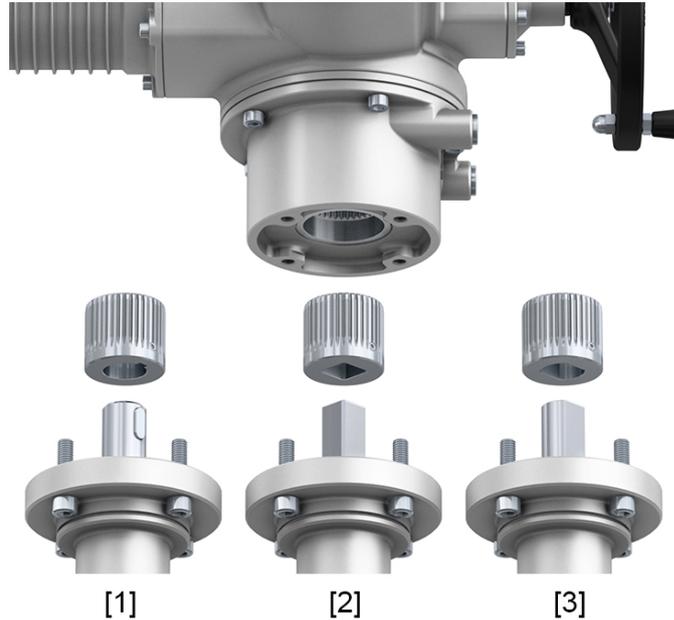
Corrosion due to damage to paint finish and condensation!

- 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.

The actuator is mounted to the valve using a coupling (standard) or via lever. Separate instructions are available for actuator mounting to the valve when equipped with base and lever.

5.3.1. Overview on coupling variants

Design Figure 11: Valve attachment via coupling



- [1] Bore with keyway
- [2] Square bore
- [3] Bore with two-flats

- Application**
- For valve attachments according to EN ISO 5211
 - For rotating, non-rising valve stem

5.3.2. Mount actuator (with coupling)

Unbored couplings or couplings with pilot bore must be machined to match the valve shaft prior to mounting the actuator to the valve (e.g. with bore and keyway, two-flat or square bore).



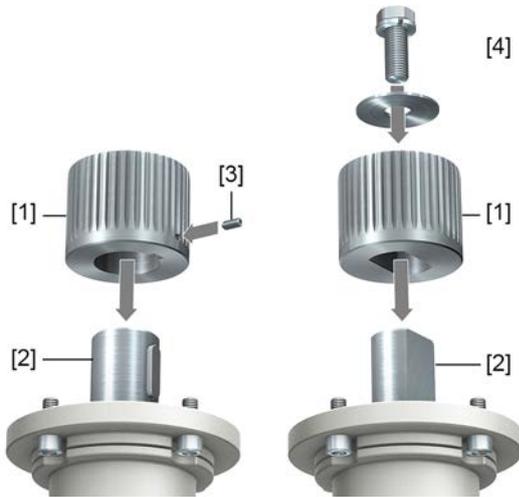
Assemble valve and actuator in the same end position. As standard, the actuator is supplied in end position CLOSED.

- Recommended mounting position for **butterfly valves**: End position CLOSED.
- Recommended mounting position for **ball valves**: End position OPEN.

- Assembly steps**
1. If required, move actuator in same end position as valve using the handwheel.
 2. Clean mounting faces, thoroughly degrease uncoated mounting surfaces.
 3. Apply a small quantity of grease to the valve shaft [2].

- Place coupling [1] onto valve shaft [2] and secure against axial slipping by using a grub screw [3] or a clamping washer and a screw with curved spring lock washer [4]. Thereby, ensure that dimensions X, Y or L are observed (refer to figure and table <Mounting positions for coupling>).

Figure 12: Examples: Fit coupling



- [1] Coupling
- [2] Valve shaft
- [3] Grub screw
- [4] Clamping washer and screw with curved spring lock washer

Figure 13: Mounting positions for coupling

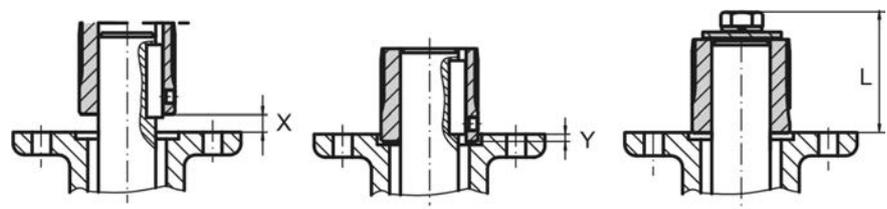
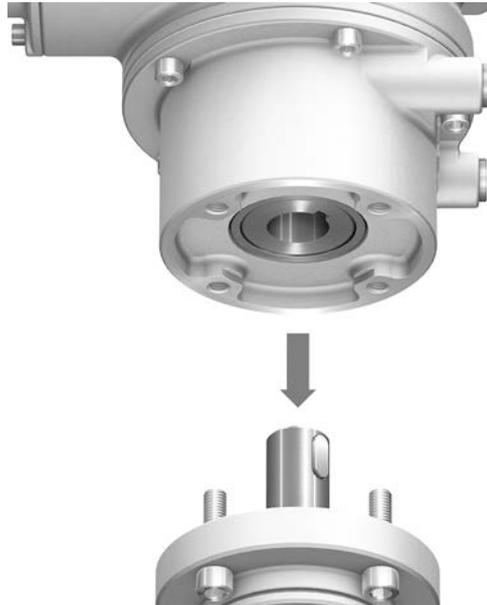


Table 9:

Mounting position of the coupling within fitting dimensions according to AUMA definition											
Dimensions [mm]	SQEx 05.2		SQEx 07.2			SQEx 10.2		SQEx 12.2		SQEx 14.2	
EN ISO 5211	F05	F07	F05	F07	F10	F10	F12	F12	F14	F14	F16
X max.	3	3	3	3	3	4	4	5	5	8	8
Y max.	2	2	2	2	2	5	5	10	10	10	10
L max.	40	40	40	40	66	50	82	61	101	75	125

- Apply non-acidic grease at splines of coupling (e.g. Gleitmo by Fuchs).

6. Fit actuator. If required, slightly turn actuator until splines of coupling engage.
 Figure 14:



Information Ensure that the spigot (if provided) fits uniformly in the recess and that the flanges are in complete contact.

7. If flange bores do not match thread:
 - 7.1 Slightly rotate handwheel until bores line up.
 - 7.2 If required, shift actuator by one tooth on the coupling.
8. Fasten actuator with screws.

Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.

9. Fasten screws crosswise to a torque according to table.

Table 10:

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

5.4. Mounting positions of local controls

Figure 15: Mounting positions



The mounting position of the local controls is implemented according to the order. If, after mounting the actuator to the valve or the gearbox on site, the local controls are in an unfavourable position, the mounting position can be changed at a later date. Four mounting positions shifted by respectively 90° are possible (by maximum 180° into one direction).

5.4.1. Mounting positions: modify

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.
- Flameproof joints must neither be damaged nor soiled in any way.
- Do not jam cover during fitting.

NOTICE

Electrostatic discharge ESD!

Risk of damage to electronic components.

- Earth both operators and devices.

1. Loosen screws and remove the local controls.
2. Check whether O-ring is in good condition, correctly insert O-ring.
3. Turn local controls into new position and re-place.

NOTICE

Cable damage due to twisting or pinching!

Risk of functional failures.

- Turn local controls by a maximum of 180°.
- Carefully assemble local controls to avoid pinching the cables.

4. Fasten screws evenly crosswise.

6. Electrical connection

6.1. Basic information



Electric shock due to presence of hazardous voltage!

Risk of death or serious injury!

- 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>).

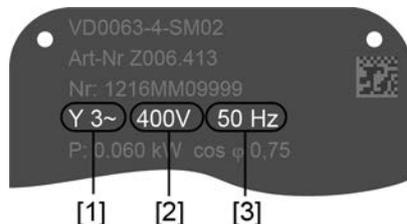
Permissible networks (supply networks)

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 16: Motor name plate (example)



- [1] Type of current
- [2] Mains voltage
- [3] Mains frequency

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	1,200 mA
208 to 240 V AC	400 mA	750 mA
380 to 500 V AC	250 mA	400 mA
515 to 690 V AC	200 mA	400 mA

Table 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)
Thyristor B1	up to 1.5 kW	16 A (g/R) I ² t<1,500A ² s

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

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

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
 Safety standards**

Refer to Technical data for options of isolated potentials.

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 applicable 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.
- To avoid contact corrosion, we recommend the use of sealing agents for cable glands and blanking plugs made of metal.
- 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.

Profinet cables The following minimum requirements with regard to LAN cables apply for Profinet networks: Category 5 according to ISO/IEC 11801 Edition 2.0 Class D.

Connector is suitable for wiring dual pair Profinet cables.

The following tables list the available cable types Profinet types A through C with regard to the respective application:

Table 14:

Cable types for dual pair Profinet cables			
Cable types	Application type A	Application type B	Application type C
Version	Dual pair data cable	Dual pair data cable	Dual pair data cable
Type of installation	fixed installation, immobile after installation	flexible installation (e.g. for continuous movement, vibration or twisting after installation)	special applications (e.g. for continuous movement, vibration or twisting)
Cable parameter			
Designation (minimum)	“Profinet type A”	“Profinet type B”	“Profinet type C”
Cross section	AWG 22/1 $\geq 0.610 \text{ mm}^2$	AWG 22/7 $\geq 0.318 \text{ mm}^2$	AWG 22/.. $\geq 0.318 \text{ mm}^2$
Outer cable diameter	5.5 – 8.0 mm		depending on application
Wire diameter	1.4 \pm 0.2 mm		depending on application
Colour of shield	Green RAL6018		depending on application
Colour of wire insulation	Pair 1: white, blue Pair 2: yellow, orange		
Number of wires	4		
Cable design	Dual pair or star quad		
Shield	Aluminium foil + copper braid		depending on application
Communication requirements			
Applicable standards	ISO/IEC 11801 Edition 2.0 IEC 61140-1 IEC 61156-5 (minimum device group 5)		ISO/IEC 11801 Edition 2.0 IEC 61140-1 IEC 61156-6 (minimum device group 5)
Delay	$\leq 20 \text{ ns}/100 \text{ m}$		
Coupling attenuation	$\geq 80 \text{ dB}$ at 30 – 100 MHz “Channel class-D” according to EN 50174-2		

Minimum cable spacing The minimum spacing (according to IEC 61918) required between laying Profinet cables and other cables must be respected. They are shown in the table below.

Table 15:

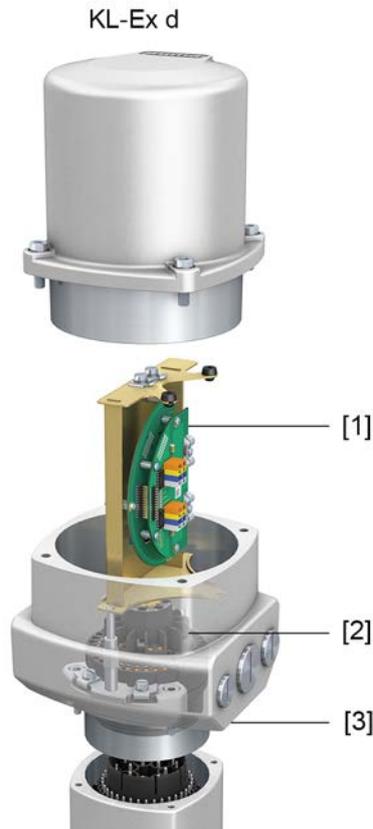
Minimum spacing for Profinet cables			
	Spacing to Profinet cable		
	Without or with non-metal cutoff bridge	Aluminium cutoff bridge	Steel cutoff bridge
Signal transmission cables			
E.g. other Profinet cables, Profibus cables, data cables for PCs, programming devices, shielded analogue inputs	0 mm	0 mm	0 mm
Power supply cables			
Unshielded power supply cables	200 mm	100 mm	50 mm
Shielded power cables	0 mm	0 mm	0 mm

Further references Ensure absence of equipotential earth bonding differences between the individual devices at Profinet (perform an equipotential earth bonding).

Available Profinet recommendations, particularly planning, assembly and commissioning guidelines of the Profibus User Organisation (PNO) (www.profibus.com) must be met.

6.2. KL electrical connection

Figure 17: KL-Ex d electrical connection



- [1] Mounting frame with connection board
- [2] Terminal carrier with screw-type terminals
- [3] Connection frame

Short description KL plug-in electrical connection with screw-type terminals for power connection and connection board for control contacts assembled onto a mounting frame.

KL version is 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

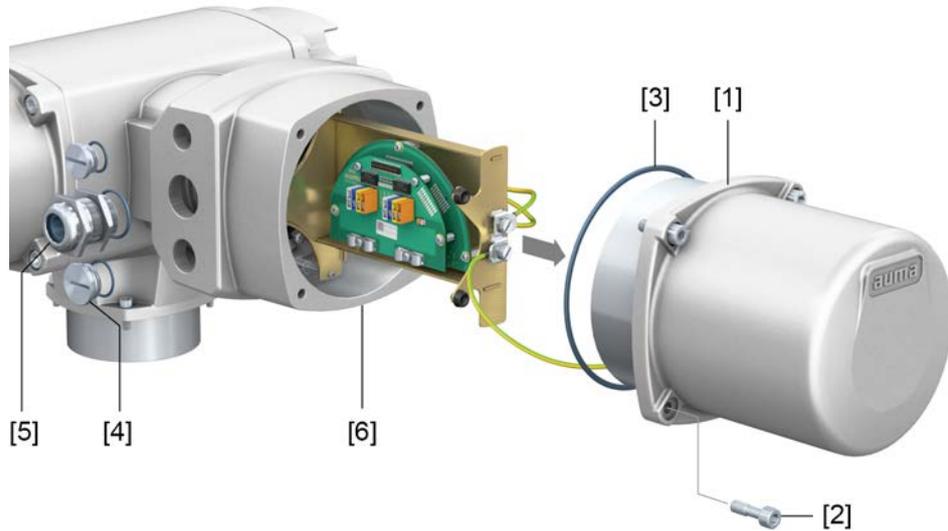
Table 16:

KT/KM/KL 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.

6.2.1. Terminal compartment: open

Figure 18: Open terminal compartment



- [1] Cover (illustration shows KL version in type of protection Ex d)
- [2] Screws for cover
- [3] O-ring
- [4] Blanking plug
- [5] Cable gland (example)
- [6] KL-Ex d 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].

How to proceed



Electric shock due to presence of hazardous voltage!

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 19: Name plate, example with enclosure protection IP68



Information: For shielded cables: Use EMC cable glands.

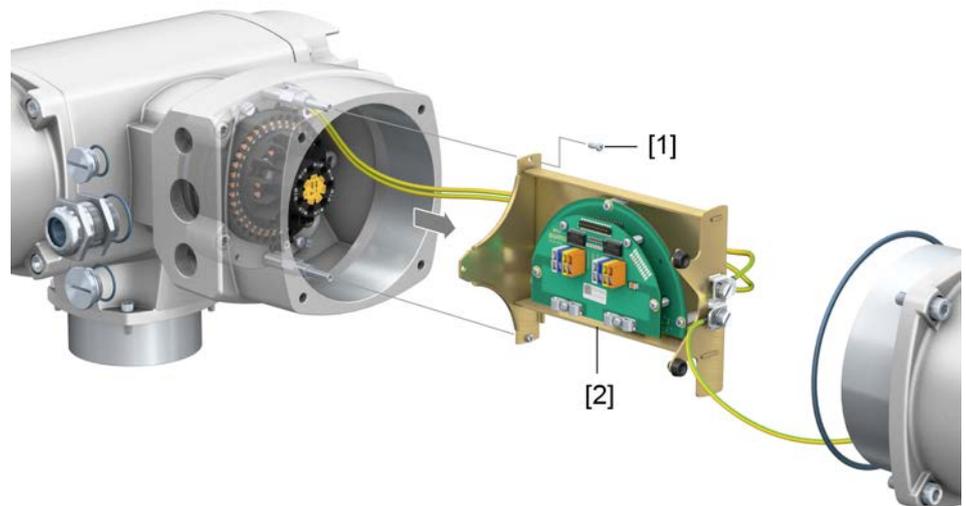
3. Seal unused cable entries with approved plugs suitable for the required protection type.

6.2.2. Cable connection

Table 17:

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

Figure 20: Disassembly of mounting frame



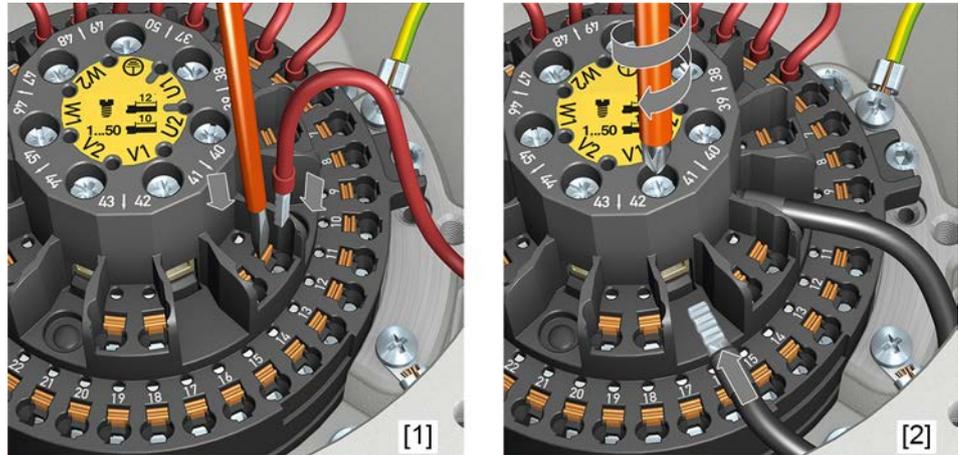
- [1] Screws
- [2] Mounting frame with connection board

How to proceed

1. Loosen screws [1] and remove mounting frame [2].
2. Remove cable sheathing in a length of 250 – 300 mm.
3. Insert the wires into the cable glands.
4. 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).
5. Strip wires:
 - 5.1 Remove wire sheathing of control cables (1...50) in a length of approx. 10 mm
 - 5.2 Remove wire sheathing of motor cables (U,V,W) in a length of approx. 12 mm

6. 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).
7. Connect cables according to order-related wiring diagram.
Information: Only connect control cables if binary signals are required in addition to the Profinet cables.

Figure 21: Connect cables to terminal carrier.



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

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



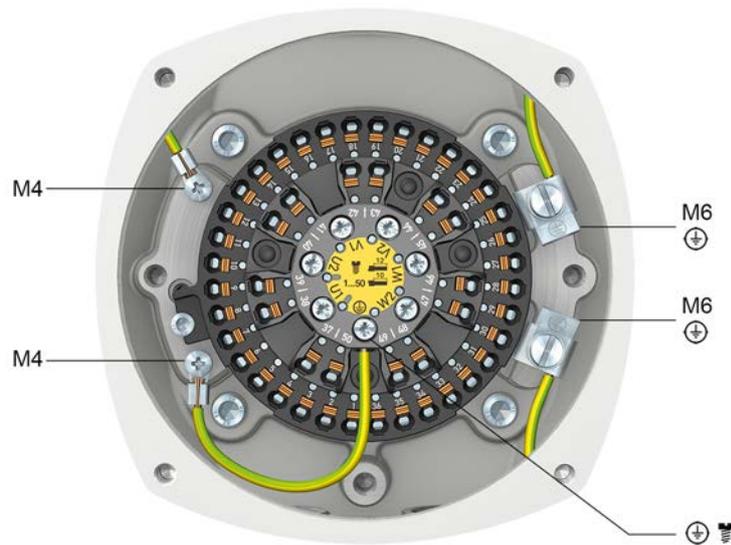
In case of a fault, electric shock due to presence of hazardous voltage if the PE conductor is NOT connected!

Risk of death or serious injury!

- 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.

8. Firmly tighten protective earth to PE connection (M6 ⊕).

Figure 22: Protective earth connections within connection frame

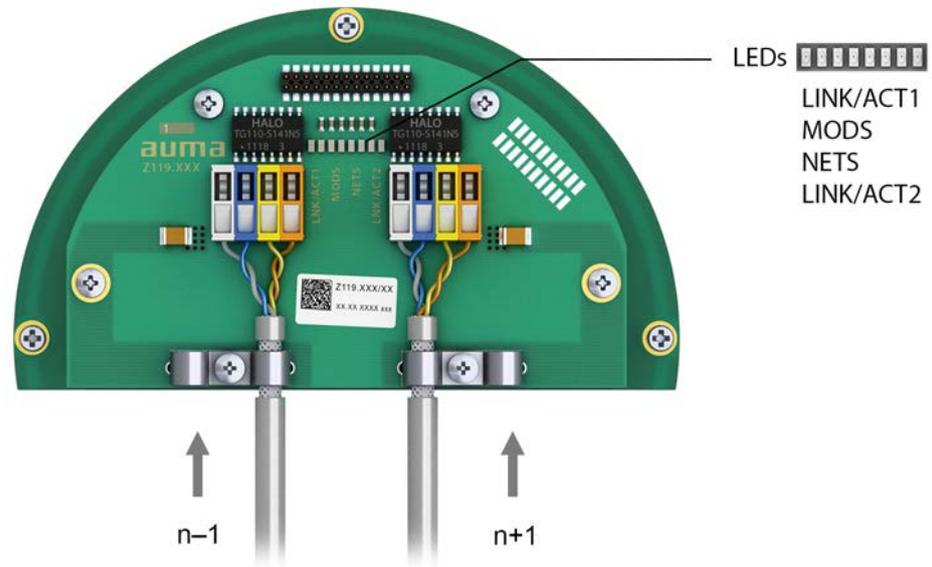


- M6 Customer protective earth connection for M6 ring lug or with U-bracket for up to two wires.
- M4 Internal protective earth connections via M4 ring lug (to cover and terminal carrier) connected in the factory
- ⊕ Protective earth connection to terminal carrier (power terminals); connected in the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

9. Assemble mounting frame [2] with screws [1] within connection frame.

6.2.3. Profinet cables: connect

Figure 23: Profinet connection board with connection terminals



- n-1 Profinet cable from previous device
 - n+1 Profinet cable to next device
- (For line topology or redundant ring/MRP - Media Redundancy Protocol)

Profinet connection is made individually by means of a safe Ethernet-capable insulation displacement connection. The colour coding of connection terminals are matching the Ethernet cable according to Profinet (white/blue/yellow/orange).

Table 18: Connecting data

Connection capacity (solid wire)	0.2 mm ² – 0.34 mm ² / AWG 24 – AWG 22
Connection capacity (stranded)	0.2 mm ² – 0.34 mm ² / AWG 24 – AWG 22

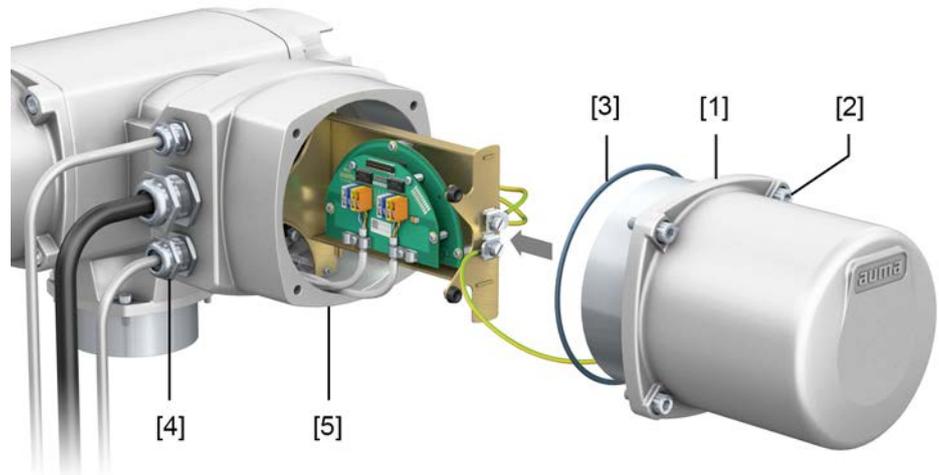
1. Remove cable sheathing and clamp shield under strain relief.
2. Connect cables to connection terminals. For this, use a small screwdriver to lift or push down the levers.

Table 19:

Connection terminal assignment		
Signal	Function	Colour of wire insulation
TD +	Transmit Data +	Yellow
TD –	Transmit Data –	Orange
RD +	Receive Data +	White
RD –	Receive Data –	Blue

6.2.4. Terminal compartment: close

Figure 24: Close terminal compartment



- [1] Cover (illustration shows KL version in type of protection Ex d)
- [2] Screws for cover
- [3] O-ring
- [4] Cable gland
- [5] Connection frame

How to proceed

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



Flameproof enclosure, risk of explosion!

Risk of death or serious injury!

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

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

6.3. External earth connection

Figure 25: Earth connection for part-turn actuator

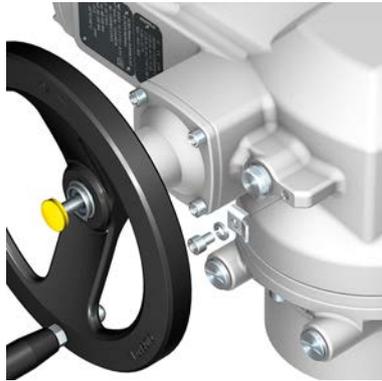


Figure 26: Earth connection for wall bracket



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

Table 20:

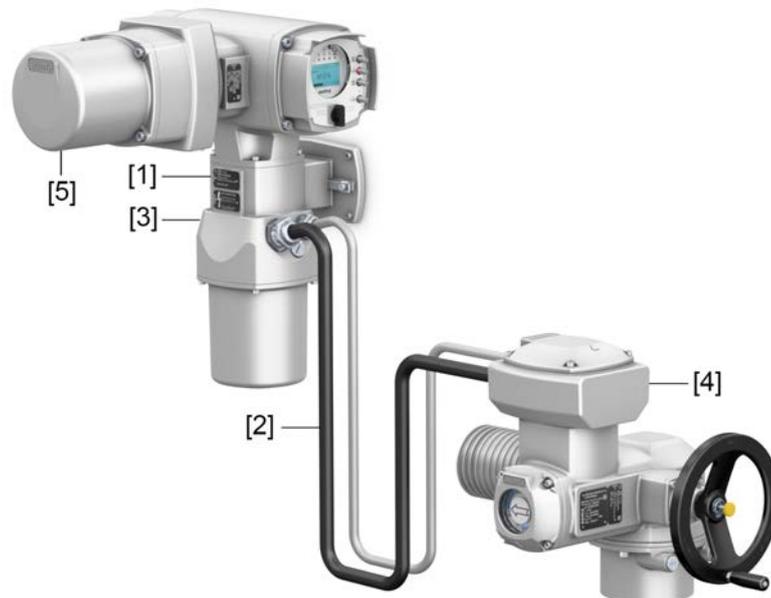
Terminal cross sections and earth connection tightening torques		
Conductor type	Terminal cross sections	Tightening torques
Solid wire and stranded	2.5 mm ² to 6 mm ²	3 – 4 Nm
Fine stranded	1.5 mm ² to 4 mm ²	3 – 4 Nm

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.

6.4. Accessories for electrical connection

6.4.1. Actuator controls on wall bracket

Design Figure 27: Design principle with wall bracket (example)



- [1] Wall bracket
- [2] Connecting cables
- [3] Electrical connection of wall bracket (XM)
- [4] Electrical connection of actuator (XA)
- [5] Electrical connection of actuator controls (XK) - customer plug

Application The wall bracket allows separate mounting of actuator controls and actuator.

- If the actuator cannot be accessed safely.
- If the actuator is subjected to high temperatures.
- In case of heavy vibration of the valve.

Information on installation with 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 “LSW” cable set.
- If the AUMA cable set is not used:
 - Use suitable flexible and screened connecting cables.
 - Use separate CAN bus cable of 120 Ohm character impedance for MWG (e.g. UNITRONIC BUS-FD P CAN UL/CSA - 2 x 2 x 0.5 mm², manufacturer: Lapp).
 - Data cable connection: XM2-XA2 = CAN L, XM3-XA3 = CAN H.
 - Voltage supply MWG: XM6-XA6 = GND, XM7-XA7 = + 24 V DC (refer to wiring diagram).
- 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.

6.4.2. Parking frame

Figure 28: PAFEx 01.1 parking frame



Application Parking frame for safe storage of a disconnected plug or cover.
For protection against touching the bare contacts and against environmental influences.

⚠ WARNING**Risk of explosion!**

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.

For PAFEx 01.1, separate operation instructions are available.

7. Operation

7.1. 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.

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

7.1.1. Manual valve operation



Damage at the manual change-over mechanism/motor coupling due to faulty operation!

- Engage manual operation only during motor standstill.
- Do NOT use extensions as lever for operation.

1. Press push button.
2. Turn handwheel in desired direction.



→ The closing direction is marked on the handwheel.

Table 21: Handwheel marking (examples)

→ For valve closing, turn handwheel in direction of the arrowhead.	
 Clockwise closing	 Counterclockwise closing
Drive shaft (valve) turns clockwise in direction CLOSE.	Drive shaft (valve) turns counterclockwise in direction CLOSE.

7.2. 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”.

7.2.1. Operating the actuator from local controls

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

Figure 29: 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

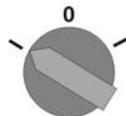


Hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight!

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).

7.2.2. Actuator operation from remote

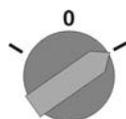


Risk of immediate actuator operation when switching on!

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).

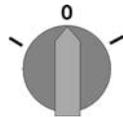


Information For actuators equipped with a positioner, it is possible to change over between **OPEN - CLOSE control** (Remote OPEN-CLOSE) and **setpoint control** (Remote SET-POINT). For further information, please refer to the Manual (Operation and setting).

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

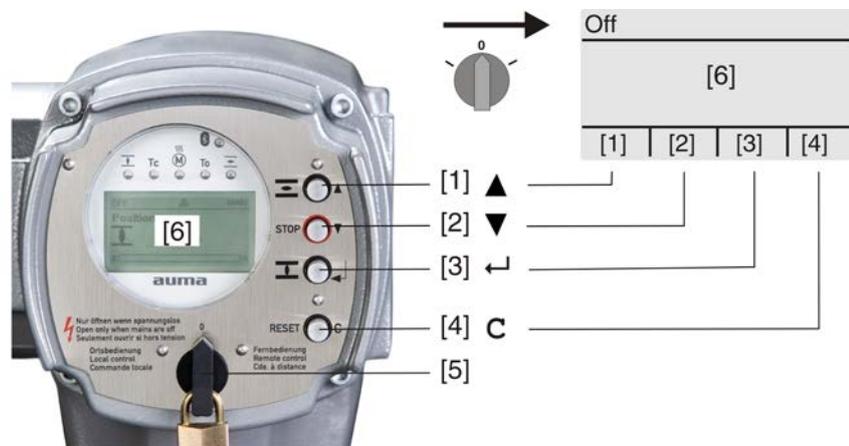
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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 30:



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

Table 22: Important push button functions for menu navigation

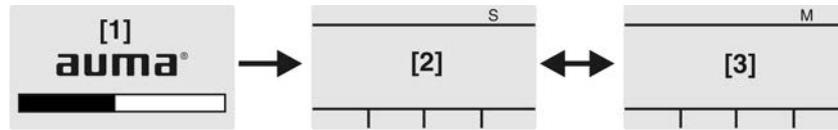
Push buttons	Navigation support on display	Functions
[1] ▲	Up ▲	Change screen/selection Change values Enter figures from 0 to 9
[2] ▼	Down ▼	Change screen/selection Change values Enter figures from 0 to 9
[3] ←	Ok	Confirm selection
	Save	Save
	Edit	Enter <Edit> menu
	Details	Display more details
[4] 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.

7.3.1. Menu layout and navigation

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

Figure 31: Groups



- [1] Start menu
- [2] Status menu
- [3] Main menu

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

Figure 32: Marking with ID

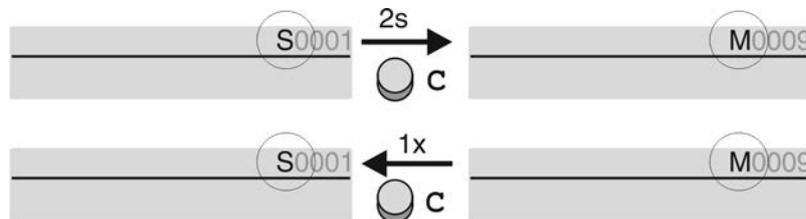


- S ID starts with S = status menu
- M ID starts with M = main menu

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 33: Select menu groups

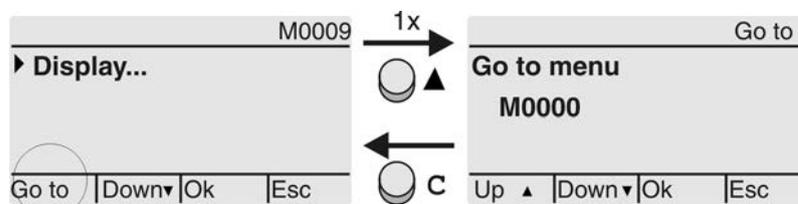


You return to the status menu if:

- 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 34: Direct display (example)



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

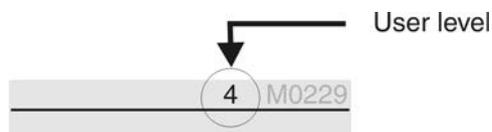
1. Press push button **▲ Go to**.
Display indicates: **Go to menu M0000**
2. Use push buttons **▲▼ Up ▲ Down ▼** to select figures 0 to 9.
3. Press push button **← Ok** to confirm first digit.
4. Repeat steps 2 and 3 for all further digits.
5. To cancel the process: Press **C Esc**.

7.4. 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 35: 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 23:

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



Unauthorised access is made easier due to insecure password!

→ We urgently recommend changing the password during initial commissioning.

7.4.1. 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.

7.4.2. Password change

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

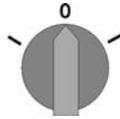
Example: If the user is signed in as **Specialist (4)**, he/she can change passwords as for password levels (1) through (4).

- 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

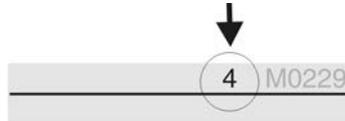
1. Set selector switch to position **0** (OFF).



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**.

7.4.3. Timeout for incorrect password entry

A timeout for incorrect password entry is provided with actuator controls. This prevents unauthorised access by systematic trials. The timeout is active for incorrect entries via the local controls as well as incorrect entries via our software tools (AUMA CDT, AUMA Assistant App). After five subsequent incorrect trials, further entry is inhibited for one minute. Each further incorrect entry doubles the timeout period. An active timeout is displayed on the screen. An individual timeout is available for each user level. This means that you may still log on with user level 3 if user level 4 is inhibited.

The incorrect entry counter can be reset in two ways:

1. Correct password entry with successful access authorisation.
2. 8 hours after the last incorrect entry.

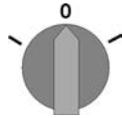
7.5. Language in the display

The display language can be selected.

7.5.1. Language change

M ▶ Display M0009
Language M0049

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



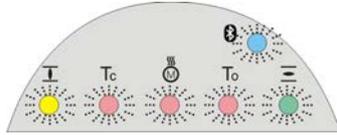
2. Press push button **C Setup** and hold it down for approx. 3 seconds.
➔ Display goes to main menu and indicates: ▶ **Display**
- Change language** 3. Press **↵ Ok**.
➔ Display indicates: ▶ **Language**
4. Press **↵ Ok**.
➔ Display indicates the selected language, e.g.: ▶ **Deutsch**
5. The bottom 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.

8. Indications

8.1. 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 36: LED test

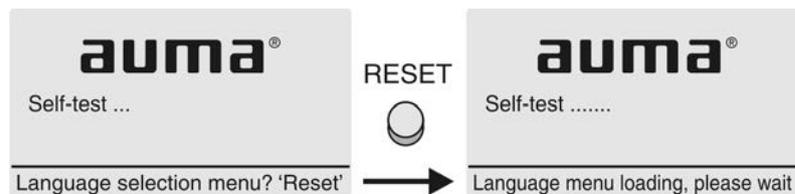


Language selection During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch to position **0** (OFF).

Activate language selection:

1. Display indicates in the bottom line: **Language selection menu? 'Reset'**
2. Hold down push button **RESET** until display of the following text in the bottom line: **Language menu loading, please wait.**

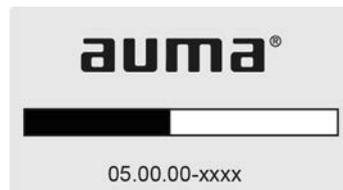
Figure 37: Self-test



The language selection menu follows the startup menu.

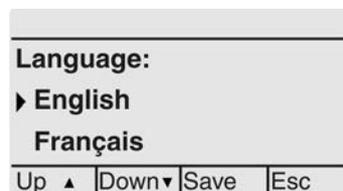
Startup menu The current firmware version is displayed during the startup procedure:

Figure 38: Startup menu with firmware version: 05.00.00–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 39: 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.

8.2. Indications in the display

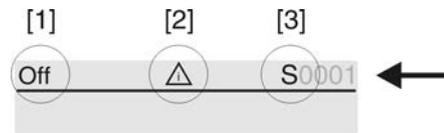


Menus and functions depend on the actuator controls firmware version!

→ Should menus or functions be unavailable, please contact the AUMA Service.

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.

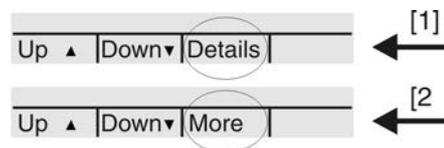
Figure 40: Information in the status bar (top)



- [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 41: 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.

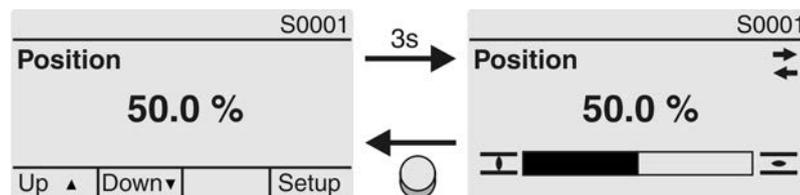
8.2.1. Feedback signals from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

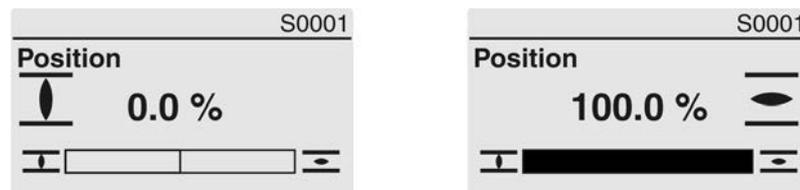
- S0001 on the display indicates the valve position in % of the travel.
- The bar graph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 42: Valve position and direction of operation



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

Figure 43: End position CLOSED/OPEN reached



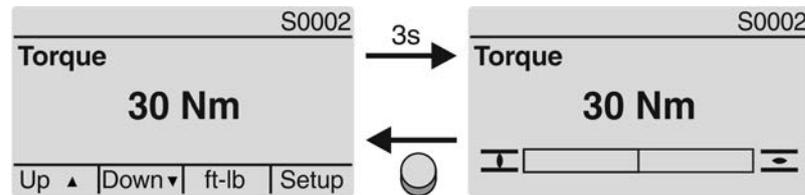
- 0% Actuator is in end position CLOSED
- 100% Actuator is in end position OPEN

Torque (S0002)

- S0002 on the display indicates the torque applied at the actuator output.

- The bar graph display appears after approx. 3 seconds.

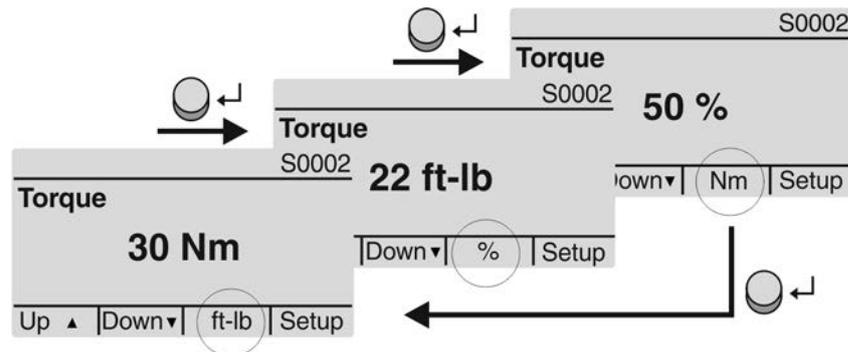
Figure 44: Torque



Select unit

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

Figure 45: Units of torque



Display in percent

100 % indication equals the max. torque indicated on the name plate of the actuator.

Example: Torque range on name plate = 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:

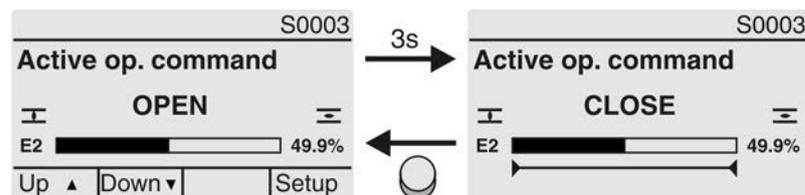
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bar graph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points 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 46: Display for OPEN - CLOSE control



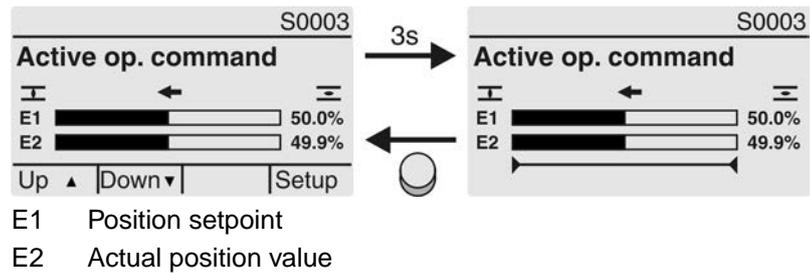
E2 Actual position value

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 47: Indication for setpoint control (positioner)



Pivot point axis

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

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

Operation profile M0294

Timer CLOSE M0156

Timer OPEN M0206

Figure 48: Examples: on the left pivot points (intermediate positions); on the right stepping mode



Table 24: 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	–

8.2.2. Status indications according to AUMA classification

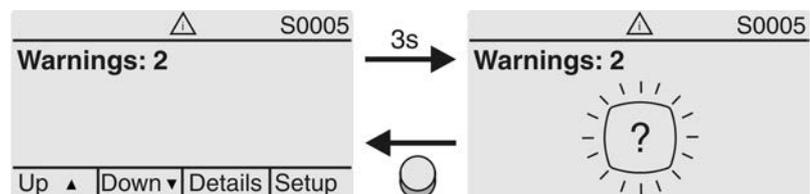
These indications are available if the parameter **Diagnostic classific. M0539** is set to **AUMA**.

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 49: Warnings



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

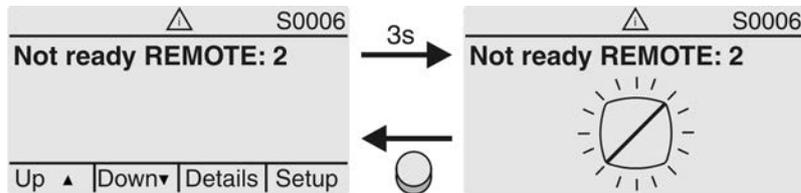
Not ready REMOTE (S0006)

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 50: Not ready REMOTE indications



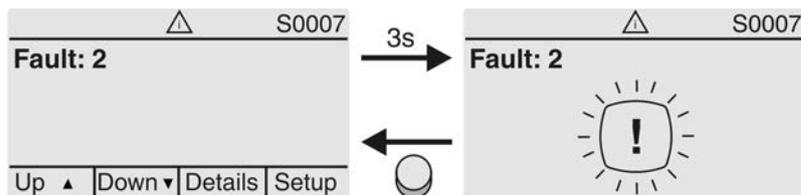
For further information, please also refer to <Corrective action>.

Fault (S0007)

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

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

Figure 51: Fault



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

8.2.3. Status indications according to NAMUR recommendation

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

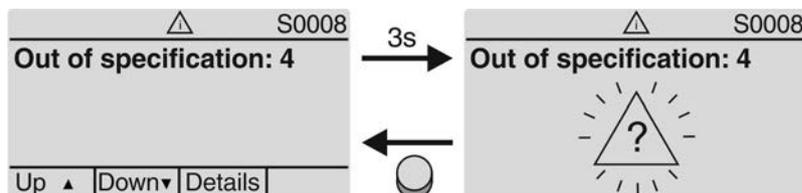
Out of Specification (S0008)

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 52: Out of specification



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

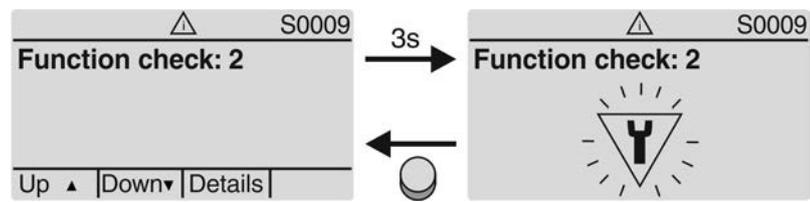
Function check (S0009)

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 53: Function check



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

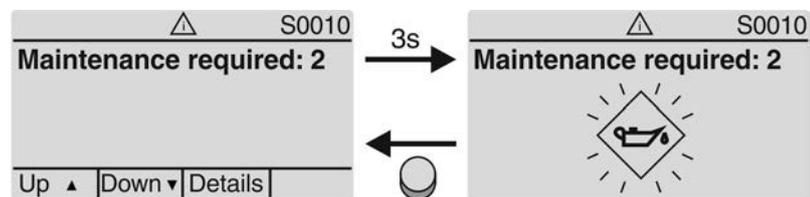
Maintenance required (S0010)

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 54: Maintenance required



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

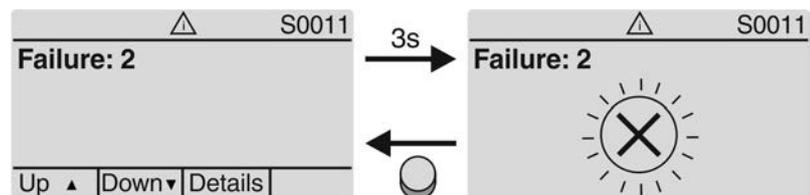
Failure (S0011)

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 55: Failure



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

8.3. Indication lights of local controls

Figure 56: 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 active

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

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

Default values (Europe):

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

Further setting values:

Refer to Manual (Operation and setting).

8.4. Mechanical position indication (self-adjusting)

Figure 57: Mechanical position indicator



- [1] End position OPEN reached
- [2] End position CLOSED reached

- Characteristics**
- Independent of power supply
 - Used as running indication: Indicator disc (with arrow \Rightarrow) rotates during actuator operation and continuously indicates the valve position
 (For “clockwise closing version”, the arrow rotates in clockwise direction for operation in direction CLOSE)
 - Indicates that end positions (OPEN/CLOSED) have been reached
 Arrow \Rightarrow points to symbol $\overline{\text{O}}$ (OPEN) or $\overline{\text{I}}$ (CLOSED)
 - Self-adjusting when increasing the swing angle

8.5. Mechanical position indication via indicator mark (not self-adjusting)

Figure 58: 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 $\overline{\text{O}}$ / $\overline{\text{I}}$ rotate in counterclockwise direction for operations in direction CLOSE)
 - Indicates that end positions (OPEN/CLOSED) have been reached
 (Symbols $\overline{\text{O}}$ (OPEN)/ $\overline{\text{I}}$ (CLOSED) point to the indicator mark \blacktriangle at cover)

9. Signals (output signals)

9.1. Signals via Profinet

Feedback signals via Profinet can be configured using the engineering tool of the DCS/PLC and the GSD file of actuator controls with Profinet (available for download at www.auma.com).

Refer to Manual Device integration Profinet for information on control commands and feedback signals via Profinet.

9.2. Status signals via output contacts (digital outputs)

- Conditions** Output contacts are only available if a parallel interface is provided in addition to the fieldbus interface.
- 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.

9.2.1. Assignment of outputs

The output contacts (outputs DOUT 1 – 6) 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

Default values:

- Signal DOUT 1 = **Fault**
 Signal DOUT 2 = **End position CLOSED**
 Signal DOUT 3 = **End position OPEN**
 Signal DOUT 4 = **Selector sw. REMOTE**
 Signal DOUT 5 = **Torque fault CLOSE**
 Signal DOUT 6 = **Torque fault OPEN**

9.2.2. Coding the outputs

The output signals **Coding DOUT 1 – Coding DOUT 6** 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 6 = **High active**

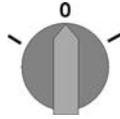
9.3. Analogue signals (analogue outputs)

- Requirements** Analogue signals are only available if additional input signals are provided.
- Valve position** Signal: E2 = 0/4 – 20 mA (galvanically isolated)
 Designation in the wiring diagram: AOUT1 (position)

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

10. Commissioning (basic settings)

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



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

2. Switch on the power supply.

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

3. Perform basic settings.

10.1. End stops in part-turn actuator



The following description applies for clockwise closing standard version.

Separate instructions are available for counterclockwise special version.

The internal end stops limit the swing angle. They protect the valve in case of limit switching failure during motor operation and serve the purpose as limitation for manual operation via handwheel. They may not be used for torque tripping in end positions during standard operation.

End stop setting is generally performed by the valve manufacturer **prior** to installing the valve into the pipework.



Exposed, rotating parts (discs/balls) at the valve!

Pinching and damage by valve or actuator.

- End stops should be set by suitably qualified personnel only.
- Never completely remove the setting screws [2] and [4] to avoid grease leakage.
- Observe dimension T_{\min} .

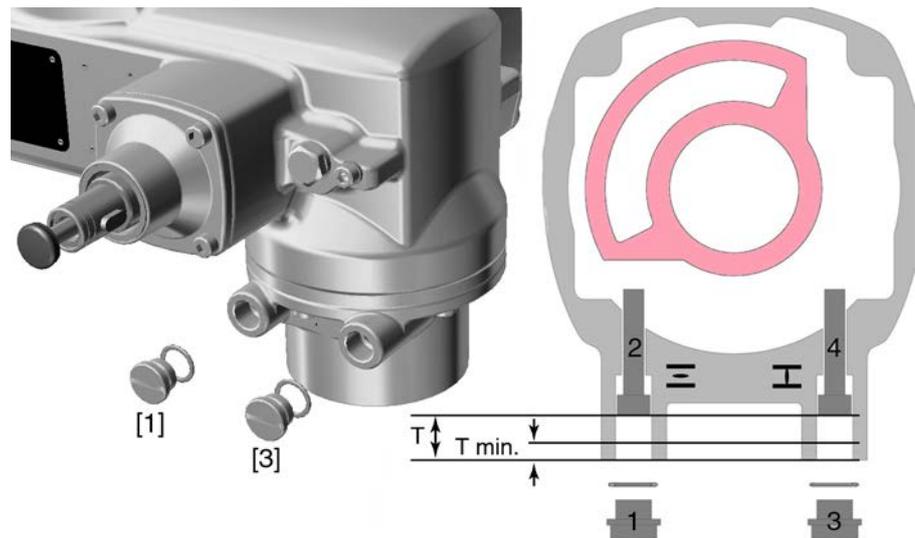
Information

- The swing angle set in the factory is indicated on the name plate:
Figure 59: Example: Swing angle on name plate



- The setting sequence depends on the valve:
 - Recommendation for **butterfly valves**: Set end stop CLOSED first.
 - Recommendation for **ball valves**: Set end stop OPEN first.

Figure 60: End stop



- [1] Screw plug for end stop OPEN
- [2] Setting screw for end stop OPEN
- [3] Screw plug for end stop CLOSED
- [4] Setting screw for end stop CLOSED

Dimensions/sizes	05.2	07.2	10.2	12.2	14.2
T (for 90°)	17	17	20	23	23
T _{min.}	11	11	12	13	12

10.1.1. Set end stop CLOSED

1. Remove screw plug [3].
2. Move valve to end position CLOSED with handwheel.
3. If the valve end position is not reached:
 - Slightly turn setting screw [4] counterclockwise until valve end position CLOSED can be safely set.
 - ➔ Turning the setting screw [4] clockwise results in a smaller swing angle.
 - ➔ Turning the setting screw [4] counterclockwise results in a larger swing angle.



4. Turn setting screw [4] clockwise to the stop.
 - ➔ This completes the setting of end stop CLOSED.
 5. Check O-ring of screw plug for seat and condition, replace if damaged.
 6. Fasten and tighten screw plug [1].
- Having completed this procedure, the end position detection CLOSED can be set immediately.

10.1.2. Set end stop OPEN

Information In general, the end stop OPEN does not have to be set.

1. Remove screw plug [1].
2. Move valve to end position OPEN with handwheel.

3. If the valve end position is not reached:
 - Slightly turn setting screw [2] counterclockwise until valve end position OPEN can be safely set.
 - ➔ Turning the setting screw [2] clockwise results in a smaller swing angle.
 - ➔ Turning the setting screw [2] counterclockwise results in a larger swing angle.



4. Turn setting screw [2] clockwise to the stop.
 - ➔ This completes the setting of end stop OPEN.
 5. Check O-ring of screw plug for seat and condition, replace if damaged.
 6. Fasten and tighten screw plug [1].
- Having completed this procedure, the end position detection OPEN can be set immediately.

10.2. 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

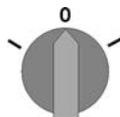
Default value: Limit

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**.

10.3. Torque switching: set

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

Information The torque switches may also trip during manual operation.

NOTICE

Valve damage due to excessive tripping torque limit setting!

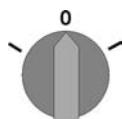
- The tripping torque must suit the valve.
- Only change the setting with the consent of the valve manufacturer.

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

Default value: According to order data

Setting range: Torque range according to actuator name plate

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



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

- Select parameter** 3. Select parameter either:
- click via the menu **M ▶** to parameter, or
 - via direct display: press **▲** and enter ID **M0088**.
- ↳ Display indicates: **Trip torque CLOSE**
- CLOSE or OPEN** 4. Use **▲▼ Up ▲ Down ▼** to select:
- **▶ Trip torque CLOSE**
 - **▶ Trip torque OPEN**
- ↳ The black triangle **▶** indicates the current selection.
5. **↵** Press **Ok**.
- ↳ Display shows the set value.
- ↳ The bottom row indicates: **Edit Esc**
6. **↵** Press **Edit**.
- ↳ Display indicates:
- **Specialist (4)** → continue with step 7
 - in bottom row **Up ▲ Down ▼ Esc** → continue with step 11
- User login** 7. Use **▲▼ Up ▲ Down ▼** to select user:
- Information:** Required user level: **Specialist (4)** or higher.
- ↳ The symbols have the following meanings:
- black triangle: **▶** = current setting
 - white triangle: **▷** = selection (not saved yet)
8. **↵** Press **Ok**.
- ↳ Display indicates: **Password 0*****
9. Enter password (→ enter password).
- ↳ Display shows the set value.
- ↳ The bottom row indicates: **Edit Esc**
10. **↵** Press **Edit**.
- Change value** 11. Enter new value for tripping torque via **▲▼ Up ▲ Down ▼**.
- Information:** The adjustable torque range is shown in round brackets.
12. Save new value via **↵ Save**.
- ↳ The tripping torque is set.
13. Back to step 4 (CLOSED or OPEN): Press **↵ Esc**.
- Information** The following fault signals are issued if the torque setting performed has been reached **in mid-travel**:
- In the display of the local controls: Status indication **S0007 Fault = Torque fault OPEN** or **Torque fault CLOSE**
- The fault has to be acknowledged before the operation can be resumed. The acknowledgement is made:
1. either by an operation command in the opposite direction.
 - For **Torque fault OPEN**: Operation command in direction **CLOSE**
 - For **Torque fault CLOSE**: Operation command in direction **OPEN**
 2. or, in case the torque applied is lower than the preset tripping torque:
 - in selector switch position **Local control (LOCAL)** via push button **RESET**.
 - in selector switch position **Remote control (REMOTE)**:
 - via the fieldbus, command reset., if the fieldbus is the active command source.
 - via a digital input (I/O interface) with **RESET** command if a digital input is configured for signal **RESET** and the I/O interface is the active command source.

10.4. Limit switching: set

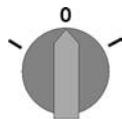
NOTICE

Valve damage at valve/gearbox due to incorrect setting!

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

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

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



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

- Select parameter** 3. Select parameter either:
 → click via the menu **M ▶** to parameter, or
 → via direct display: press **▲** and enter ID **M0084**.
 → Display indicates: **Set end pos.CLOSED?**

- CLOSED or OPEN** 4. Select via **▲▼ Up ▲ Down ▼**:
 → ▶ **Set end pos.CLOSED? M0084**
 → ▶ **Set end pos. OPEN? M0085**
 → The black triangle ▶ indicates the current selection.
 5. Press **↵ Ok**.

- User login** → The display indicates either:
 - **Set end pos.CLOSED? CMD0009** → continue with step 9
 - **Set end pos. OPEN? CMD0010** → continue with step 12
 - **Specialist (4)** → continue with step 6
 6. Use **▲▼ Up ▲ Down ▼** to select user:
Information: Required user level: **Specialist (4)** or higher

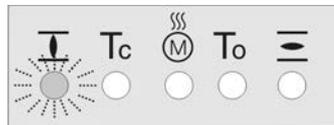
- The symbols have the following meaning:
 - black triangle: ▶ = current setting
 - white triangle: ▷ = selection (not saved yet)
 7. Press **Ok** to confirm selected user.
 → Display indicates: **Password 0*****
 8. Enter password (→ enter password).
 → The display indicates either:
 - **Set end pos.CLOSED? CMD0009** → continue with step 9
 - **Set end pos. OPEN? CMD0010** → continue with step 12

**Set end position
CLOSED** **CMD0009**

9. Set end position CLOSED again :
 - 9.1 For large strokes: Set selector switch in position **Local control** (LOCAL) and operate actuator in motor operation via push button  (CLOSE) in direction of the end position.
Information: Stop actuator **before** reaching end of travel (press **STOP** push button to avoid damage).
 - 9.2 Engage manual operation.
 - 9.3 Turn handwheel until valve is closed.
 - 9.4 Set selector switch to position **0** (OFF).
 ➔ Display indicates: **Set end pos. CLOSED? Yes No**

Confirm new end position

10. Press  **Yes** to confirm new end position.
 ➔ Display indicates: **End pos. CLOSED set!**
 ➔ The left LED is illuminated (standard version) and thus indicates that the end position CLOSED setting is complete.



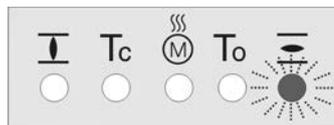
11. Make selection:
 - **Edit** → back to step 9: Set end position CLOSED "once again"
 - **Esc** → back to step 4; either set end position OPEN or exit the menu.

Set end position OPEN **CMD0010**

12. Re-set end position OPEN:
 - 12.1 For large strokes: Set selector switch in position **Local control** (LOCAL) and operate actuator in motor operation via push button  (OPEN) in direction of the end position.
Information: Stop actuator **before** reaching end of travel (press **STOP** push button to avoid damage).
 - 12.2 Engage manual operation.
 - 12.3 Turn handwheel until valve is open.
 - 12.4 Set selector switch to position **0** (OFF).
 ➔ Display indicates: **Set end pos. OPEN? Yes No**

Confirm new end position

13. Press  **Yes** to confirm new end position.
 ➔ Display indicates: **End pos. OPEN set!**
 ➔ The right LED is illuminated (standard version) and thus indicates that the end position OPEN setting is complete.



14. Make selection:
 - **Edit** → back to step 12: Set end position OPEN "once again"
 - **Esc** → back to step 4; either set end position CLOSED or exit the menu.

Information If an end position cannot be set: Check the type of control unit in actuator.

10.5. Test run

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

10.5.1. 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 self-adjusting mechanical position indication:**

- ➔ The direction of rotation is correct if the actuator operates in direction **CLOSE** and arrow ⇨ turns **clockwise** in direction CLOSE (symbol $\overline{\text{I}}$).

Figure 61: Direction of rotation ⇨ (for “clockwise closing” version)



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

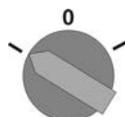
- ➔ The direction of rotation is correct if the actuator operation in direction **CLOSE** and the symbols $\overline{\text{E}}/\overline{\text{I}}$ turn **counterclockwise**:

Figure 62: Direction of rotation $\overline{\text{E}}/\overline{\text{I}}$ (for “clockwise closing” version)



10.5.2. Limit switching: check

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



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

11. Commissioning (settings in the actuator)

Figure 63: Mechanical position indicator (self-adjusting)



The actuator is supplied with the swing angle set in the factory in compliance with the order. The mechanical position indication is set to this swing angle.

If the factory swing angle is changed at a later date, the position indicator must be adapted to the new swing angle:

- Increasing the swing angle: The mechanical position indication automatically adjusts with the subsequent operation.
- Decreasing the swing angle: The mechanical position indication must be newly set (refer to the subsequent chapters).

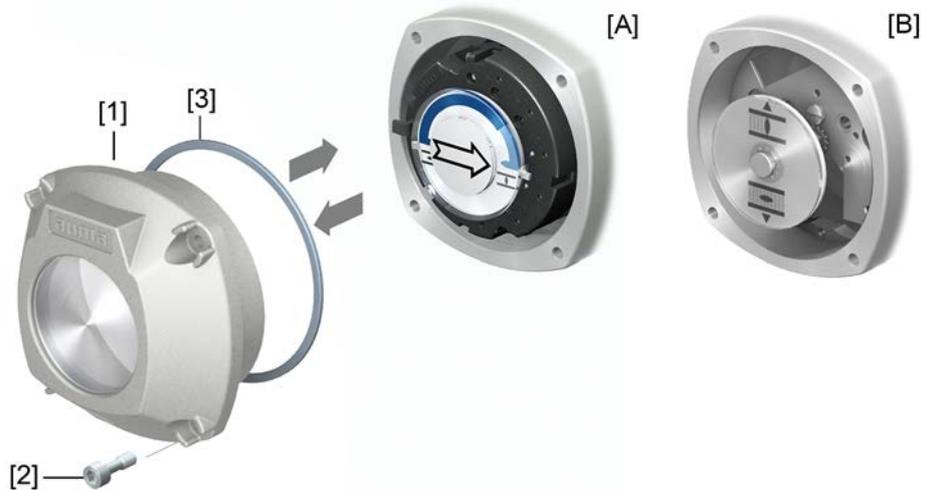
Figure 64: Mechanical position indication via indicator mark (not self-adjusting)



In case the mechanical position indication integrated within the actuator is NOT self-adjusting, the switch compartment must be opened for mechanical position indication adjustment when commissioning.

11.1. Switch compartment: open/close

Figure 65: Open/close switch compartment



- [A] Mechanical position indication (self-adjusting)
- [B] Mechanical position indication via indicator mark



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.
- Flameproof joints must neither be damaged nor soiled in any way.
- Do not jam cover during fitting.

- | | |
|--------------|---|
| Open | 1. Loosen screws [2] and remove cover [1] from the switch compartment. |
| Close | 2. Clean sealing faces of housing and cover. |
| | 3. Preserve joint surfaces with an acid-free corrosion protection agent. |
| | 4. Check whether O-ring [3] is in good condition, replace if damaged. |
| | 5. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly. |
| | 6. Place cover [1] on switch compartment. |
| | 7. Fasten screws [2] evenly crosswise. |

11.2. Mechanical position indicator (self-adjusting)

Figure 66: Mechanical position indicator (self-adjusting)



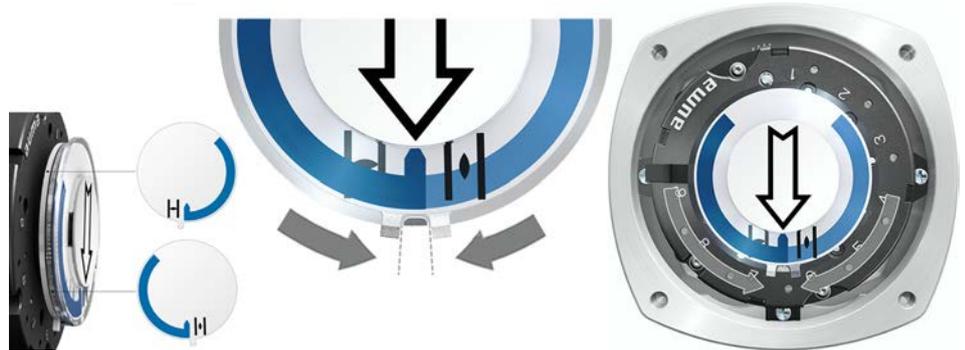
The self-adjusting mechanical position indicator shows the valve position by means of an arrow \Downarrow . When correctly set, the arrow points to symbol \equiv (OPEN) or \perp (CLOSED) in the end positions.

Information The position indications is housed in the actuator switch compartment. Opening the switch compartment for manual setting is only necessary if the gear stage setting must be modified or if the factory settings of predefined end position CLOSED (or OPEN) must be adapted when commissioning.

11.2.1. Mechanical position indicator: set

1. Move valve to end position CLOSED.
2. Push both lower discs with the symbols  (OPEN) and  (CLOSED) towards each other. The disc with the arrow is thereby  is driven:

Figure 67: Setting position in CLOSED



3. Move actuator to end position OPEN.
- ➔ The arrow  rotates in direction OPEN driving the indicator disc with symbol  (OPEN) until the actuator stops in position OPEN.

Figure 68: Operation in direction OPEN (left) and position OPEN (right)



4. Check settings:
 - ➔ The setting of the mechanical position indicator is correct if the angle between the symbols  (OPEN) and  (CLOSED) ranges between approx. 120° and 280°.
 - ➔ If all three discs are turned at the same time, the indicator can be shifted in steps of 15°. Individual shifts of 5° are possible.
 - ➔ If the indicator is rotated too far (more than 280°) or if the angle is too small (below 120°), adapt the gear stage setting to the actuator swing angle. Refer to <Gear stage of the reduction gearing: test/set>.

11.2.2. Gear stage of the reduction gearing: test/set

The test/setting is only required if the mechanical position indicator cannot be correctly set or if another swing angle range is ordered subsequently, for example, 120° ±15° instead of 90° ±15° (replacement by the AUMA Service only).

1. Refer to table and check if swing angle corresponds to the setting of the reduction gearing (stages 1– 9).

Table 25:

Actuator swing angle and suitable reduction gearing setting				
	SQ 05.2 / SQ 07.2	SQ 10.2	SQ 12.2	SQ 14.2
30° +/-15°	2	2	3	4
60° +/-15°	3	3	4	5
90° +/-15°	3	3	4	6
120° +/-15°	3	4	5	6
150° +/-15°	4	4	5	6
180° +/-15°	4	4	5	7
210° +/-15°	4	5	6	7
290° +/-70°	5	5	6	7

2. To modify settings, lift the lever at the reduction gearing and engage at the selected stage.

Figure 69: Set reduction gearing



11.3. Mechanical position indication via indicator mark (not self-adjusting)

Figure 70: Mechanical position indication via indicator mark



The mechanical position indicator shows the valve position via two indicator discs with symbols  (OPEN) and  (CLOSED). When correctly set, the symbols OPEN/CLOSED point to the indicator mark  at the cover in the end positions.

Setting elements

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

11.3.1. Mechanical position indicator: set

- ✓ If options (e.g. potentiometer, position transmitter) are available: Only set mechanical position indication once all optional equipment have been successfully set.

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



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



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

If the symbol  (CLOSED) is no longer in alignment with ▲ mark on the cover:
→ Repeat setting procedure.

11.3.2. Gear stage of the reduction gearing: test/set

This test/setting is only required if a different swing angle is subsequently required:

Information The adjustable swing angle range is available in the order-related technical data sheet (e.g. "90° +/-15°").

1. Pull off indicator disc using a spanner as lever if required.



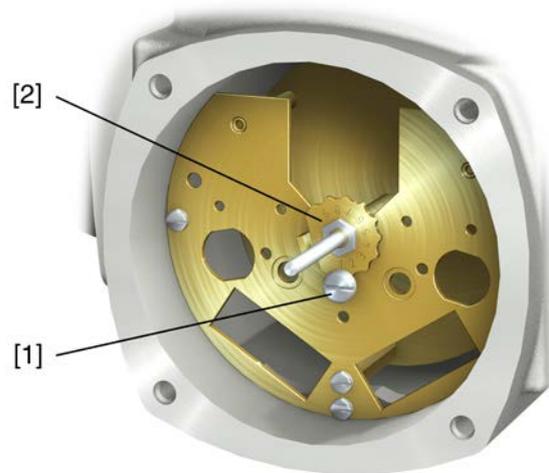
2. Refer to table and check if swing angle of the actuator corresponds to the setting of the reduction gearing (stages 1– 9).
 If the setting is **not correct**: continue with step 4.
 If the setting is correct: continue with step 7.

Table 26:

Actuator swing angle and suitable reduction gearing setting				
	SQ 05.2 / SQ 07.2	SQ 10.2	SQ 12.2	SQ 14.2
30° +/-15°	2	2	3	4
60° +/-15°	3	3	4	5
90° +/-15°	3	3	4	6
120° +/-15°	3	4	5	6
150° +/-15°	4	4	5	6
180° +/-15°	4	4	5	7
210° +/-15°	4	5	6	7
290° +/-70°	5	5	6	7

3. Loosen screw [1].
4. Set crown wheel [2] to desired stage according to table.
5. Tighten screw [1].
6. Place indicator disc on shaft.
7. Set mechanical position indicator.

Figure 71: Control unit with reduction gearing



- [1] Screw
- [2] Crown wheel

12. Corrective action

12.1. Faults during commissioning

Table 27:

Faults during operation/commissioning		
Fault	Description/cause	Remedy
Mechanical position indicator cannot be set.	Reduction gearing is not suitable for actuator swing angle.	Set gear stage of the reduction gearing. The control unit might have to be exchanged.
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.	<ul style="list-style-type: none"> Determine overrun: Overrun = travel covered from switching off until complete standstill. Set limit switching again considering the overrun. (Turn handwheel back by the amount of the overrun)

12.2. 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 28:

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 29:

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

1) For actuators controls in SIL version

Table 30:

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

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

1) For lift plug valve product variant

2) For actuators equipped with fail safe unit

Table 31:

Not ready REMOTE and Function check (collective signal 04)		
Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: <ul style="list-style-type: none"> Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SET-POINT operation simultaneously) A setpoint is present and the positioner is not active 	<ul style="list-style-type: none"> Check operation commands (reset/clear all operation commands and send one operation command only). Set parameter Positioner to Function active. Check setpoint. Press push button  Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Sel. sw. not REMOTE	Selector switch is not in position REMOTE.	Set selector switch to position REMOTE.
Service active	Operation via service interface (Bluetooth) and AUMA CDT service software.	Exit service software.
Disabled	Actuator is in operation mode Disabled.	Check setting and status of function <Local controls enable>.
EMCY stop active	The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected.	<ul style="list-style-type: none"> Enable EMERGENCY stop switch. Reset EMERGENCY stop state by means of Reset command.
EMCY behav. active	Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input.	<ul style="list-style-type: none"> Detect cause for EMERGENCY signal. Verify failure source. Apply +24 V DC at EMERGENCY input.
I/O interface	The actuator is controlled via the I/O interface (parallel).	Check I/O interface.
Handwheel active	Manual operation is activated.	Start motor operation.
FailState fieldbus	Fieldbus connection available, however no process data transmission by the master.	Verify master configuration
Local STOP	A local STOP is active. Push button STOP of local controls is operated.	Release push button STOP.
Interlock OPEN + CLOSE	An interlock is active.	Check interlock signal.
Interlock bypass	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

12.3. Fuses

12.3.1. Fuses within the actuator controls

F1/F2

Table 32:

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 33:

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 34:

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)

12.3.2. Fuse replacement

12.3.2.1. Replace fuses F1/F2



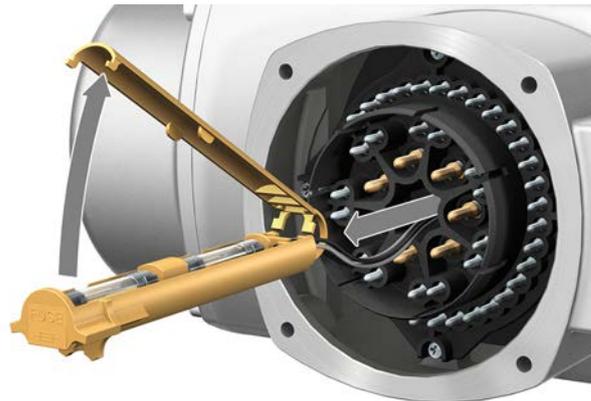
Electric shock due to presence of hazardous voltage!

Death or serious injury.

→ Disconnect device from the mains before opening.

1. Remove electrical connection from actuator controls.

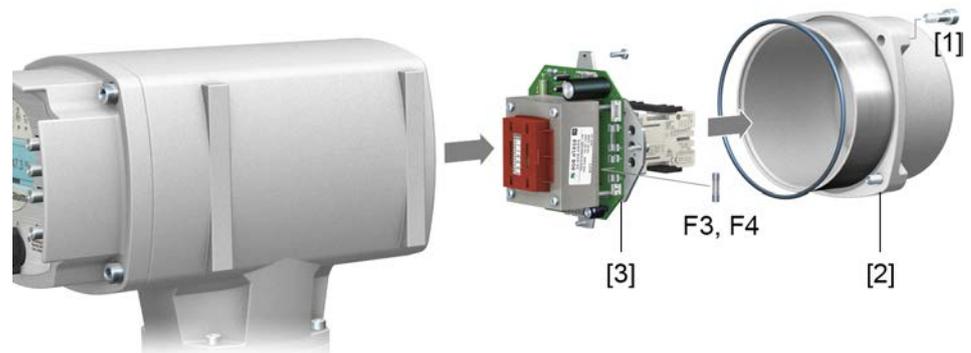
Figure 72:



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

12.3.2.2. Test/replace fuses F3/F4

1. Loosen screws [1] and remove cover [2] on the rear of the actuator controls.
Figure 73:



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

Table 35:

Checking	Measuring points
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.

12.3.3. Motor protection (thermal monitoring)

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

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

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

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

Depending on the parameter setting (motor protection behaviour), the fault signal is either automatically reset or the fault signal has to be acknowledged.

The acknowledgement is made:

- in selector switch position **Local control** (LOCAL) via push button **RESET**.
- In selector switch position **Remote control** (REMOTE) with Reset command via fieldbus.

Proof-test motor protection

The functionality of the motor protection must be verified at the latest when performing the maintenance (refer to chapter <Servicing and maintenance>).

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

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

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

Test procedure:

1. Set selector switch to position **0** (OFF).
2. Return to the main menu and select the simulation value in parameter **TMS proof test M1950**: Select **Thermal test**.
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.

13. Servicing and maintenance



Damage caused by inappropriate maintenance!

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

AUMA Service & Support

AUMA offers extensive service such as servicing and maintenance as well as customer product training. For the contact addresses, refer to our website (www.auma.com).

13.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Carry out visual inspection:
Cable entries, cable glands, blanking plugs, etc. have to be checked for correct fit and sealing. If required, tighten cable glands and blanking plugs with torque in compliance with the manufacturer's specifications.
Check actuator for damage as well as for grease or oil leakage.
- When deployed in areas where dust formation represents a potential explosion hazard, perform visual inspection for deposit of dirt or dust on a regular basis. Clean devices if required.
- 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 enclosure protection IP68

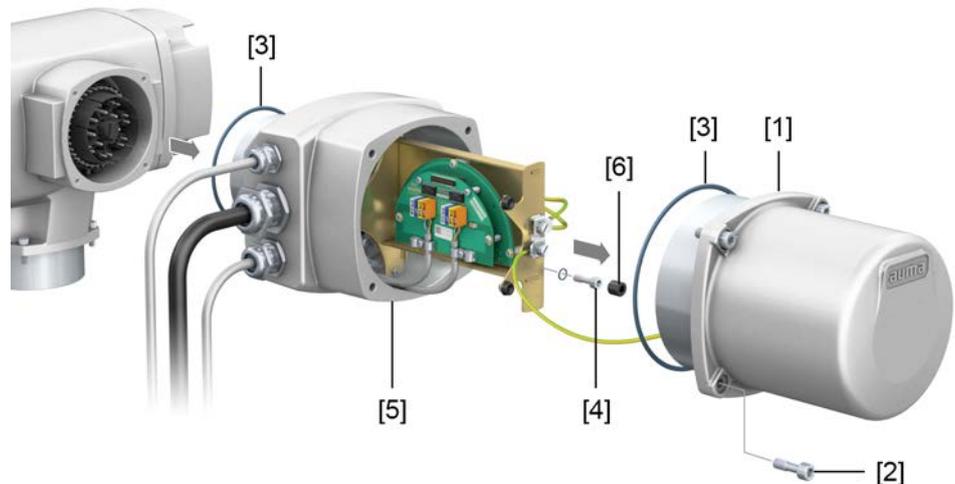
After submersion:

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

13.2. 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.

Figure 74: KL 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



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.
- Flameproof joints must neither be damaged nor soiled in any way.
- Do not jam cover during fitting.

Removing the plug:

1. Loosen the screws [2].
2. Remove cover [1].
3. 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. 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.

13.3. 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 and mounted accessories. Ensure that no outside damage, changes or leakage of grease and oil are visible.
 - Check actuator for unusual running or grinding noise or vibration which might be an indication of bearing or gear damage.
 - 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 having 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.

13.4. 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.:

- Electronic scrap
- Various metals
- Plastic materials

- 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.

14. 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).

14.1. Technical data Part-turn actuator

Features and functions	
Explosion protection	Refer to name plate
Certificates and standards	Certificates are attached to the device. All standards applied and their respective issues are indicated on these certificates.
Particular conditions of use	The particular conditions of use are listed on the certificates supplied.
Type of duty (Part-turn actuators for open-close duty)	Standard: With 3-phase AC motor: Short-time duty S2 - 15 min, classes A and B according to EN 15714-2 With 1-phase AC motor: Short-time duty S2 - 10 min, classes A and B according to EN 15714-2 For nominal voltage and +40 °C ambient temperature and at run torque load.
Type of duty (Part-turn actuators for modulating duty)	Standard: With 3-phase AC motor: Intermittent duty S4 - 25 %, class C according to EN 15714-2 With 1-phase AC motor: Intermittent duty S4 - 20 %, class C according to EN 15714-2 Option: With 3-phase AC motor: Intermittent duty S4 - 50 %, class C according to EN 15714-2 For nominal voltage and +40 °C ambient temperature and at modulating torque load.
Motors	Standard: 3-phase AC asynchronous motor, type IM B9 according to IEC 60034-7, IC410 cooling procedure according to IEC 60034-6 Option: 1-phase AC motor with integral permanent split capacitor (PSC), type IM B9 according to IEC 60034-7, IC410 cooling procedure 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 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: Options apply for open-close duty only Thermoswitches (NC) in the actuator and thermal overload relay in controls
Motor heater (option)	Voltages: 110 – 120 V AC, 220 – 240 V AC or 380 – 480 V AC 110 – 120 V AC, 220 – 240 V AC Power: 12.5 W
Swing angle	Standard: 75° to < 105° adjustable Options: 15° to < 45°, 45° to < 75°, 105° to < 135°, 135° to < 165°, 165° to < 195°, 195° to < 225°
Self-locking	Yes (Part-turn actuators are self-locking if the valve position cannot be changed from standstill while torque acts upon the output drive.)
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
Indication for manual operation (option)	Indication whether manual operation is active/not active via single switch (1 change-over contact)
Splined coupling for connection to the valve shaft	Standard: Coupling without bore Options: Machined coupling with bore and keyway, square bore or bore with two-flats according to EN ISO 5211
Valve attachment	Dimensions according to EN ISO 5211 without spigot

With base and lever (option)	
Swing lever	Made of spheroidal cast iron with two or three bores for fixing a lever arrangement. Considering the installation conditions, the lever may be mounted to the output shaft in any desired position.
Ball joints (option)	Two ball joints matching the lever, including lock nuts and two welding nuts, suitable for pipe according to dimension sheet
Fixing	Base with four holes for fastening screws
Electronic control unit	
Non-Intrusive setting	Magnetic limit and torque transmitter (MWG)
Position feedback signal	Via actuator controls
Torque feedback signal	Via actuator controls
Mechanical position indicator	Continuous self-adjusting indication with symbols OPEN and CLOSED
Running indication	Blinking signal via actuator controls
Heater in switch compartment	Resistance type heater with 5 W, 24 V AC
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 actuator name plate
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 (double sealed) For special motors differing enclosure protection: refer to name plate. According to AUMA definition, enclosure protection IP68 meets the following requirements: <ul style="list-style-type: none"> • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during immersion • Modulating duty is not possible during 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	2 g, 10 to 200 Hz (AUMA NORM), 1g, 10 to 200 Hz (for actuators with AMExC or ACExC integral actuator controls) Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid for part-turn actuators in version AUMA NORM and in version with integral actuator controls, each with AUMA plug/socket connector. 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 Two-component iron-mica combination
Colour	Standard: AUMA silver-grey (similar to RAL 7037) Option: Available colours on request.
Lifetime	AUMA part-turn actuators meet or even exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.

Further information	
EU Directives	ATEX Directive 2014/34/EU Machinery Directive 2006/42/EC Low Voltage Directive 2014/35/EU EMC Directive 2014/30/EU RoHS Directive 2011/65/EU RED Directive 2014/53/EU

Technical data for handwheel activation switches	
Mechanical lifetime	10 ⁶ starts
Silver plated contacts:	
U min.	12 V DC
U max.	250 V AC
I max. AC current	3 A at 250 V (inductive load, cos phi = 0.8)
I max. DC current	3 A at 12 V (resistive load)

14.2. 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 %: <ul style="list-style-type: none"> • 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 %: <ul style="list-style-type: none"> • 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: Thyristor unit for AUMA power classes B1 and B2 Option: Thyristor unit for AUMA power class B3
Control and feedback signals	Via Profinet interface

Features and functions					
Profinet interface with additional input signals (option)	<ul style="list-style-type: none"> • 2 free analogue inputs (0/4 – 20 mA), 4 free digital inputs <ul style="list-style-type: none"> - Signal transmission is made via fieldbus interface • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) <ul style="list-style-type: none"> - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface: Selection of control type (Fieldbus interface or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA) for position setpoint • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) <ul style="list-style-type: none"> - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface: Selection of control type (Fieldbus interface or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA) for setpoint position and 1 analogue input (0/4 – 20 mA) for actual process value 				
Control voltage/current consumption for control inputs	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; border-right: 1px solid black; padding-right: 5px;">Standard:</td> <td style="padding-left: 5px;">24 V DC, current consumption: approx. 10 mA per input</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">Options:</td> <td style="padding-left: 5px;"> 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 </td> </tr> </table>	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
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				
Status signals	Via Profinet interface				
Profinet interface with additional output signals (option)	<p>Additional, binary output signals (only available in combination with additional input signals (option))</p> <ul style="list-style-type: none"> • 6 programmable output contacts: <ul style="list-style-type: none"> - 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Standard assignment: End position CLOSED, end position OPEN, selector switch REMOTE, 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) • 6 programmable output contacts: <ul style="list-style-type: none"> - 5 potential-free change-over contacts with one common, max. 250 V AC, 1 A (resistive load) - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: <ul style="list-style-type: none"> - 6 potential-free change-over contacts without one common, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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), • Analogue output signal for position feedback <ul style="list-style-type: none"> - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω) 				
Voltage output	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; border-right: 1px solid black; padding-right: 5px;">Standard:</td> <td style="padding-left: 5px;">Auxiliary voltage 24 V DC: max. 100 mA for supply of control inputs, galvanically isolated from internal voltage supply.</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">Option:</td> <td style="padding-left: 5px;"> 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) </td> </tr> </table>	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)
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)				

Features and functions	
Local controls	<p>Standard:</p> <ul style="list-style-type: none"> • Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET <ul style="list-style-type: none"> - Local STOP The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.) • 6 indication lights: <ul style="list-style-type: none"> - End position and running indication CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue) • Graphic LC display: illuminated <p>Options:</p> <ul style="list-style-type: none"> • Special colours for the indication lights: <ul style="list-style-type: none"> - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), end position OPEN (red)
Bluetooth Communication interface	<p>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).</p> <p>Required accessories:</p> <ul style="list-style-type: none"> • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool)
Application functions	<p>Standard:</p> <ul style="list-style-type: none"> • Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED • Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time) • Start and end of stepping mode as well as ON and OFF times can be set individually for directions OPEN and CLOSE, 1 to 1,800 seconds • Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable • Running indication blinking: can be set • Positioner: <ul style="list-style-type: none"> - Position setpoint via Profinet interface - Automatic adaptation of dead band (adaptive behaviour selectable) - Change-over between OPEN-CLOSE control and setpoint control via Profinet interface <p>Option:</p> <ul style="list-style-type: none"> • PID process controller: with adaptive positioner, via 0/4 – 20 mA analogue inputs for process setpoint and actual process value • Automatic deblocking: Up to 5 operation trials, travel time in opposite direction can be set
Safety functions	<p>Standard:</p> <ul style="list-style-type: none"> • EMERGENCY operation (programmable behaviour) <ul style="list-style-type: none"> - Via additional input (option, low active) or via Profinet interface - 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). <p>Options:</p> <ul style="list-style-type: none"> • Release of local controls via Profinet interface: Thus, actuator operation can be enabled or disabled via push buttons on local controls. • Local STOP <ul style="list-style-type: none"> - 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.) • Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via Profinet interface • PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time
Monitoring functions	<ul style="list-style-type: none"> • Valve overload protection: adjustable, results in switching off and generates fault signal • Motor temperature monitoring (thermal monitoring): results in switching off and generates fault indication • Monitoring the heater within actuator: generates warning signal • Monitoring of permissible on-time and number of starts: adjustable, generates warning signal • Operation time monitoring: adjustable, generates warning signal • Phase failure monitoring: results in switching off and generates fault signal • Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current)

Features and functions	
Diagnostic functions	<ul style="list-style-type: none"> • Electronic device ID with order and product data • Operating data logging: A resettable counter and a lifetime counter each for: <ul style="list-style-type: none"> - 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): <ul style="list-style-type: none"> - 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 thermostiches within actuator
Electrical connection	Standard: AUMA Ex plug/socket connector with integral terminal connection (terminal frame) and enlarged terminal compartment.
Threads for cable entries	Standard: Metric threads
	Options: Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate

Further options for version with MWG in actuator	
Setting of limit and torque switching via local controls	
Torque feedback signal	Via Profinet interface Galvanically isolated analogue output 0/4 – 20 mA (load max. 500 Ω). Option, only possible in combination with output contacts.
Wiring diagram	Refer to name plate

Settings/programming the Profinet interface

The Profinet interface is set (assignment of device name as well as assignment of the IP address) using the Profinet engineering tools of the DCS.

General data of the Profinet interface	
Communication protocol	Profinet according to IEC 61158 and IEC 61784
Network topology	Star topology, point-to-point wiring Due to the switch function integrated within the AC 01.2, both line topology and redundant ring topology (MRP) are available. Unused network ports can be switched off.
Connection	Ethernet IEEE 802.3 2-pair cabling in compliance with IEC 61784-5-3 Auto Polarity Exchange, Auto Negotiation and Auto Crossover are supported.
Profinet connection	2 x Ethernet connection terminals with insulation displacement connection, integral screen with strain relief, suitable for all Ethernet cable types or 2 x RJ-45 Connection via connector for field assembly, one RJ-45 connector for Cat.5 (K009.706) is included in the scope of supply of the electrical connection.
Transmission rate	100 Mbits/s (100BASE-TX), full duplex
Cable length	Max. 100 m
Device classes	I/O controller (usually the PLC/DCS) I/O devices (field devices) I/O supervisor (programming device, PC or HMI for diagnostics/commissioning)
Fieldbus access	Provider - consumer model
Supported Profinet specification	Version V2.32
Supported Profinet functions	Cyclic Profinet communication (RT) Acyclic Profinet communication (Read/Write Record)

General data of the Profinet interface									
Supported Profinet alarms	Status Alarm Update Alarm Port Data Change Notification Alarm Sync Data Change Notification Alarm								
Supported network diagnostic and management protocols	ACD (Address Conflict Detection) ARP (Address Resolution Protocol) DCP (Discovery and Basic Configuration Protocol) SNMP (Simple Network Management Protocol) LLDP (Link Layer Discovery Protocol) in accordance with IEEE 802.1AB These functions allow assignment of the Profinet device name, a graphic representation of the plant topology, port-granular diagnostics as well as neighbourhood detection as the basis for quick commissioning and easy device replacement.								
Profinet redundancy	Standard: Media Redundancy Protocol in compliance with IEC 62439 (switch function integrated within AC 01.2) Option: System redundancy S2 Single NAP								
Vendor ID	319								
Ident Code	1								
Profinet device type	AUMA-Actuator-AC01-2								
Identification & Maintenance properties	<table border="1"> <tr> <td>I&M0 Profile ID:</td> <td>62976</td> </tr> <tr> <td>I&M0 Profile Specification Type:</td> <td>4</td> </tr> <tr> <td>I&M0 Version:</td> <td>257</td> </tr> <tr> <td>I&M0 Supported:</td> <td>30</td> </tr> </table>	I&M0 Profile ID:	62976	I&M0 Profile Specification Type:	4	I&M0 Version:	257	I&M0 Supported:	30
I&M0 Profile ID:	62976								
I&M0 Profile Specification Type:	4								
I&M0 Version:	257								
I&M0 Supported:	30								
Profinet Ident Nr.	0x013F; 0x0001								
DAP (Device Access Point)	0x80010000								
Conformance class	CC-B (Conformance Class B) for the Profinet application of the AC actuator controls CC-C (Conformance Class C) for the integral switch function								
Netload Class	III								
Device diagnostics via Ethernet	Via TCP/IP and integral web server possible Via FDI package & software for diagnostics/commissioning (e. g. Siemens PDM, Emerson AMS)								
Device integration	Via GSD (ml) file (available for download at www.auma.com)								

Commands and signals of the Profinet interface	
Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable local controls, Interlock OPEN/CLOSE, PVST
Process representation input (feedback signals)	End positions OPEN, CLOSED Actual position value Actual torque value, requires MWG in actuator Selector switch in position LOCAL/REMOTE Running indication (directional) Torque switches OPEN, CLOSED Limit switches OPEN, CLOSED Manual operation by handwheel or via local controls Analogue (2) and digital (4) customer inputs
Process representation input (fault signals)	Motor protection tripped Torque switch tripped in mid-travel One phase missing Failure of analogue customer inputs
Behaviour on loss of communication	The behaviour of the actuator is programmable: <ul style="list-style-type: none"> • Stop in current position • Travel to end position OPEN or CLOSED • Travel to any intermediate position • Execute last received operation command

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 in accordance with IEC 60529	IP68 Terminal compartment additionally sealed against interior of actuator controls (double sealed) According to AUMA definition, enclosure protection IP68 meets the following requirements: <ul style="list-style-type: none"> • Depth of water: Maximum 8 m head of water • Continuous immersion in water: maximal 96 hours • Up to 10 operations during immersion • Modulating duty is not possible during 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

Accessories	
Wall bracket	For actuator controls mounted separately from the actuator, including plug/socket connector. Connecting cable on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service. Cable length between actuator and actuator controls is max. 100 m. An MWG is required for position feedback.
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool)

Further information	
Weight	Approx. 12 kg (with AUMA KT Ex plug/socket connector)
EU Directives	ATEX Directive 2014/34/EU Machinery Directive 2006/42/EC Low Voltage Directive 2014/35/EU EMC Directive 2014/30/EU RoHS Directive 2011/65/EU

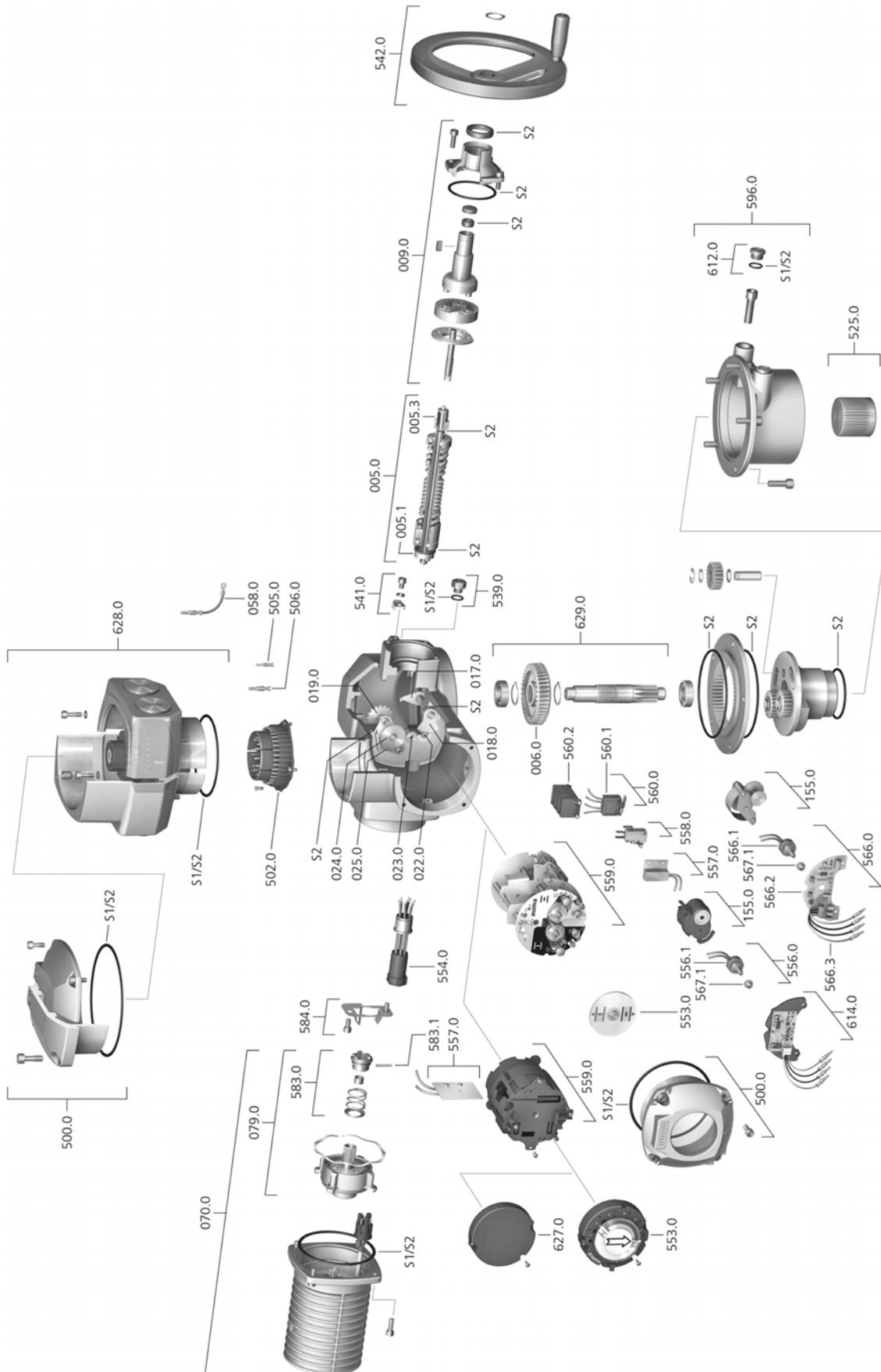
14.3. Tightening torques for screws

Table 36:

Tightening torques for screws		
Threads	Tightening torque [Nm]	
	Strength class	
	A2-70/A4-70	A2-80/A4-80
M6	7.4	10
M8	18	24
M10	36	48
M12	61	82
M16	150	200
M20	294	392
M30	1,015	1,057
M36	1,769	2,121

15. Spare parts

15.1. Part-turn actuators SQEx 05.2 – SQEx 14.2/SQREx 05.2 – SQREx 14.2 KT/KM

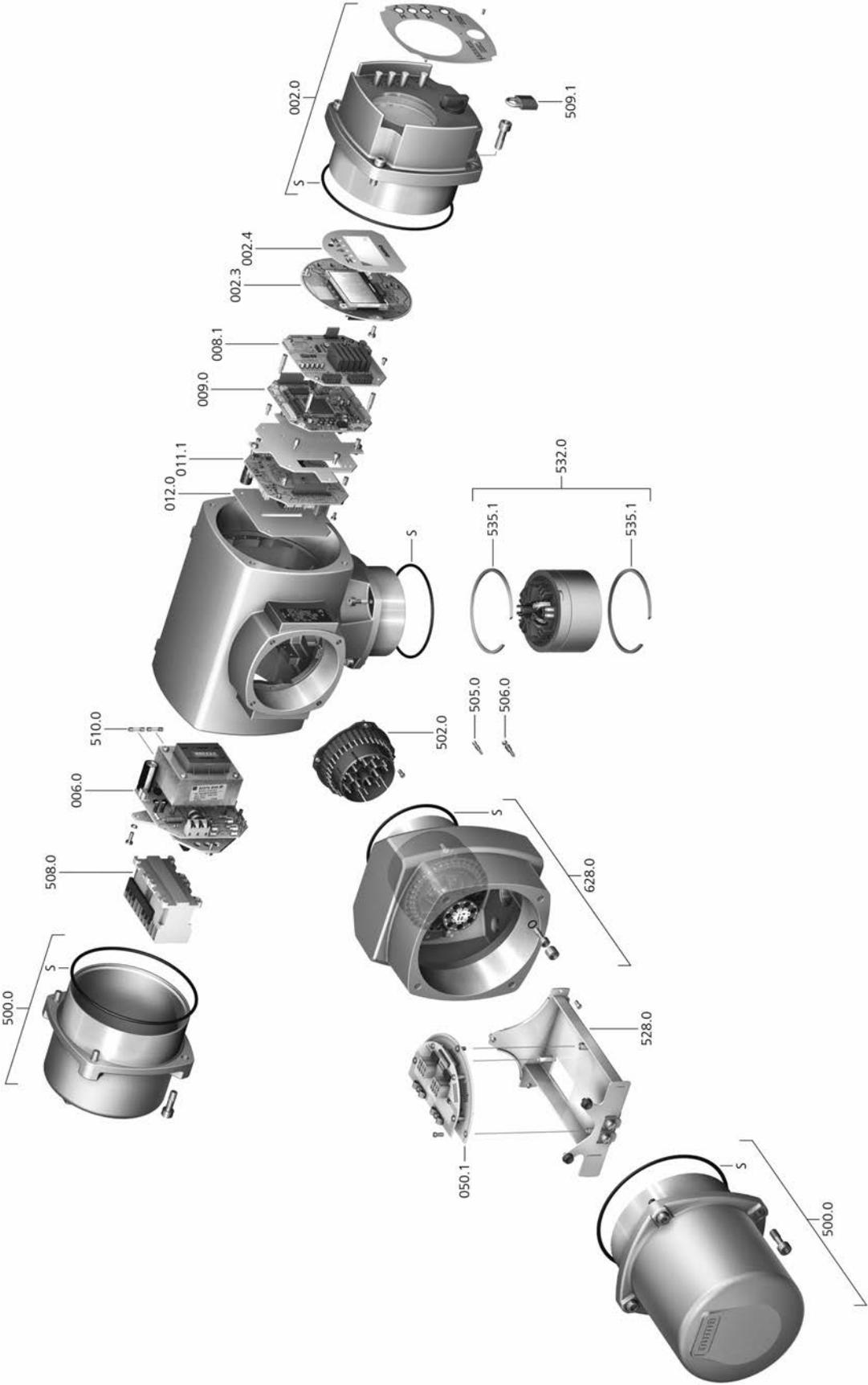


Spare parts

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
005.0	Drive shaft	Sub-assembly	556.1	Potentiometer without slip clutch	Sub-assembly
005.1	Motor coupling	Sub-assembly	557.0	Heater	Sub-assembly
005.3	Manual drive coupling	Sub-assembly	558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
006.0	Worm wheel		559.0–1	Electromechanical control unit with switches, including torque switching heads	Sub-assembly
009.0	Manual gearing	Sub-assembly	559.0–2	Electronic control unit with magnetic limit and torque transmitter (MWG)	Sub-assembly
017.0	Torque lever	Sub-assembly	560.0–1	Switch stack for direction OPEN	Sub-assembly
018.0	Gear segment		560.0–2	Switch stack for direction CLOSE	Sub-assembly
019.0	Crown wheel	Sub-assembly	560.1	Switch for limit/torque	Sub-assembly
022.0	Drive pinion II for torque switching		560.2–1	Switch case for direction OPEN	
023.0	Output drive wheel for limit switching	Sub-assembly	560.2–2	Switch case for direction CLOSE	
024.0	Drive wheel for limit switching	Sub-assembly	566.0	RWG position transmitter	Sub-assembly
025.0	Locking plate	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	Sub-assembly
058.0	Cable for protective earth	Sub-assembly	566.2	Position transmitter board for RWG	Sub-assembly
070.0	Motor (incl. ref. no. 079.0)	Sub-assembly	566.3	Cable set for RWG	Set
079.0	Planetary gearing for motor drive	Sub-assembly	567.1	Slip clutch for potentiometer	Sub-assembly
155.0	Reduction gearing	Sub-assembly	583.0	Motor coupling on motor shaft	Sub-assembly
500.0	Cover	Sub-assembly	583.1	Pin for motor coupling	
502.0	Pin carrier without pins	Sub-assembly	584.0	Retaining spring for motor coupling	Sub-assembly
505.0	Pin for controls	Sub-assembly	596.0	Output drive flange with end stop	Sub-assembly
506.0	Pin for motor	Sub-assembly	612.0	Screw plug for end stop	Sub-assembly
525.0	Coupling	Sub-assembly	614.0	EWG position transmitter	Sub-assembly
539.0	Screw plug	Sub-assembly	627.0	MWG 05.3 cover	
541.0	Protective earthing	Sub-assembly	628.0	Ex plug/socket connector with terminal connection (KT)	
542.0	Handwheel with ball handle	Sub-assembly	629.0	Pinion shaft	Sub-assembly
553.0	Mechanical position indicator	Sub-assembly	S1	Seal kit, small	Set
554.0	Socket carrier for motor plug/socket connector with cable harness		S2	Seal kit, large	Set
556.0	Potentiometer for position transmitter	Sub-assembly			

15.2. ACExC 01.2 KL-Ex d actuator controls



Spare parts

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	
050.1	Fieldbus connection 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	Set
528.0	Terminal frame (without terminals)	
532.0	Cable conduit (actuator connection)	
535.1	Retaining ring	
628.0	Ex plug/socket connector	
S	Seal kit	Set

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