



Part-turn actuators

SQVEx 05.2 – SQVEx 14.2

SQRVEx 05.2 – SQRVEx 14.2

Control unit: electronic (MWG)

with actuator controls

ACVExC 01.2 Non-Intrusive

Multiport valve version

Control

Parallel

Profibus DP

→ 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 ACVExC 01.2 Modbus
- Manual (Fieldbus device integration) of actuator controls ACVExC 01.2 Modbus

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	<p>The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation.</p> <p>Depending on the actuator version, this includes:</p> <ul style="list-style-type: none"> Standards and directives such as IEC 60079 "Explosive atmospheres": <ul style="list-style-type: none"> Part 14: Electrical installations design, selection and erection. Part 17: Electrical installations inspection and maintenance. Configuration guidelines for the respective fieldbus or network applications.
Safety instructions/warnings	<p>All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.</p>
Qualification of staff	<p>Assembly, electrical connection, commissioning, operation, and maintenance must be carried out by suitably qualified personnel authorised by the end user or contractor of the plant only.</p> <p>Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.</p> <p>Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant is responsible for respect and control of these regulations, standards, and laws.</p>
Electrostatic charging	<p>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.</p> <p>This also applies to fireproof coatings or covers available as an option.</p>
Ignition dangers	<p>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.</p>
Commissioning	<p>Prior to commissioning, imperatively check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.</p>
Operation	<p>Prerequisites for safe and smooth operation:</p> <ul style="list-style-type: none"> Correct transport, proper storage, mounting and installation, as well as careful commissioning. Only operate the device if it is in perfect condition while observing these instructions. Immediately report any faults and damage and allow for corrective measures. Observe recognised rules for occupational health and safety. Observe national regulations. During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature 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 SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 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 at least have a strength class of A*-70.
- For fixing the screws, please also refer to [page 82, Tightening torques for screws](#).
- After tripping of the thermal motor protection (TMS), an acknowledgement (RESET) of the thermal fault is required.

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)



Via the menu to parameter

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



Result of a process step

Describes the result of a preceding process step.

Warning signs at the device

The following warning signs can be attached to the device.



General warning sign

General warning of a danger zone.



Hot surface

Warning of hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight.



Electrical voltage

Hazardous voltage! Warning of electric shock. At some devices, the warning sign additionally includes a time interval, e.g. 30 s. Once power supply is switched off, you will have to wait for the indicated period. Only then may the device be opened.

2. Short description

AUMA part-turn actuator Figure 1: AUMA SQVEx 10.2 part-turn actuators



- [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 SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 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.

For variable speed actuators SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 14.2, the actuator speed is modified by means of a frequency converter in the actuator controls.

Please note: Actuators in multiport valve product variant are multi-turn and can approach different valve connection. Consequently, no end stops are available. The designations "End position OPEN" and "End position CLOSED" used in the following chapters signify the MPV positions, or "Position reached" for this product variant. Direction OPEN corresponds to an operation in CW direction and direction CLOSE to an operation in CCW direction.

Actuator controls The actuator controls ACVExC 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.

Connection between computer (notebook, tablet) and actuator is wireless via Bluetooth interface.

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.

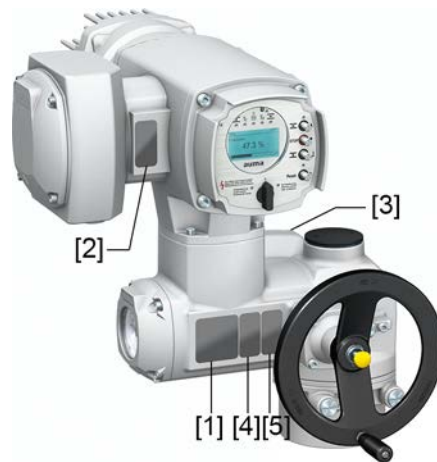
The AUMA Assistant App can be downloaded free of charge from the Play Store (Android) or App Store (iOS).

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] Additional plate, e.g. KKS plate (Power Plant Classification System)
- [5] Explosion protection approval plate

Actuator name plate

Figure 5: Actuator name plate (example)

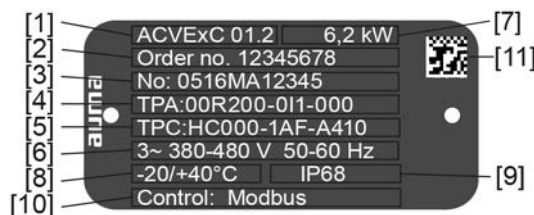


auma (= manufacturer logo); **CE** (= CE mark)

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

Actuator controls name plate

Figure 6: Name plate for actuator controls (example)

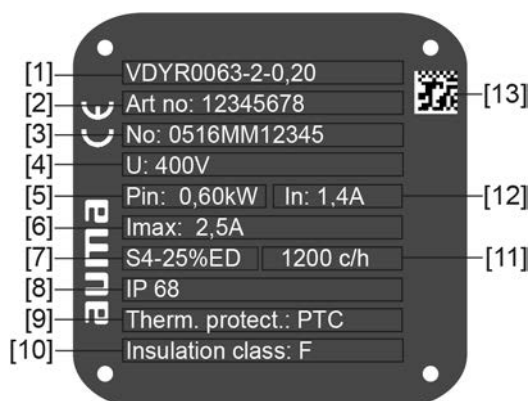


auma (= manufacturer logo)

- [1] **Type designation**
- [2] **Order number**
- [3] **Serial number**
- [4] **Actuator terminal plan**
- [5] Actuator controls terminal plan
- [6] Mains/voltage range/frequency range
- [7] **Rated motor power of ACVExC**
- [8] Permissible ambient temperature
- [9] Enclosure protection
- [10] **Control**
- [11] Data Matrix code

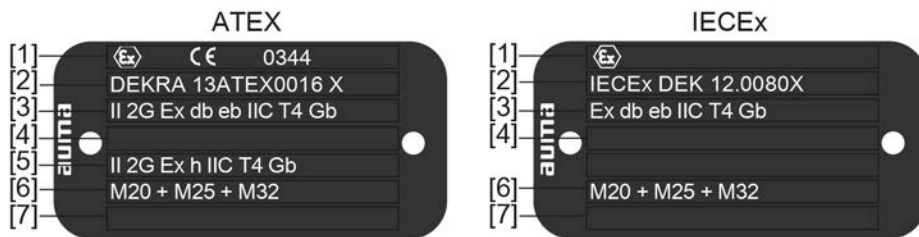
Motor name plate

Figure 7: Motor name plate (example)



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

- [1] Motor type
- [2] Motor article number
- [3] Serial number
- [4] Rated voltage
- [5] Consumed nominal power by the mains P_N
- [6] Consumed nominal current by the mains I_N
- [7] Type of duty
- [8] Enclosure protection
- [9] Motor protection (temperature protection)
- [10] Insulation class
- [11] Perm. number of starts (for SQRV)
- [12] Nominal current
- [13] Data Matrix code

Approval plate in explosion-proof version

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

Type designation

Table 1:

Description of type designation (with the example of SQVEx 07.2-F07)			
SQVEx	07.2	-F10	
SQVEx			Type SQ VEx = Part-turn actuators for open-close duty Type SQR VEx = Part-turn actuators for modulating duty V = variable operating times Ex = explosion-proof version
	07.2		Size These instructions apply to sizes 05.2, 07.2, 10.2, 12.2, 14.2
		F10	Flange size

Ex marking

Table 2:

Marking for explosion protection (example of /-a3b1)					
	–	a	3	b	1
	–	Not used			
		a	Motor type a = VDY, SDY: 3-phase AC motor (for 3-phase mains voltage via frequency converter) VSY, SSY: 3-phase motor (for 1-phase mains voltage via frequency converter)		
		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.

Actuator serial number

Table 3:

Description of serial number up to 2022 (example of 0522MD12345)			
05	22	MD12345	
05			Positions 1+2: Assembly in week = week 05
	22		Positions 3+4: Year of manufacture = 2022
		MD12345	Internal number for unambiguous product identification

Table 4:

Description of serial number as from 2023 (example of 0000-00101-2023)			
0000-00101	–	2023	
0000-00101			Serial number of sales articles 11-digit, internal number for unambiguous product identification
		2023	Year of manufacture = 2023

Actuator terminal plan

Position 9 after **TPA**: Position transmitter version

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

Control

Table 5:

Control examples (indications on actuator controls name plate)	
Input signal	Description
Modbus RTU	Control via Modbus RTU interface
Modbus RTU/24 V DC	Control via Modbus RTU 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, storage and packaging

4.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

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



NOTICE

Delicate cooling fins, risk of damage!

During transport or assembly without the supplied transport protection, the cooling fins may either break or bend if they hit other objects during inappropriate transport.

- During transport and installation, leave the supplied cooling fin transport protection on the cooling fins.

Table 6:

Weights for part-turn actuators SQVEx 05.2 – SQVEx 14.2 / SQRVEx 05.2 – SQRVEx 14.2 with 3-phase AC motors	
Type designation Actuator	Weight ¹⁾ approx. [kg]
SQVEx 05.2/ SQRVEx 05.2	29
SQVEx 07.2/ SQRVEx 07.2	29
SQVEx 10.2/ SQRVEx 10.2	34
SQVEx 12.2/ SQRVEx 12.2	42
SQVEx 14.2/ SQRVEx 14.2	51

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.

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

Long-term storage

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

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

5. Assembly

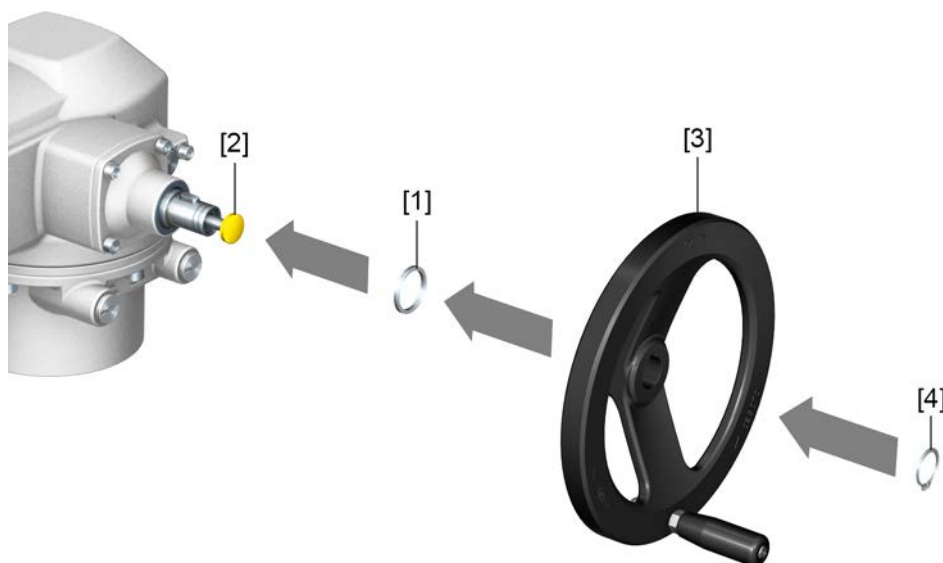
5.1. Mounting position

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

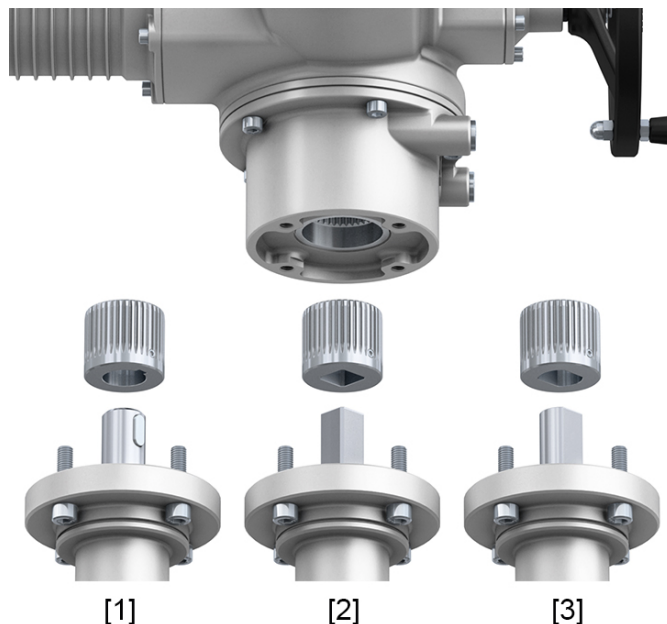
Corrosion due to damage to paint finish and condensation!

- 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].

4. 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

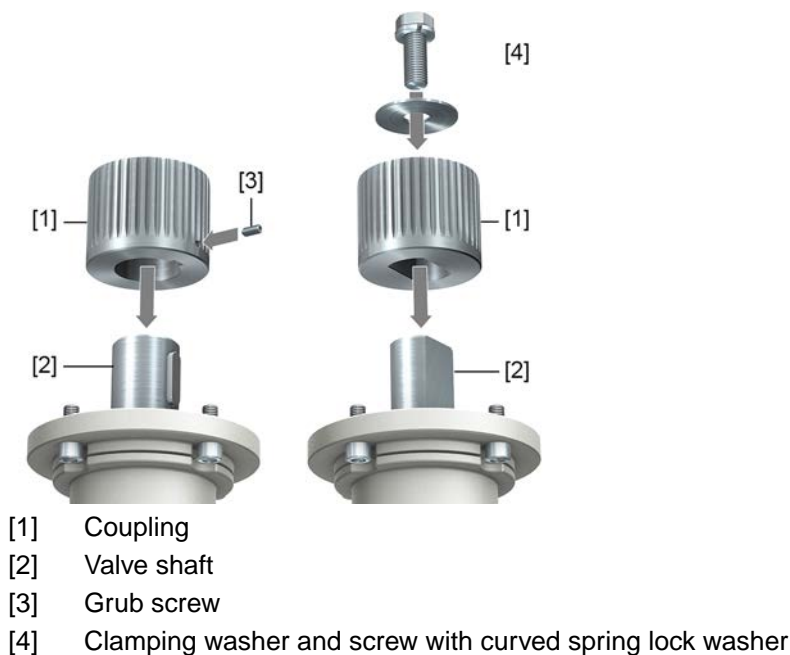


Figure 13: Mounting positions for coupling

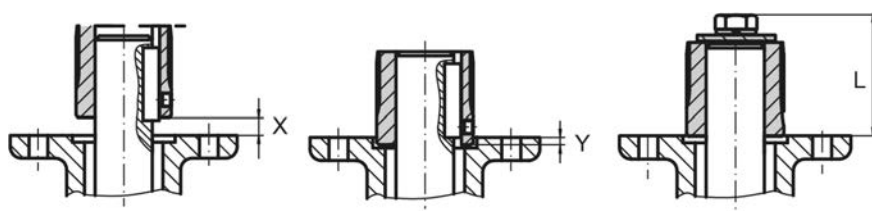
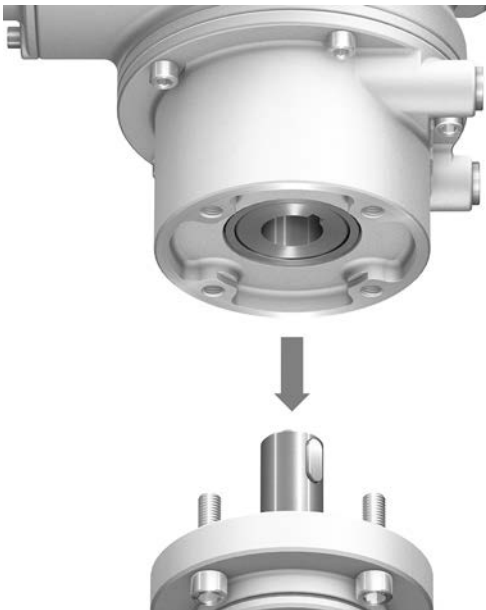


Table 7:

Mounting position of the coupling within fitting dimensions according to AUMA definition											
Dimensions [mm]	SQ(V)Ex 05.2		SQ(V)Ex 07.2			SQ(V)Ex 10.2		SQ(V)Ex 12.2		SQ(V)Ex 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

5. 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.
Information: To increase tensile strength of screws, actuators are equipped with HELICOIL® threaded inserts for increased shock safety.

NOTICE

Loss of tensile strength of screws when reworking the threads!
→ Threads may neither be modified nor damaged.

Table 8:

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. Modify mounting positions

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.
- Wait for 30 seconds after power cut-off prior to opening the housing.
- 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

WARNING

Electric shock due to presence of hazardous voltage!

Risk of death or serious injury!

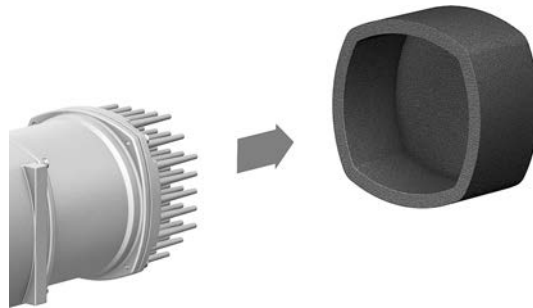
- The electrical connection must be carried out exclusively by suitably qualified personnel.
- Prior to connection, observe basic information contained in this chapter.
- After connection but prior to applying the voltage, observe the <Commissioning> and <Test run> chapters.

NOTICE

Risk of overheating during operation with mounted transport protection!

- Prior to connection, remove transport protection from cooling fins.

Figure 16: Remove transport protection



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>).

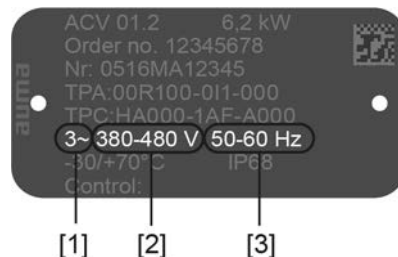
Permissible networks (supply networks)

The actuators are suitable for use in TN and TT networks with directly grounded star point for nominal voltages up to maximum 480 V AC. Use in IT network is permissible for nominal voltages up to maximum 480 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 17: Actuator controls name plate (example)



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

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.

Table 9:

Protection on site				
Part-turn actuator	3-phase AC motor 380 V – 480 V/50 Hz – 60 Hz ¹⁾			Fuse ²⁾
Type	Consumed nominal power P_{IN} [kW]	Nominal current I_N [A]	Max. current I_{max} [A]	Blow characteristics: Time-delay (gG) [A]
SQVEx 05.2	0.21	0.8	1.3	6.0
SQRVEx 05.2	0.17	0.7	1.1	6.0
SQVEx 07.2	0.39	1.3	1.9	6.0
SQRVEx 07.2	0.18	0.8	1.0	6.0
SQVEx 10.2	0.21	1.0	1.5	6.0
SQRVEx 10.2				
SQVEx 12.2	0.21	1.0	1.5	6.0
SQRVEx 12.2				
SQVEx 14.2	0.27	1.0	1.5	6.0
SQRVEx 14.2				

- 1) For motor with different current type/mains voltage/mains frequency (refer to motor name plate). Select fuse referring to the Electrical data sheet.
- 2) The actuators are suitable for use in current circuits with a maximum short-circuit 1-phase AC current value of 5,000 A root-mean-square (R.M.S). The output data of the fuses to be provided on site must not exceed the following values: 32 A/600 V at a maximum mains short-circuit alternating current of 5,000 A AC.

Consider the max. current (I_{max}) (refer to motor name plate or electrical data sheet) when selecting the circuit breaker.

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. DC current may be present within the PE conductor.

Implementation of overcurrent protection devices is not required. Actuator controls are equipped with own protection mechanisms, adapted to the actuator system. Therefore, we recommend refraining from using overcurrent protection devices.

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 10:

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

Refer to Technical data for options of isolated potentials.

NOTICE

Actuator failure after short-term power supply failure!

If the mains voltage is switched on again too soon after a brief failure, F12 fuse may blow. F12 fuse is used for protection of the power supply of the switchgear DC link. The fuse may trip if the DC link is not yet completely de-energised when rebooting the ACV.

- Ensure that in the event of a brief mains failure, the mains voltage is only switched on again after a waiting time of 15 seconds.

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

NOTICE

This product potentially causes high frequency interference!

→ The measures eliminating interference described hereafter must be observed for cable installation in accordance with EMC.

- Use shielded power cable and earth shield at both ends.
- 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.
- In a residential environment, this product may cause radio interference, in which case supplementary mitigation measures might be required.

Network cables This device is equipped with a network port.

Table 11:

Cable recommendation	
Only network cables suitable for Industrial Ethernet are to be used.	
Minimum requirement	Cat.5e for fixed installation, 2x2xAWG22 structure
Cable recommendation	Cat.6e for fixed installation, 2x2xAWG22 structure

Prior to installation, please note:

- Install network cables at a distance of minimum 20 cm to other cables.
- If possible, network cables should be laid in a separate, conductive, and earthed cable tray.
- Ensure absence of equipotential earth bonding differences between the individual devices within the network (perform an equipotential earth bonding).
- Do not use network hubs.



Table 12: Transmission rate/cable length for star topology or point-to-point wiring

Baud rate (kbit/s)	Maximum cable length: between two network participants for copper cables
10/100 Mbits/s	100 m

6.2. Overview of AUMA electrical connections

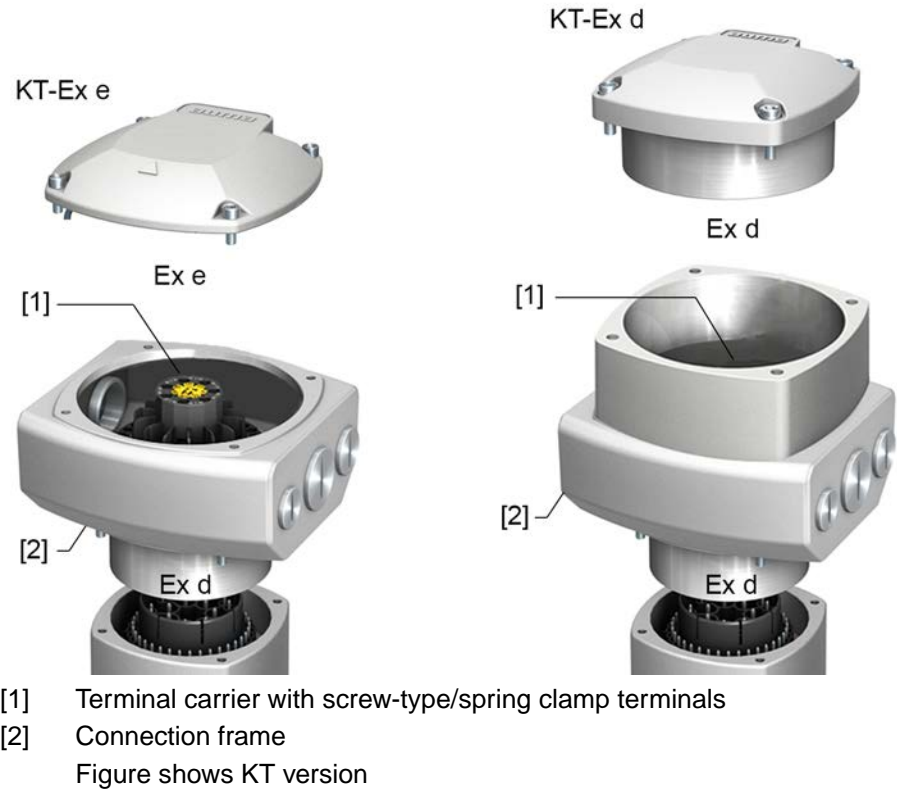
The section below provides an overview of the different electrical connections described in the chapters to follow.

Table 13: Versions of the AUMA plug/socket connector

Electrical con- nection	Figure	Properties	For description and assembly refer to chapter
KT		Plug-in integral terminal connection with enlarged terminal compartment	⇒ page 24, KT/KM electrical connection
KES		Plug-in terminal connection with enlarged terminal compartment	⇒ page 33, KES electrical connection

6.3. KT/KM electrical connection

Figure 18: KT/KM electrical connection



Short description

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

KM version with additional support terminals (terminal blocks) via terminal carrier. When using solid fieldbus cables in line topology, imperatively use support terminals.

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

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

Technical data

Table 14:

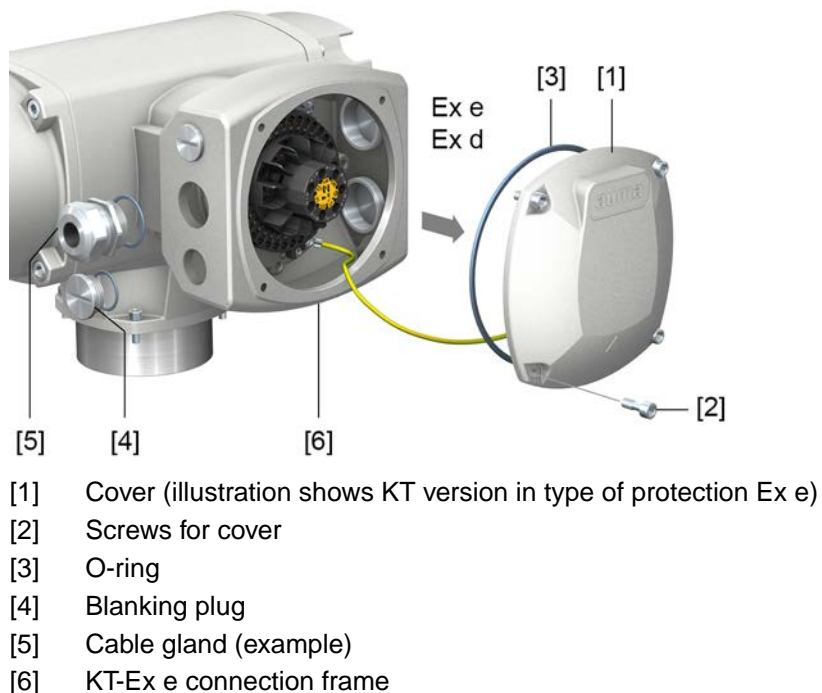
KT/KM/KL electrical connection		
	Power contacts	Control contacts
No. of contacts max.	6 + PE conductors ¹⁾	50
Designations	U1, V1, W1, U2, V2, W2, ⊕	1 to 36, 37 to 50
Support terminals max.	3	12
Connection voltage max.	1,000 V	250 V
Rated current max.	25 A	5 A ²⁾
Type of customer connection	Screw connection 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.

6.3.1. Open terminal compartment

Figure 19: Open terminal compartment



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

How to proceed



Electric shock due to presence of hazardous voltage!

Death or serious injury.

→ Disconnect device from the mains before opening.

→ Wait for 30 seconds after power cut-off prior to opening the housing.

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 20: 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.

6.3.2. Cable connection

Table 15: Customising the cables

Terminal designation	Type	Wires per terminal	Terminal cross sections	Dismantling length	Length of wire end sleeve insulated (without insulation)	Type of connection and (tightening torque)
Power contacts (U1, V1, W1, U2, V2, W2) PE connection ⚡	solid	1	0.25 – 10.0 mm ²	12 mm	–	Screw-type terminals (M = 1.2 – 1.5 Nm)
	flexible	1	up to 2.5 mm ² up to 4 mm ² up to 10 mm ²	1)	8 (8) mm 10 (10) mm 12 (12) mm	
	flexible	2 ²⁾	0.25 – 6 mm ²	1)	12 (12) mm	
Control contacts (1 to 36, 37 to 50)	solid	1	0.25 – 2.5 mm ²	10 mm	–	Spring clamp terminals
	flexible	1	up to 1.0 mm ² up to 1.5 mm ² up to 2.5 mm ²	1)	10 (6) mm 10 (7) mm 10 (10) mm	
	flexible	2 ²⁾	0.25 – 0.75 mm ²	1)	10 (10) mm	
Protective earth connection within frame (customer connection)	solid	2	1.5 mm ² – 10 mm ²	10 mm	–	U-bracket (M = 3 – 4 Nm)
	flexible	2	1.5 mm ² – 10 mm ²	1)	M6 ring lug	

1) For dismantling length, refer to manufacturer's specifications for wire end sleeve or ring lug

2) For two wires per terminal, a twin wire end sleeve must be used

How to proceed

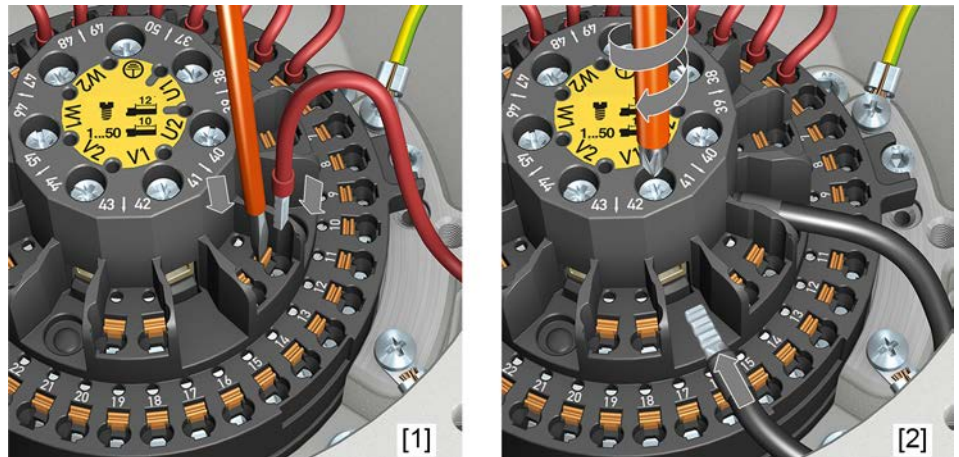
1. Remove cable sheathing in a length of 250 – 300 mm.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.

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

4. Strip wires. For dismantling length, refer to [page 26, Table 15](#)

5. Connect cables according to order-related wiring diagram.

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 is equipped with a test contact located above the numbering.

Information For flexible cables: for screw-type terminals, use wire end sleeves according to DIN 46228. For spring clamp terminals, connection is possible without wire end sleeves.



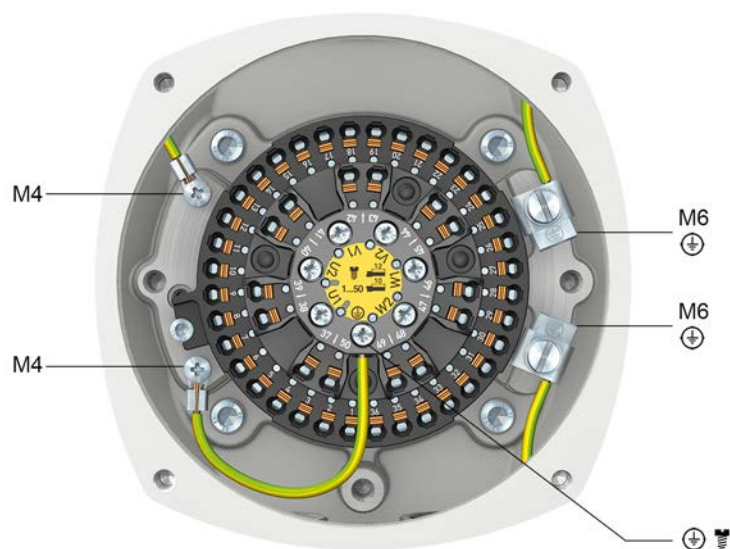
In case of a fault, electric shock due to presence of hazardous voltage if the PE conductor is NOT connected!

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.

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

Figure 22: Protective earth connections within connection frame

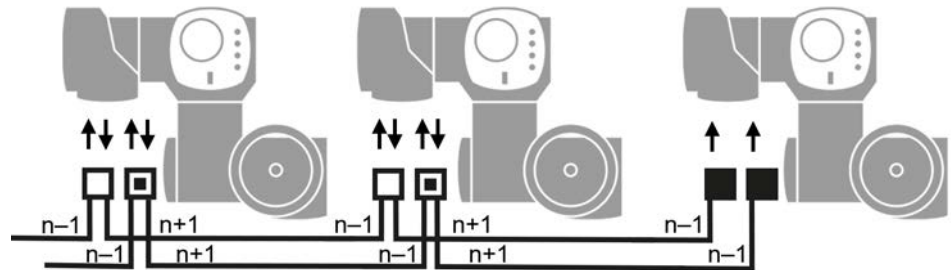


- M6 Customer protective earth connection for M6 ring lug or with U-bracket for up to two wires.
- M4 Internal protective earth connections via M4 ring lug (to cover and terminal carrier) connected in the factory
- ⊕ Protective earth connection to terminal carrier (power terminals); connected in the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

6.3.3. Fieldbus cables: connect

6.3.3.1. Fieldbus connection for line topology

Figure 23: Line topology



- Channel 1: Further fieldbus devices follow
 - ▣ Channel 2 (redundancy only): further fieldbus devices follow
 - Last fieldbus device
- n-1 Fieldbus cable from previous device (input)
n+1 Fieldbus cable to next device (output)

Connection at terminal carrier for loop topology

For flexible cables, the fieldbus connection can be made via spring clamp terminals directly at the terminal carrier. For solid cables (single or multiple strands), additional support terminals must be used. Refer to <Connection with support terminals> section

Information

For two flexible wires per terminal, a joint wire end sleeve must be used (twin wire end sleeve).

Figure 24: Terminal assignment at terminal carrier: Channel 1 (1A/1B)

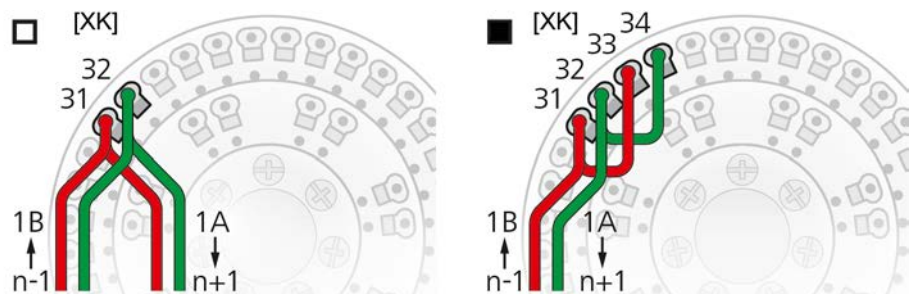
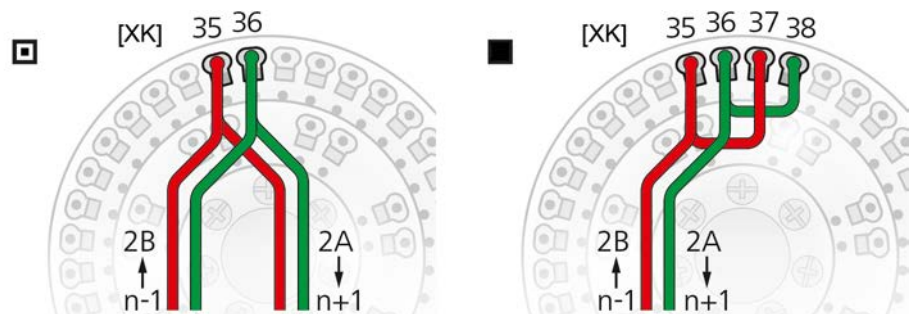


Figure 25: Terminal assignment at terminal carrier: Channel 2 (2A/2B)



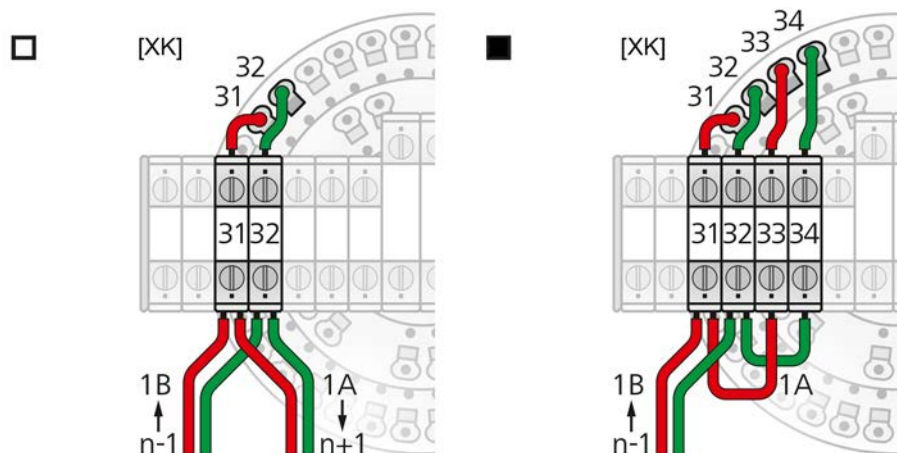
[XK] Terminal assignment according to wiring diagram (customer connection):

- Channel 1 □ or channel 2 ▣ if further fieldbus devices follow
- If the actuator is the last fieldbus device:
Channel 1: Link terminals 31/33 and 32/34
Channel 2: Link terminals 35/37 and 36/38

Connection with support terminals for line topology

When using solid cables (single or multiple strands), additional support terminals must be used. The support terminals (terminal blocks) are mounted above the terminal carrier.

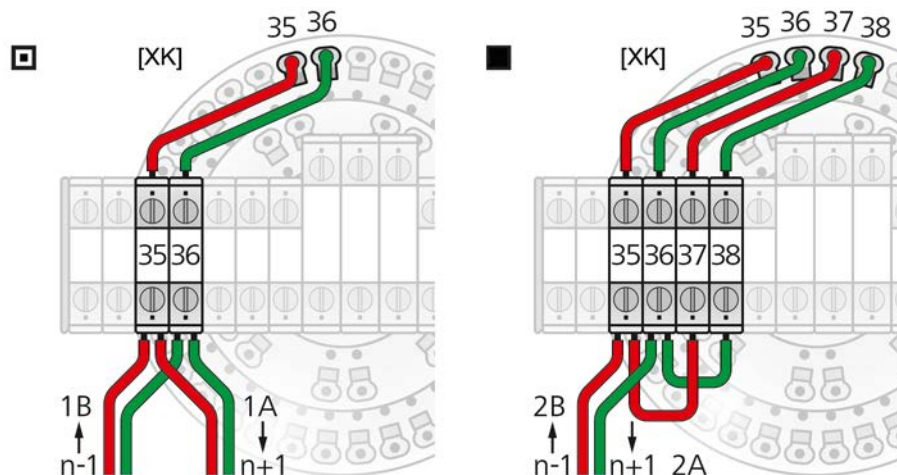
Figure 26: Terminal assignment of support terminals: Channel 1 (1A/1B)



[XK] Terminal assignment according to wiring diagram (customer connection):

- Terminals 31 and 32 if another fieldbus device follows
- Terminals 31 – 34 if the actuator is the last fieldbus device

Figure 27: Terminal assignment of support terminals: Channel 2 (2A/2B)

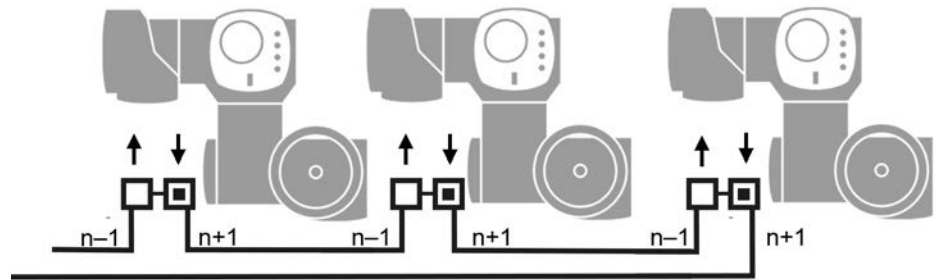


[XK] Terminal assignment according to wiring diagram (customer connection):

- Terminals 35 and 36 if another fieldbus device follows
- Terminals 35 – 38 if the actuator is the last fieldbus device

6.3.3.2. Fieldbus connection for loop topology

Figure 28: Loop topology



- Channel 1
- ▣ Channel 2
- Last fieldbus device
- n-1 Fieldbus cable from previous device (input)
- n+1 Fieldbus cable to next device (output)

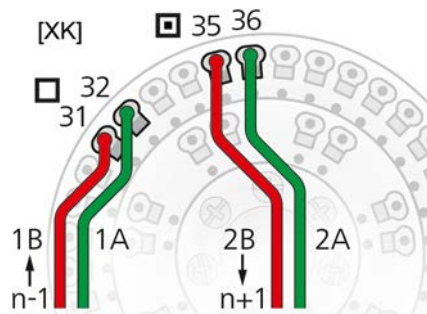
Information

- For loop topology, automatic termination is performed once the actuator controls are connected to the power supply.
- In case of a power outage of actuator controls, the two RS-485 loop segments will be automatically connected so that the actuators following these segments remain available.
- When using a SIMA master station, a redundant loop topology may be established.

Connection at terminal carrier for loop topology

For flexible cables, the fieldbus connection can be made via spring clamp terminals directly at the terminal carrier. For solid cables (single or multiple strands), additional support terminals must be used. Refer to <Connection with support terminals> section

Figure 29: Terminal assignment at terminal carrier (2-channel)

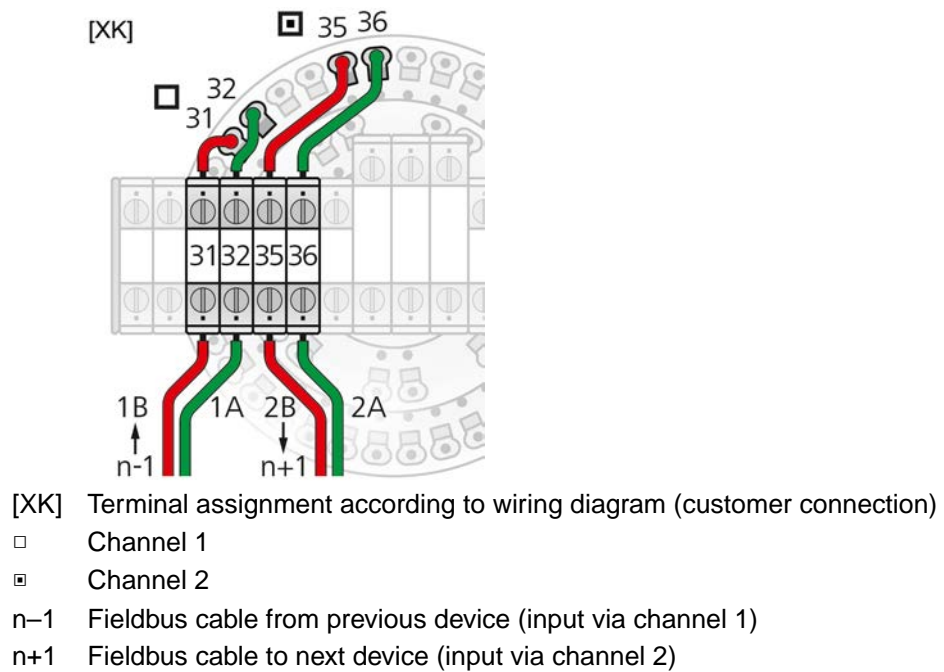


- [XK] Terminal assignment according to wiring diagram (customer connection)
- Channel 1
- ▣ Channel 2
- n-1 Fieldbus cable from previous device (input via channel 1)
- n+1 Fieldbus cable to next device (input via channel 2)

Connection with support terminals for loop topology

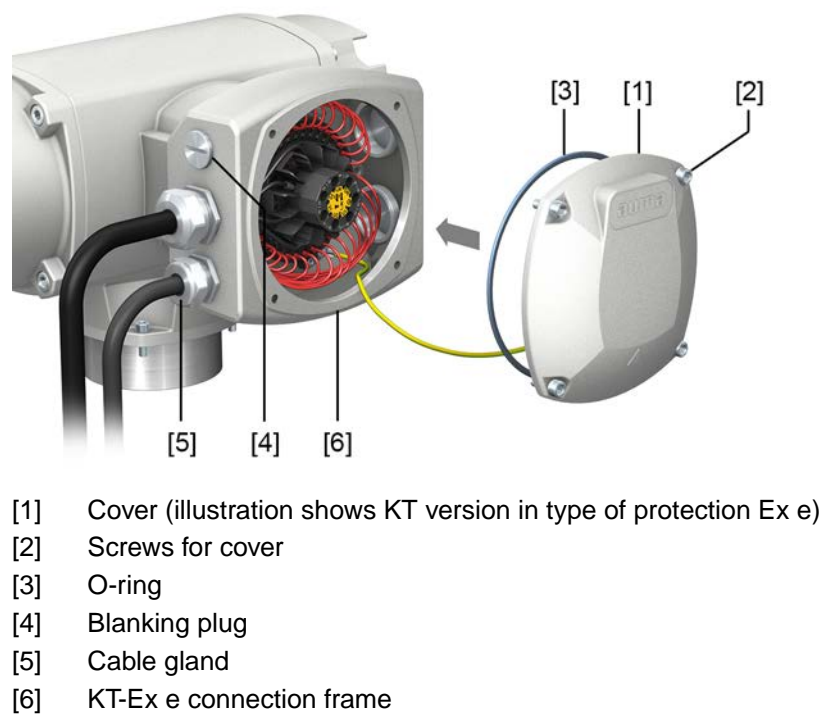
When using solid cables (single or multiple strands), additional support terminals must be used. The support terminals (terminal blocks) are mounted above the terminal carrier.

Figure 30: Terminal assignment of support terminals (2-channel)



6.3.4. Close terminal compartment

Figure 31: Close terminal compartment



- How to proceed

- Clean sealing faces of cover [1] and connection frame [6].
 - For design in flameproof enclosure (Ex d): Preserve joint surfaces with an acid-free corrosion protection agent.
 - Check whether O-ring [3] is in good condition, replace if damaged.
 - 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):



Risk of explosion in case of damage to flameproof enclosure!

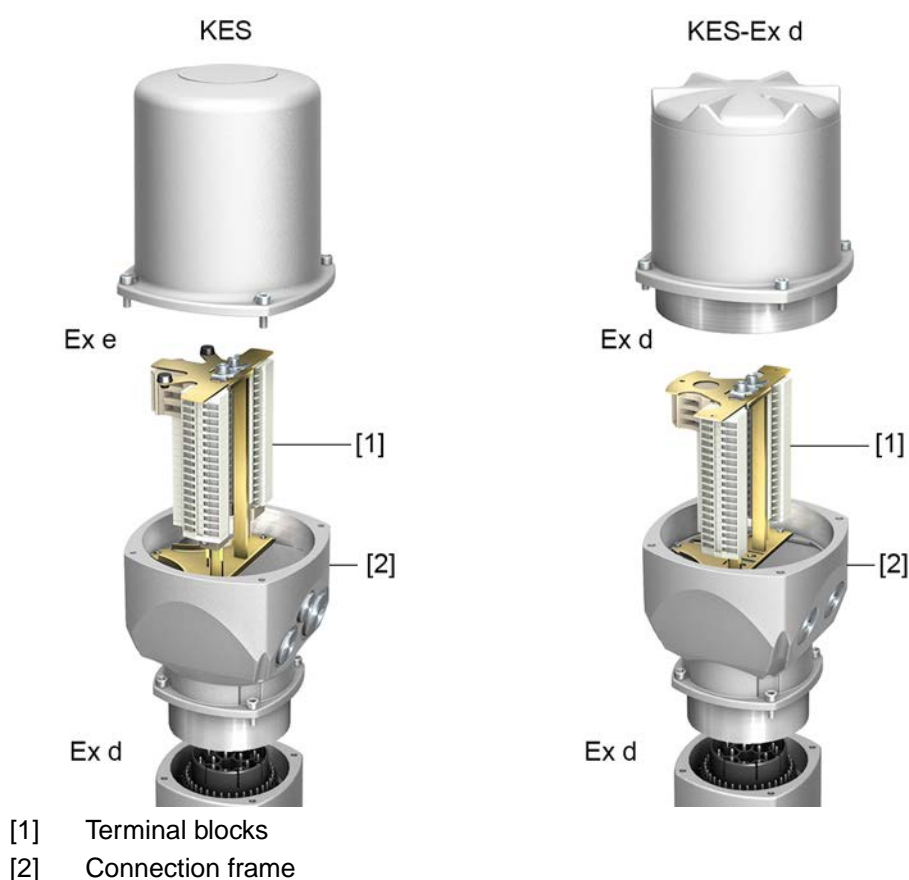
Risk of death or serious injury!

- 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.

6.4. KES electrical connection

Figure 32: KES electrical connection



Short description KES plug-in electrical connection with terminal blocks for power and control contacts. Cable entry via the connection frame. Cover in KES-e version for terminal compartment in type of protection Ex e (increased safety). Cover in KES-Ex d version for terminal compartment in type of protection Ex d (flameproof enclosure). Plug-in connection is made via the connection frame. For cable connection, simply remove the cover. The connection frame remains within the device. The flameproof interior of the connected devices remains sealed.

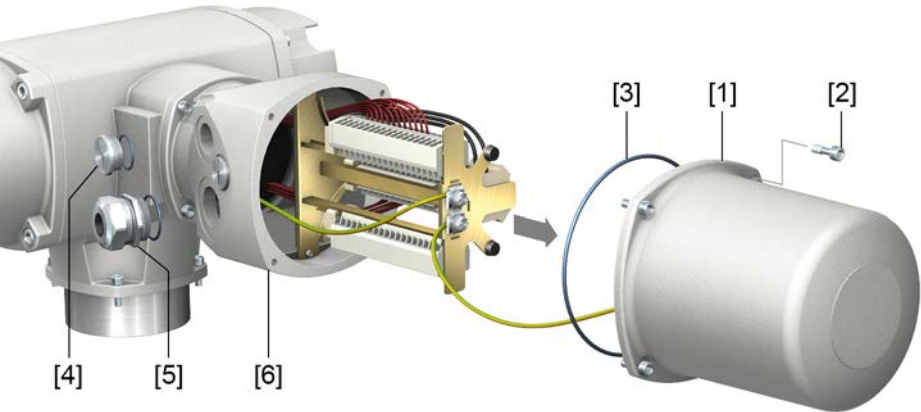
Technical data

Table 16:

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

6.4.1. Terminal compartment: open

Figure 33: Open terminal compartment



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



Electric shock due to presence of hazardous voltage!

Death or serious injury.

- Disconnect device from the mains before opening.
- Wait for 30 seconds after power cut-off prior to opening the housing.

1. Loosen screws [2] and remove cover [1].
Information: Terminal compartment is designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure) (refer to Ex marking on name plate). The flameproof interior of the connected device remains closed when removing the cover [1].

2. Insert cable glands suitable for connecting cables.

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

Figure 34: Name plate, example with enclosure protection IP68



Information: For shielded cables: Use EMC cable glands.

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

6.4.2. Cable connection

Table 17:

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

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



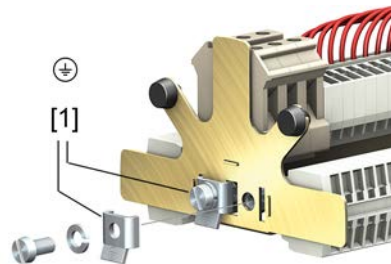
In case of a fault, electric shock due to presence of hazardous voltage if the PE conductor is NOT connected!

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.

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

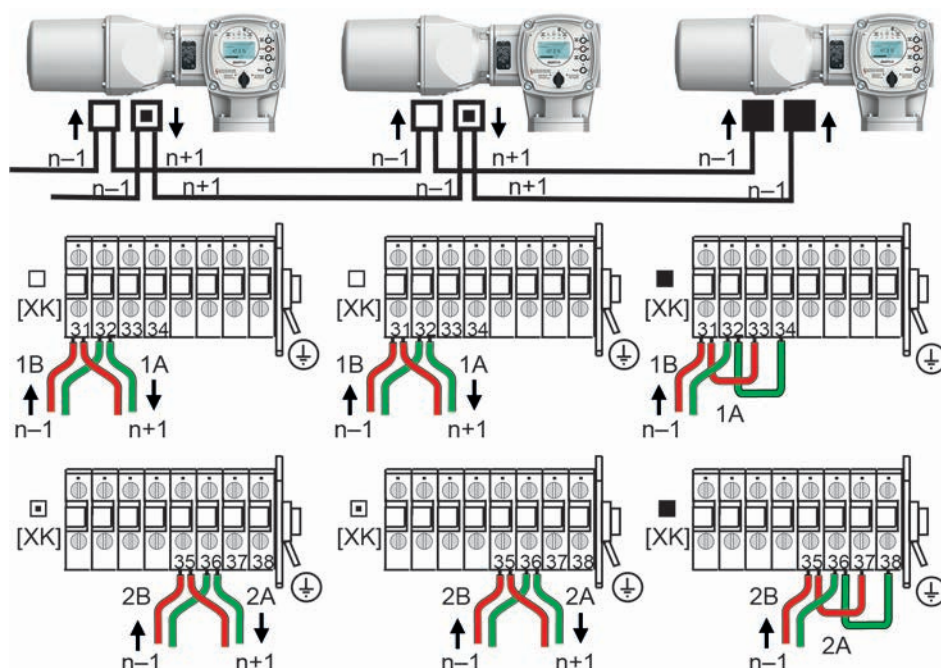
Figure 35: Protective earth (PE)



[1] U-bracket for PE connection

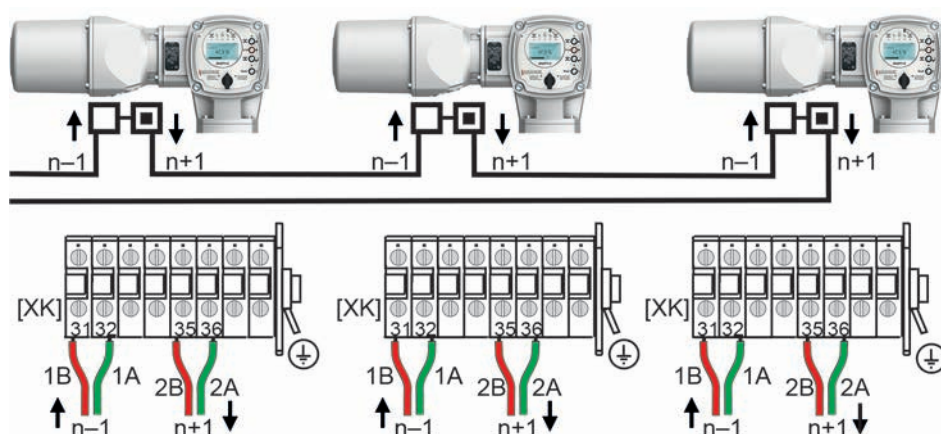
6.4.3. Fieldbus cables: connect

Figure 36: Terminal assignment for line topology (1-channel or 2-channel for AUMA redundancy I or II)



- Channel 1: Further fieldbus devices will follow (standard)
 - ▣ Channel 2: Further fieldbus devices will follow (AUMA redundancy I or II only)
 - Last fieldbus device
- n-1 Fieldbus cable from previous device (input)
n+1 Fieldbus cable to next device (output)
[XK] Terminal assignment according to wiring diagram (customer connection):
Channel 1: Terminals 31, 32 and 33, 34
Channel 2: Terminals 35, 36 and 37, 38 (AUMA redundancy I or II)

Figure 37: Terminal assignment for loop topology (2-channel)



- Channel 1
 - ▣ Channel 2
- n-1 Fieldbus cable from previous device (input via channel 1)
n+1 Fieldbus cable to next device (output via channel 2)
[XK] Terminal assignment according to wiring diagram (customer connection)

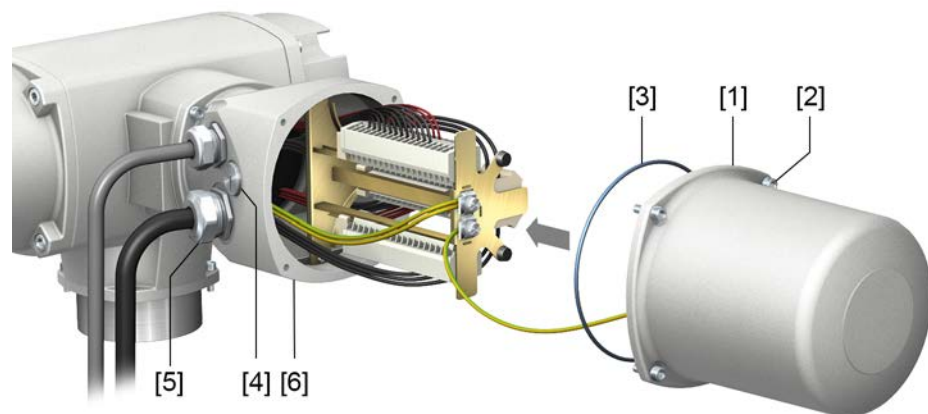
- Information**
- For loop topology, automatic termination is performed once the actuator controls are connected to the power supply.
 - In case of a power outage of actuator controls, the two RS-485 loop segments will be automatically connected so that the actuators following these segments remain available.
 - When using a SIMA master station, a redundant loop topology may be established.

Connect fieldbus cables:

1. Connect fieldbus cables.
2. If the actuator is the final device in the fieldbus segment (line topology only):
 - 2.1 Connect termination resistor for channel 1 through linking the terminals 31 - 33 and 32 - 34 (standard)
 - 2.2 For AUMA redundancy I or II: Connect termination resistor for channel 2 through linking the terminals 35 - 37 and 36 - 38.

6.4.4. Terminal compartment: close

Figure 38: Close terminal compartment



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

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



Risk of explosion in case of damage to flameproof enclosure!

Risk of death or serious injury!

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

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

6.5. External earth connection

Figure 39: Earth connection for part-turn actuator

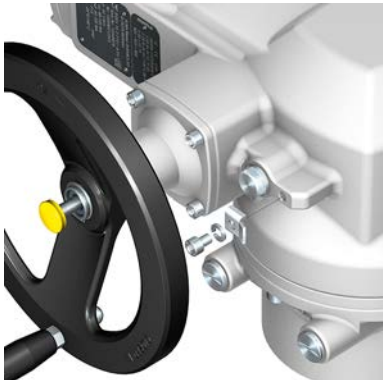


Figure 40: Earth connection for wall bracket



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

Table 18:

Terminal cross sections and earth connection tightening torques		
Conductor type	Terminal cross sections	Tightening torques
Solid wire and stranded	2.5 mm² to 6 mm²	3 – 4 Nm
Fine stranded	1.5 mm² to 4 mm²	3 – 4 Nm
For fine stranded (flexible) wires, connection is made via cable lugs/ring terminals. When connecting two individual wires with a U-bracket, cross sections have to be identical.		

6.6.

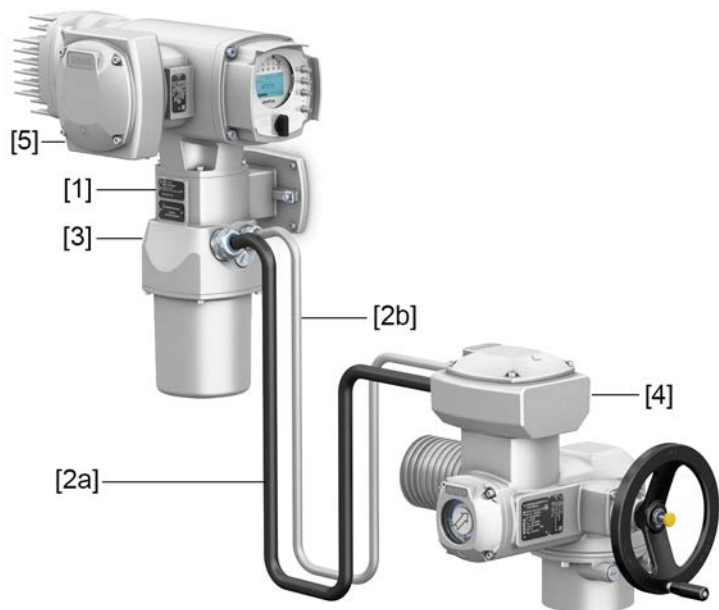
Accessories for electrical connection

6.6.1.

Actuator controls on wall bracket with AUMA LSW

Design principle

Figure 41: Set-up with wall bracket and AUMA LSW (example)



- [1]

Wall bracket
- [2]

AUMA LSW: [a] Motor connection [b] Feedback signals
- [3]

Electrical connection of wall bracket
- [4]

Electrical connection of actuator (XA)
- [5]

Electrical connection of actuator controls (XK)

Application

Using the wall bracket and the AUMA LSW (cable set for wall bracket), actuator controls can be mounted separately from the 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 of LSW between separate local controls and the actuator amounts to 16 m maximum.

6.6.2.

Parking frame

Figure 42: 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.



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 19: Handwheel marking (examples)

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

7.2. Motor operation



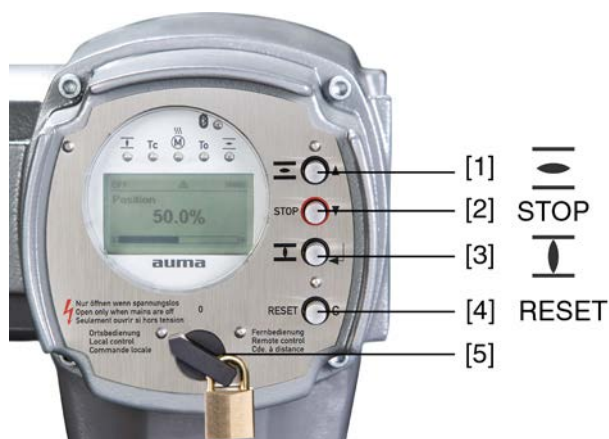
Valve damage due to incorrect basic setting!

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

7.2.1. Actuator operation from local controls

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

Figure 43: Local controls



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

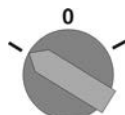
CAUTION

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

Risk of burns

→ Verify surface temperature and wear protective gloves.

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



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

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

Information

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

7.2.2. Actuator operation from remote

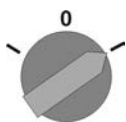
CAUTION

Risk of immediate actuator operation when switching on!

Risk of personal injuries or damage to the valve

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

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



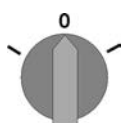
➔ Now, the actuator can be remote-controlled via fieldbus.

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)

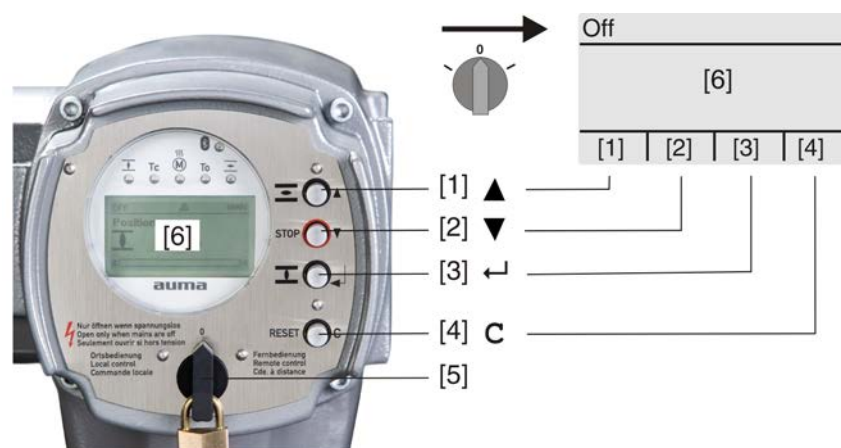
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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 44:



[1–4] Push buttons or navigation support

[5] Selector switch

[6] Display

Table 20: 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

Push buttons	Navigation support on display	Functions
[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 45: Groups



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

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

Figure 46: Marking with ID

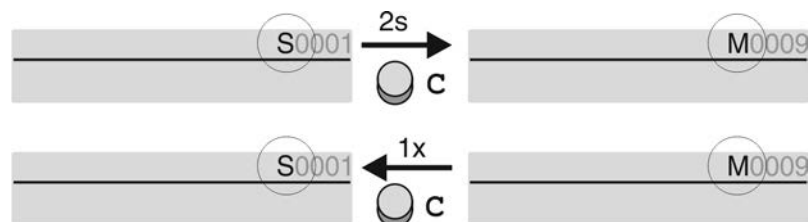


- S ID starts with S = status menu
- M ID starts with M = main menu

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 47: Select menu groups

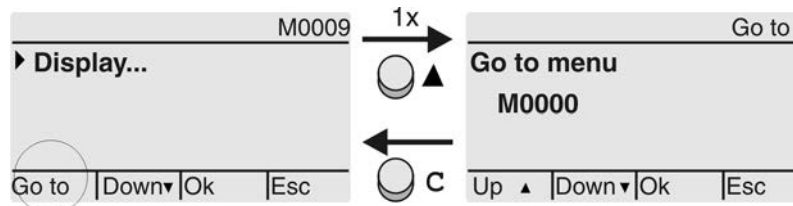


You return to the status menu if:

- 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 48: Direct display (example)



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

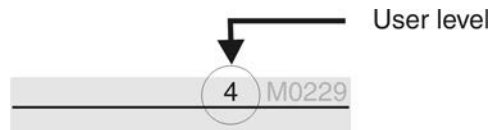
1. Press push button **▲ Go to**.
Display indicates: **Go to menu M0000**
2. Use push buttons **▲▼ Up ▲ Down ▼** to select figures 0 to 9.
3. Press push button **↵ Ok** to confirm first digit.
4. Repeat steps 2 and 3 for all further digits.
5. To cancel the process: Press **C Esc**.

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 49: 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 21:

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

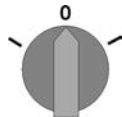
Only the passwords of same or lower access level may be changed.

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

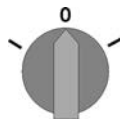
The display language can be selected.

7.5.1. Language change

M ▶ **Display** M0009
Language M0049

Select main menu

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



Change language

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

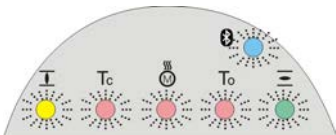
8. Indications

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 50: LED test



Language selection

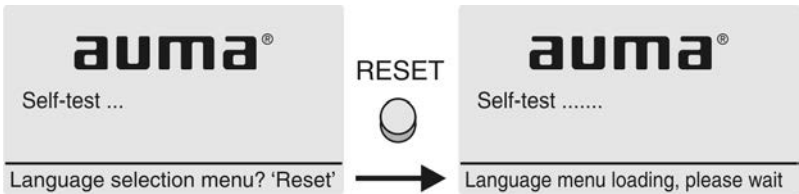
During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch to position 0 (OFF).

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 51: Self-test



The language selection menu follows the startup menu.

Startup menu

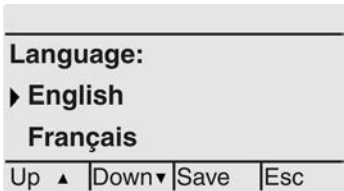
The current firmware version is displayed during the startup procedure:

Figure 52: 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 53: Language selection



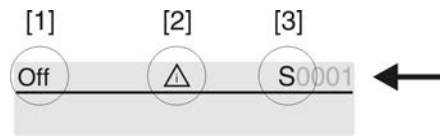
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

8.2. Indications on display

Status bar

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

Figure 54: 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


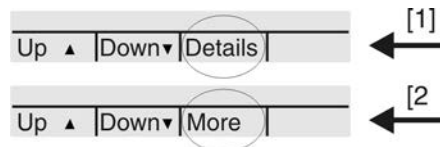
If further details or information are available with reference to the displayed code, the following indications **Details** or **More** appear in the navigation support (bottom display line). Then, further information can be displayed via push button .

Figure 55: 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.

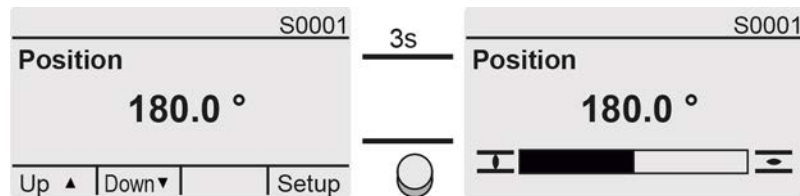
8.2.1. Feedback indications from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

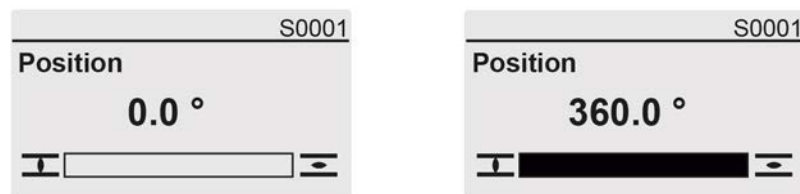
- S0001 on the display indicates the position in °.
- The bargraph display appears after approx. 3 seconds.

Figure 56: Valve positioning and position



The bargraph signals the position 0.0°. After commissioning, this is the homeport (zero position). If 360.0° are reached, the bargraph is completely filled. After approx. 3 seconds, the display returns to 0.0° and the bargraph is completely empty.

Figure 57: Bargraph for 9° and 360°.



Torque (S0002)

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

Figure 58: Torque

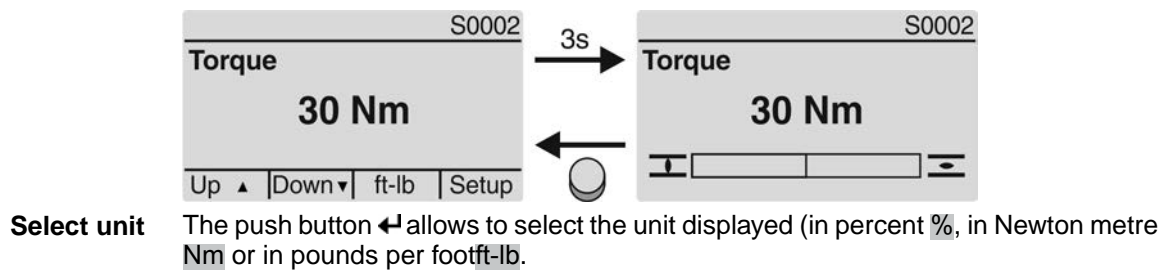
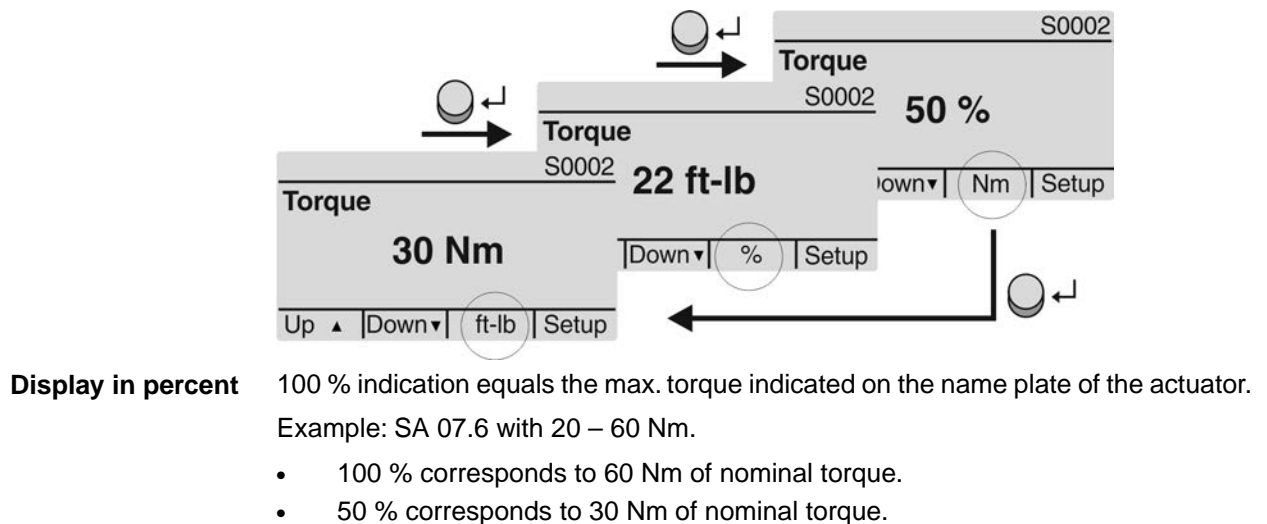


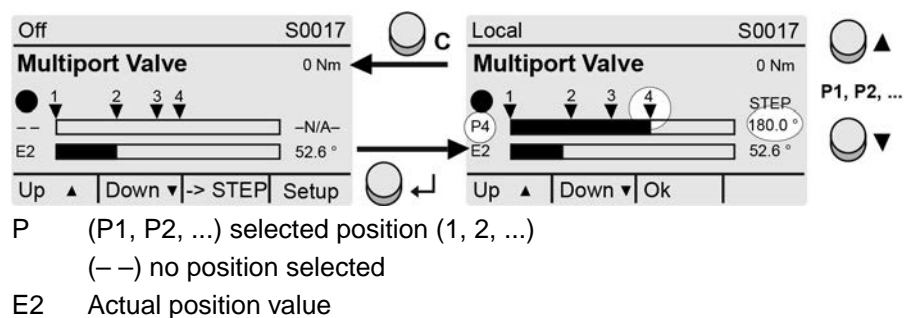
Figure 59: Units of torque



Multiport valve positions (S0017)

For activated multiport valve function, the display S0017 above the position setpoint E2 indicates a second bar chart showing the selection positions (valve connections). Positions (P1, P2, ...) are indicated by a black triangle: ▼. In STEP mode, positions can be selected and approached in selector switch position LOCAL using ▲▼ push buttons. Both the positions as well as the current position setpoint E2 are displayed in degrees.

Figure 60: Status indication for multiport valve (example P4 = 180°)



8.2.2. Status indications according to AUMA classification

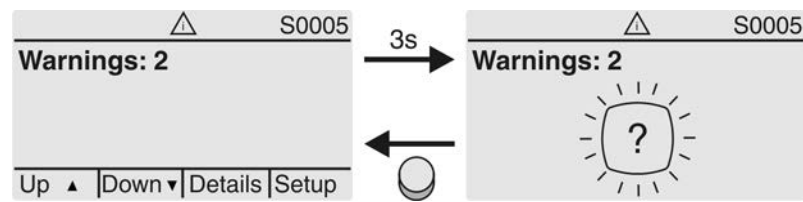
These indications are available if parameter **Diagnostic classific.** M0539 is set to **AUMA**.

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 61: Warnings



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

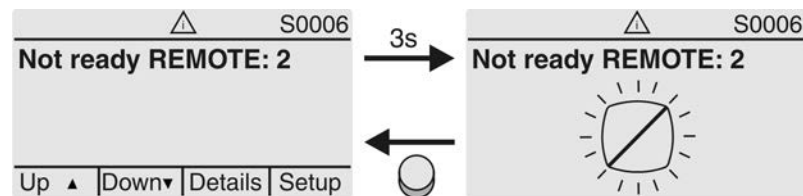
Not ready REMOTE (S0006)

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 62: Not ready REMOTE signals



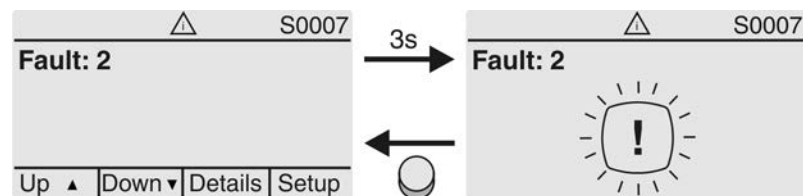
For further information, please also refer to <Corrective action>.

Fault (S0007)

If a fault has occurred, the display shows S0007:

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

Figure 63: Fault



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

8.2.3. Status indications according to NAMUR recommendation

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

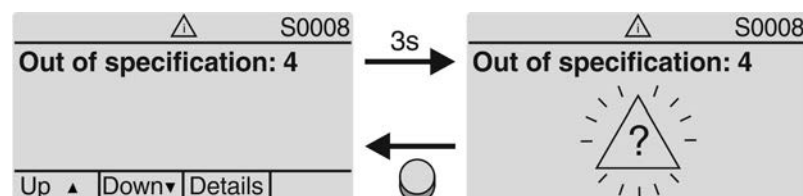
Out of Specification (S0008)

The S0008 indication shows out of specification indications according to the 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 64: Out of specification



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

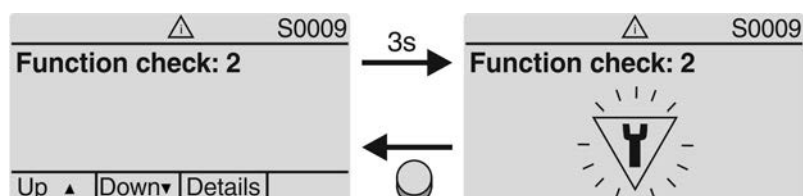
Function check (S0009)

The **S0009** indication shows function check indications according to the 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 65: Function check



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

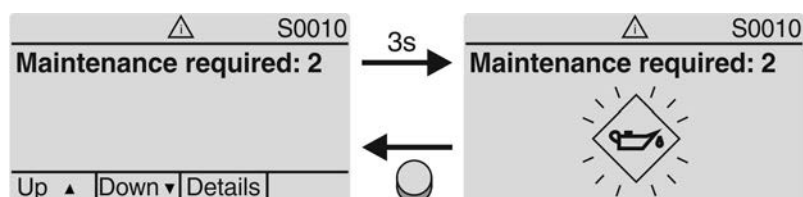
Maintenance required (S0010)

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

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

- the number of indications occurred
- a blinking square with a oil can after approx. 3 seconds

Figure 66: Maintenance required



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

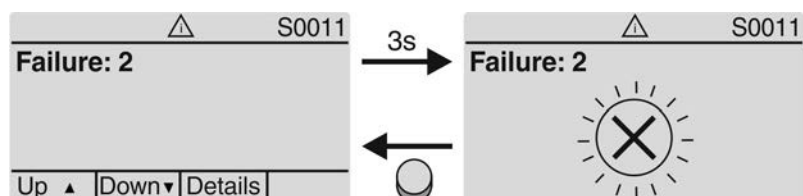
Failure (S0011)

The **S0011** indication shows the causes of the failure indication according to the 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 67: Failure



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

8.3. Indication lights of local controls

Figure 68: Arrangement and signification of indication lights



- [1] Marking with symbols (standard)
- [2] Marking with figures 1 – 6 (option)
- 1 Running indication CW
- 2 Tc Torque fault CLOSE
- 3 Motor protection tripped
- 4 To Torque fault OPEN
- 5 Running indication CCW
- 6 Bluetooth connection active

Indication lights (indications); modify

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

Further setting values:

Refer to Manual (Operation and setting).

9. Signals (output signals)

9.1. Signals via Modbus RTU

The feedback signals via Modbus RTU can be read using the appropriate Modbus function codes.

For further information, please refer to the Manual (Device integration fieldbus) Modbus.

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 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.

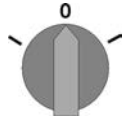
Torque feedback Signal: E6 = 0/4 – 20 mA (galvanically isolated)

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. In **0** (OFF) position, actuator control via operation commands OPEN/STOP/CLOSE is prevented. The controls' power supply is maintained.

2. Switch on the power supply.

Information: Observe heat-up time for ambient temperatures below –30 °C.

3. Perform basic settings.

10.1. Multiport valve function

Properties

The multiport valve function is considered as **product variant** and must be activated in the factory. Only for an activated multiport valve function will the respective parameters be available for setting in the actuator controls menu.

The multiport valve function allows to directly access a valve port of a valve equipped with several ports without stopping at any other port. Example: Operation from position 2 to 4 without stopping at position 3.

In operation modes Local and Fieldbus, up to 16 positions can be approached. Operation mode Remote allows the function “next position” also up to 16 positions.

Depending on the setting, the actuator will either operate the valve at a defined direction of rotation (counterclockwise or clockwise) or as quickly as possible (irrespective of the actuator position) to the specified valve port.

Procedure for commissioning a multiport valve

1. Set/check multiport valve parameters:
(generally, they are set in the factory prior to delivery)
 - Actuator type
 - Gear reduction ratio
 - Number of ports (positions)
 - Configuration of digital inputs
2. Define/check positions (of valve ports).
3. Set/check signal behaviour of positions.
4. Set home port (zero position).
5. Approach positions.
6. If required, perform/correct multiport valve parameter settings like inertia, dead band, backlash compensation and hysteresis.
7. If further multiport valve parameters were set: Reset the homeport and re-set parameters as required.

10.1.1. Actuator type: set/check

The actuator type is set in the factory but can be modified at a later date.

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

M ► Customer settings M0041
 Multiport valve M1140
 Actuator type M1142

Default value: Actuator type set in the factory

Setting ranges: Selection list of all AUMA actuators

10.1.2. Gear reduction ratio: set/check

The reduction ratio of the gear stage of the actuator mounted to the valve gearbox must be set here. To facilitate adjustment, a selection table of supported gearboxes is available.

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

M ▶ **Customer settings** M0041
Multiport valve M1140
Reduction ratio M1143

Default values: GS50.3

Setting values:

Table 22: Selection of gearboxes supported by AUMA

Sizes GS 50.3 – GS 125.3	Sizes GS160.3 – GS 250.3
GS50.3	GS160.3
GS63.3	GS160.3/GZ160.3(4:1)
GS80.3	GS160.3/GZ160.3(8:1)
GS100.3	GS200.3
GS100.3/VZ2.3	GS200.3/GZ200.3(4:1)
GS100.3/VZ3.3	GS200.3/GZ200.3(8:1)
GS100.3/VZ4.3	GS250.3
GS125.3	GS250.3/GZ250.3(4:1)
GS125.3/VZ2.3	GS250.3/GZ250.3(8:1)
GS125.3/VZ3.3	
GS125.3/VZ4.3	

10.1.3. Number of ports (positions)

Number of valve ports (positions)

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

M ▶ **Customer settings** M0041
Multiport valve M1140
Number of ports M1141

Default value: 8

Setting ranges:

In operation mode Remote **2** to **10**

In operation mode Local or Fieldbus **2** to **16**

10.1.4. Home port (zero position): set

The home port is the zero position (0° or 360° of one turn) and is consequently the starting point for all other intermediate positions.

Information Set the gear reduction ratio (parameter **Reduction ratio** M1143) and the actuator type (parameter **Actuator type** M1142) prior to setting the home port.

- Set home port**
1. Position multiport valve to zero position either via manual operation (handweel) or via motor operation (via push buttons of local controls)
 2. In a next step, confirm this position (with **Yes**) as homeport via parameter **MPV home port** M1162.
As an alternative, the home port position can also be confirmed via a signal at a digital input. To this end, a digital input has to be available and configured.

Set home port (zero position) via parameter

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

M ▶ **Customer settings** M0041

Multiport valve M1140
 MPV home port M1162
 Set?

Successful homeport setting is visualised by a black circle on the actuator controls display: ●.

Reset homeport (zero point)

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041
 Multiport valve M1140
 Reset MPV homeport M2863
 Reset?

Successful resetting of the homeport is shown by a white circle with a black line on the actuator controls display: ○.

Configuration of digital input

Required user level: Specialist (4).

M ▷ Device configuration M0053
 I/O interface M0139
 Digital inputs M0116

Example Use input DIN 5 for “Set home port” signal:

Parameters: Signal DIN 5 M0122

Setting value: MPV set home pos. (wiring diagram designation: Home port)

Information The logic for the digital inputs may be inverted. Depending on the parameter setting (e.g. Coding DIN 5M0127), the input is either High active or Low active. Default setting is High active.

10.1.5. Positions (of valve ports): define/check

Each position can be set to any value between 0° and 360° (one full turn of the valve).

Information Prior to setting the positions, the home port must be defined (parameter MPV home port).

This corresponds to the zero position of the valve (0° or 360° of one full valve turn as well as 0 % or 100 % of position feedback).

The positions of the valve ports have to be set afterwards.

M ▷ Customer settings M0041
 Multiport valve M1140
 MPV positions M1149

Setting ranges: 0.0 to 359.9°

Default values: 0.0° (for all positions)

If desired, positions can be preset in the factory.

Information The first position must always be located at 0.0°.

Example configuration for a multiport valve comprising 8 ports: All 8 positions are evenly spread across 360°.

Position 1 = 0.0 (bzw. 359,9°)
 Position 2 = 45.0
 Position 3 = 90.0
 Position 4 = 135.0
 Position 5 = 180.0
 Position 6 = 225.0

Position 7 = 270.0

Position 8 = 315.0

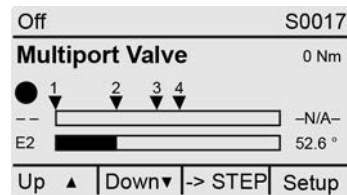


The positions must be set in subsequent sequence (descending/ascending).

10.1.6. Operate to position via push buttons of the local controls

To operate to a position via push buttons of the local controls, status indication **S0017** must be shown (refer to <Indications in the display>).

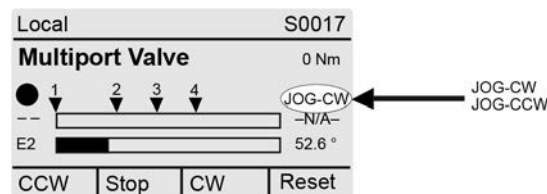
Figure 69: Status indication of multiport valve (selector switch in position OFF)



Operation in clockwise or counterclockwise direction:

When changing the selector switch to position **Local control** (LOCAL), the display changes:

Figure 70: Status indication of multiport valve (selector switch in position LOCAL)

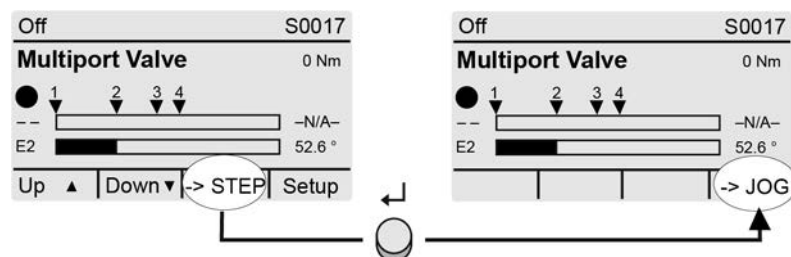


As a consequence, the valve can be operated into clockwise or counterclockwise direction (display shows CW or CCW)

Direct operation to a position:

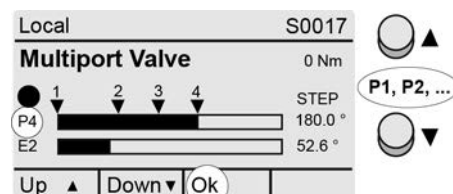
When selector switch is in position **0** (OFF), the function “Direct operation to a position via push buttons” is activated via **->STEP** (push button **↵**) (display shows **->JOG**).

Figure 71: Status indication of multiport valve (selector switch in position OFF)



When changing the selector switch to position **Local control** (LOCAL), the display changes for selection of the desired position:

Figure 72: Status indication of multiport valve (selector switch in position LOCAL)




Select the desired position (P1, P2, ...) via push buttons **▲▼** and confirm selection via **Ok** (push button **↵**).

→ The operation is issued as soon as push button **Ok** is pressed.

Symbol	
▼	Set positions (of valve ports)
P	(P1, P2, ...) selected position (1, 2, ...)
-- / -N/A-	No position has been selected.
E2	Actual position value
●	Homeport (zero point) set
○	No homeport (zero point) has been set

To interrupt an operation (triggered operation command):

→ Select "-- / -N/A-" during operation and confirm via **Ok** (push button ). The actuator stops in its current position.

10.1.7. Operate to position from Remote

For direct operation to position from remote, make sure that selector switch position **Remote control** (REMOTE) is selected.

Approach position via fieldbus command

If fieldbus interface control has been selected, the operation command for direct position approach is performed via a fieldbus command.

Example: Fieldbus command **Fieldb. interm. pos. 1**:

- **Fieldb. interm. pos. 1** = 0 (low active) = no operation command
- **Fieldb. interm. pos. 1** = 1 = intermediate position 1 is approached selecting the shortest path

The commands are described in the Manual (Device integration fieldbus).

If the operation commands for direct position approach are not issued via fieldbus command but are to be transmitted using a binary signal, (e.g. + 24 V DC) via <Additional inputs> or via an additional <Parallel interface>, digital inputs must be provided and configured accordingly.

Operation to position via digital inputs

An input (DIN) must be configured for each position (valve port).

Configuration of digital inputs

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

M ▶ **Device configuration M0053**
I/O interface M0139
Digital inputs M0116

Example DIN4 input to operate to position 1 selecting the shortest path:

Parameters: Signal DIN 4 M0118 = Intermediate pos. 1

Setting values for digital inputs (DIN)	Operation behaviour for input control
Intermediate pos. 1 to Intermediate pos. 16	Operation to defined position while selecting the shortest path
MPV: CW Position 1 to MPV: CW Position 10	Operation to defined position in clockwise direction
MPV: CCW Position 1 to MPV: CCW Position 10	Operation to defined position in counterclockwise direction
MPV DriveCW	Actuator operates in clockwise direction (without stop at any position).
MPV DriveCCW	Actuator operation in counterclockwise direction (without stop at any position).

Command "Next position"

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

A digital input is used to select the desired operation to the next port including the direction of operation. Thus, up to 16 ports can be approached in both directions, even without fieldbus connection with only 2 inputs.

Device configuration M0053

I/O interface M0139

Digital inputs M0116

Example Parameter Signal DIN 1 M0117:

- Next position CW = clockwise
- Next position CCW = counterclockwise

Self-retaining when leaving the factory in both direction (cw and ccw).

10.1.8. Dead band

The dead band prevents operation to a new setpoint position within a specified band.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041

Multiport valve M1140

Dead band M1145

Default value: 0.00°

Setting range: 0.00 – 36.0° (degrees)

10.1.9. Correction of inertia

Due to reaction times and inertia, each Multiport valve has a specific inertia. This can be compensated by inertia correction.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041

Multiport valve M1140

Overrun M1656

Default value: 0.00°

Setting range: 0.00° – 10.0° (degrees)

10.1.10. Backlash compensation

Adjustable backlash compensation of the overall system including valve coupling.

Required user level: Specialist (4) or higher.

M ▷ Customer settings M0041

Multiport valve M1140

Backlash comp. M1146

Default value: 0.00°

Setting range: 0.00 – 36.0° (degrees)

10.1.11. Signalling behaviour of positions: set/check

Reaching of a point (valve port) can be signalled:

- via bus (see separate instructions)
- via indication lights (LEDs) of the local controls or (refer to chapters <Indications> <Indication lights>)
- via output contacts (refer to chapters <Indications> <Assignment of outputs>)

Signal behaviour, this means the signal behaviour upon reaching a position, is set via parameter MPV sign. beh. 1.

M ▷ Customer settings M0041

Multiport valve M1140

Default value: No signal

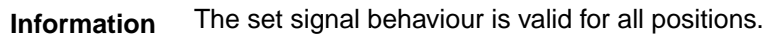
No signal

C _____ O

A diagram of a carbon atom (C) with a single bond to a carbon atom (C) and a single bond to an oxygen atom (O). The carbon atom is on the left, and the oxygen atom is on the right. The bond between them is a single line.

C _____ | | _____ O

Figure 73: Signal behaviour of positions



The hysteresis determines the tripping point.

Parameter **Hysteresis M1148** is set to 3.0°.

P2 Switch-off point (○)

Required user level: AUMA (6).

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Hysteresis M1148**Default values:** 0.5° for all 16 intermediate positions**Setting range:** 0.0° to 5.0° (degree)**10.2. Set torque switching**

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

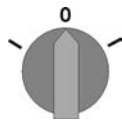
Information The torque switches may also trip during manual operation.

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*****

- Change value**
9. Enter password (→ enter password).
 - ➔ Display shows the set value.
 - ➔ The bottom row indicates: **Edit Esc**
 10. ⬅ Press **Edit**.
 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.

10.3. Operating time (internal): set

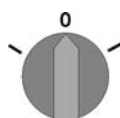
Internal operation time setting is only possible if the speed source is set to internal operating time. If the actuator is controlled via an external speed source, the internal operating values will not have an impact on the operation behaviour.

Table 23:

Speed sources		
Parameters	Value	Adjustable internal operating time
Sp. source LOC OP M1700	Internal 1	Yes
Sp. source LOCAL CL M2039	Internal 2	Yes
Sp. source REM OP M1701	Internal 3	Yes
Sp. source REM CL M2040	2 DigIn: "Internal (1-4)"	Yes
	Internal 4	Yes
	Analogue input	No (external speed source)
	Fieldbus	No (external speed source)

For further information on setting the speed sources, refer to Manual (Operation and Setting):

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



- Select parameter for operating time**
2. Press push button **C Setup** and hold it down for approx. 3 seconds.
 - ➔ Display goes to main menu and indicates: ▶ **Display**
 3. Either click via the menu **M ▶** to the parameter or via direct display
 - **Via the menu M ▶:**
 - Customer settings** M0041
 - Speed functions** M1699
 - Operat. time internal1** M1940
 - Operat. time internal2** M1941
 - Operat. time internal3** M1942
 - Operat.time internal4** M1943
 - Oper. time rem. max.** M1946
 - Oper. time rem. max.** M1947
 - **Via direct display** For this, press ▲ and enter ID, e.g.: M1940.
 - ➔ Display indicates: **Operat. time internal1**
- Selection**
4. Select via ▲ ▼ Up ▲ Down ▼:
 - ▶ **Operat. time internal1** M1940
 - ▶ **Operat. time internal2** M1941
 - ▶ **Operat. time internal3** M1942
 - ▶ **Operat.time internal4** M1943
 - ▶ **Oper. time rem. max.** M1946
 - ▶ **Oper. time rem. max.** M1947
 - ➔ 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 the bottom row **Up ▲ Down ▼ Esc** → continue with step 11
- Log on user**
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).
 - ➔ Display shows the set value.
 - ➔ The bottom row indicates: **Edit** **Esc**
 10. Press **Edit** ↵.
- Change value**
11. Enter new value for operating time via ▲ ▼ Up ▲ Down ▼.
 - Information:** The adjustable operating time range is specified on the actuator name plate and is indicated on the display in round brackets.
 12. Save new value via ↵ **Save**.
 - ➔ Operating time setting is complete
 13. Return to step 4 (Selection): Press **Esc** ↵.

10.4. Fieldbus address (slave address), baud rate, parity and monitoring time: set

M ► Customer settings M0041
Modbus M0341
MD1 slave address M0247
MD2 slave address M0409
Baud rate M0343
Parity/stop bit M0782
Monitoring time M0781

Default values:
MD1 slave address = 247
MD2 slave address = 247
Baud rate = Auto
Parity/stop bit = Even, 1 stop bit
Monitoring time = 15 seconds

Information Parameter MD2 slave address is only available if AUMA redundancy I (option) is available.

For further settings and information e.g. on redundancy, refer to Manual (Device integration).

11. Corrective action

11.1. Faults during commissioning

Table 24:

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)
Actuator operation is too fast or too slow.	Operating time setting is incorrect.	Modify operating time.
Actuator suddenly stops in end positions.	Velocity reduction switched off or incorrectly set before reaching end positions.	Modify velocity.

11.2. Fault indications and warning indications

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

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

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

Table 25:

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 26:

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 timeM0356, 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 startsM0357, 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.
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, manualM0570) 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, manualM0570.
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 timeM0634.
Wrn FOC ¹⁾	Optical receiving signal (channel 1) incorrect (no or insufficient Rx receive level) or RS-485 format error (incorrect bit(s))	Check/repair FO cables.
Wrn FO cable budget ¹⁾	Warning: FO cable system reserve reached (critical or permissible Rx receive level)	Check/repair FO cables.
Wrn FOC connection ¹⁾	Warning FO cable connection is not available.	Fit FO cable connection.
Torque wrn OPEN	Limit value for torque warning in direction OPEN exceeded.	Check parameter Wrn torque OPENM0768 , re-set if required.

Warnings and Out of specification		
Indication on display	Description/cause	Remedy
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769, re-set if required.
PVST required	Execution of PVST (Partial Valve Stroke Tests) is required.	
Maintenance required	Maintenance is required.	

1) For actuator controls with FOC connection

Table 27:

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-phase AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. When connecting to a 3-phase AC system: One of the phases L1, L2 or L3 is missing. 	Test/connect phases.
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 Usan M0832 must be less than parameter Volt.level diff. potent. M0833.
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. For a 1-phase AC motor, this can be caused by a defective auxiliary capacitor.	Check operation command control. For 3-phase AC current mains, activate phase monitoring (parameter Adapt rotary dir.M0171). Check device configuration setting (parameter Closing rotationM0176). To delete the fault indication: <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.
Converter fault	Motor protection: Fault within converter	

Table 28:

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 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.

Temperature monitoring of PTC tripping device

The temperature monitoring of PTC tripping device must be connected and monitored in an external system circuit. The signal is issued via an output contact.

Designation in the wiring diagram: TEMP-WARNING PTC TRIPPING DEVICE

Active signal = NC contact open (NO contact = closed)

Active signal means: The PTC tripping device temperature is not within the permitted temperature range.

Table 29:

Signal on temperature monitoring of PTC tripping device active		
	Possible causes	Remedy
for ambient temperatures below –30 °C	Heating system (wiring diagram designation: R5 H) failure	Check external power supply of heating system.
for ambient temperatures exceeding –30 °C	Heating system defective PTC tripping device defective	Switch off heater control unit M1338 Switch off external power supply of heating system. Contact AUMA service

11.3. Fuses

11.3.1. Fuses within the actuator controls

- F5** Automatic reset fuse as short-circuit protection for external 24 V DC supply for customer (refer to wiring diagram)

11.3.2. Motor protection (thermal monitoring)

In order to protect against overheating and impermissibly high surface temperatures at the actuator, PTC thermistors 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.

Then acknowledge the fault signal. 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.

12. 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).

12.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Carry out visual inspection:
Cable entries, cable glands, 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.

At the latest every 3 years

- Check functionality of motor protection. Refer to chapter <Motor protection (thermal monitoring)>.

12.2. Disconnection from the mains

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

12.2.1. Mains disconnection with KES electrical connection

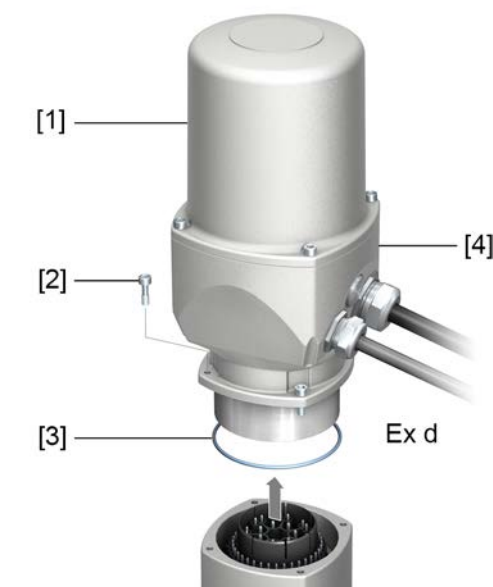


Ignition of potentially explosive atmospheres caused by sparks!

Risk of death or serious injury!

- Before opening the flameproof enclosure, ensure absence of gas and voltage.
- Wait for 30 seconds after power cut-off prior to opening the housing.
- Handle cover and housing parts with care.
- Flameproof joints must neither be damaged nor soiled in any way.
- Do not jam cover during fitting.

Figure 75: KES electrical connection



- [1] Cover
- [2] Screws for housing
- [3] O-ring
- [4] Connection frame (KES)

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

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

12.3. 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.
- Cables and wire entries, blanking plug, 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 with appropriate Ex approval.
- Check whether Ex connections are fastened correctly.
- Take care of possible discolouration of the terminals and wires. This would indicate an increased temperature.
- For Ex housings, pay special attention to a possible collection of water. This may originate from "breathing" due to severe temperature variations (e. g. change of night and day), from damaged seals etc. Remove any water immediately.
- The process temperature range must be within the range of the specified ambient temperature.
- Check the flame path gaps of flameproof enclosures for dirt and corrosion.
- Since the dimensions of all flameproof joints are strictly defined and inspected, no mechanical work (such as grinding) shall be performed on them. The joint surfaces have to be cleaned chemically (e. g. with Esso-Varsol).
- Consult manufacturer for indications regarding flameproof joints.
- Repair interventions on flameproof joints is not permitted.
- Prior to fitting, preserve joint surfaces with an acid-free corrosion protection agent (e. g. Esso Rust-BAN 397).
- Ensure that all housing covers are handled carefully and that the seals are checked.
- All cable and motor protection components have to be checked.
- If defects impairing the safety are detected during maintenance, repair measures have to be initiated without delay.
- Any kind of surface coating for the joint surfaces is not permitted.
- When replacing parts, sealing elements, etc. only original spare parts shall be used.

12.4. Disposal and recycling

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

- 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.

13. Technical data

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

13.1. Technical data Part-turn actuator

Features and functions			
Explosion protection	Standard:	II 2G Ex db eb IIC T4 or T3 Gb II 2G Ex h IIC T4 or T3 Gb	
	Options:	II 2G Ex db IIC T4 or T3 Gb II 2G Ex db eb IIB T3 Gb II 2G Ex db IIB T3 Gb II 2G Ex h IIB T3 Gb	
Product certificates	DEKRA 13ATEX0016 X		
Type of duty	Short-time duty S2- 15 min, classes A and B according to EN ISO 22153		
(Part-turn actuators for open-close duty)	For 100 % nominal voltage and +40 °C ambient temperature and at load with 35 % of the max. torque.		
Type of duty	Intermittent duty S4 - 25 %, class C according to EN ISO 22153		
(Part-turn actuators for modulating duty)	For 100 % nominal voltage and +40 °C ambient temperature and at modulating torque load.		
Motors	3-phase AC asynchronous motor, type IM B9 according to IEC 60034-7, IC410 cooling procedure according to IEC 60034-6		
Mains voltage, mains frequency	Refer to name plate of ACVExC actuator controls		
	3-phase AC Voltages/frequencies		
	Volt	220 – 240	380 – 480
	Hz	50 – 60	50 – 60
	1-phase AC Voltages/frequencies		
	Volt	110 – 120	220 – 240
	Hz	50 – 60	50 – 60
	Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 %		
	Overvoltage category	Category III according to IEC 60364-4-443	
Insulation class	Standard:	F, tropicalized	
	Option:	H, tropicalized	
Motor protection	Standard:	Thermoswitches (NC)	
	Option:	PTC thermistors (according to DIN 44082)	
Motor protection	PTC thermistors (according to DIN 44082) PTC thermistors additionally require a suitable tripping device in the actuator controls.		
Motor heater (option)	Voltages:	110 – 120 V AC, 220 – 240 V AC or 380 – 480 V AC	
	Power	12.5 W	
Swing angle	Standard:	Adjustable between 75° and < 105°	
	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.		
	Option:	Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm	

Features and functions		
Indication for manual operation (option)	Indication whether manual operation is active/not active via single switch (1 change-over contact)	
Electrical connection	Standard:	AUMA Ex plug/socket connector (KT); screw-type motor terminals; push-in type control terminals
	Option:	AUMA Ex plug/socket connector with screw-type terminals (KP), max. 38 control terminals AUMA Ex plug/socket connector with terminal blocks (KES)
Threads for cable entries	Standard:	Metric threads
	Option:	Pg threads, NPT threads, G threads
Terminal plan	Terminal plan according to order number enclosed with delivery	
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 and 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	
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 in accordance with IEC 60529	Standard:	IP68 Refer to name plates at motor and actuator for exact version
	Option:	DS terminal compartment additionally sealed against interior of actuator (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 	
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)	
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	

Service conditions		
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Other colours on request
Lifetime	AUMA part-turn actuators meet or exceed the lifetime requirements of EN ISO 22153. Detailed information can be provided on request.	
Sound pressure level	< 72 dB (A)	

Other	
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
Reference documents	Dimensions Part-turn actuators SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 14.2 with ACVExC 01.2 Electrical data Part-turn actuators SQVEx 05.2 – SQVEx 14.2 Electrical data Part-turn actuators SQRVEx 05.2 – SQRVEx 14.2

13.2. Technical data Actuator controls

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.									
Power supply	Standard voltages AC:									
	3-phase AC Voltages/frequencies					1-phase AC Voltages/frequencies				
	Volt	220 – 240		380 – 480		Volt	110 – 120		220 – 240	
	Hz	50	60	50	60	Hz	50	60	50	60
	Permissible variation of mains frequency: ± 5 %									
	Permissible variation of mains voltage: ± 10 %									
	–30 % for maximum 10 seconds within a range of 380 V – 480 V with the following restrictions:									
<ul style="list-style-type: none">• If required, the motor speed will be reduced down to nominal speed depending on the load of the actuators used• A low mains voltage increases the mains current consumption; a higher mains voltage reduces the mains current consumption• The torque limits of the actuators used might be decreased for a short time, if applicable										
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.									
Rated power	The actuator controls are designed for the rated power motor power, refer to motor name plate									
Control and feedback signals	Via Modbus RTU interface									
Fieldbus 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 CCW, STOP, CW, EMERGENCY, I/O interface (via opto-isolator thereof CCW, STOP, CW with one common and EMERGENCY, I/O interface respectively without common)<ul style="list-style-type: none">- Control inputs: CCW, STOP, CW- I/O interface: Selection of control type (Fieldbus or additional binary CCW, STOP, CW input signals)									

Features and functions		
Control voltage/current consumption for control inputs	Standard	24 V DC, current consumption: approx. 10 mA per input
	Options:	48 V DC, current consumption: approx. 7 mA per input 60 V DC, current consumption: approx. 9 mA per input 100 V – 125 V DC, current consumption: approx. 15 mA per input 100 V – 120 V AC, current consumption: approx. 15 mA per input
All input signals must be supplied with the same potential.		
Status signals	Via Modbus RTU interface	
Fieldbus interface with additional output signals (option)	Additional, binary output signals (only available in combination with additional input signals (option)) <ul style="list-style-type: none"> 6 programmable output contacts: <ul style="list-style-type: none"> 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Default configuration: MPV/LPV position reached, selector switch REMOTE, torque fault CLOSE, torque fault OPEN 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) Default configuration: 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	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
Redundancy (option)	Redundant line topology with universal redundancy behaviour according to AUMA redundancy I or II Redundant loop topology in combination with SIMA Master Station <ul style="list-style-type: none"> Max. number of actuators with actuator controls per redundant loop: 247 units Max. possible cable length between the actuators equipped with actuator controls without external repeater: 1,200 m Max. possible total length per redundant ring: approx. 290 km Automatic commissioning of the redundant ring by means of the SIMA Master Station 	
Local controls	Standard:	<ul style="list-style-type: none"> Selector switch: LOCAL - OFF - REMOTE (lockable in all three positions) Push buttons: OPEN, STOP, CLOSE, RESET <ul style="list-style-type: none"> Local STOP The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.) 6 indication lights: <ul style="list-style-type: none"> Running indication CW (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault CCW (red), running indication CCW (green), Bluetooth (blue) Graphic LC display: illuminated
	Option:	<ul style="list-style-type: none"> Special colours for the indication lights: <ul style="list-style-type: none"> Running indication CW (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), running indication CCW (red)
ACVExC 01.2 heating system (option)	Temperature version below –30 °C including heating system: <ul style="list-style-type: none"> in version with internal power supply at 400 V AC, or in version with external power supply for 230 V AC or 115 V AC 	
	For external power supply of the heating system, the minimum operational temperature may not fall below –40 °C in case of danger of disconnection of the mains voltage.	

Features and functions	
Bluetooth Communication interface	Bluetooth class II chip, version 2.1: With a range up to 10 m in industrial environments, supports the SPP Bluetooth profile (Serial Port Profile). Required accessories: <ul style="list-style-type: none"> AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool)
Application functions	Standard: <ul style="list-style-type: none"> Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time) Running indication blinking: can be set Speed source can be selected (REMOTE, LOCAL) 4 internal nominal speeds can be programmed (and selected in LOCAL) Nominal speed source can be selected for REMOTE (binary, analogue, fieldbus) Soft start, soft stop (0.1 s – 10 s can be selected)
Safety functions	Standard: <ul style="list-style-type: none"> EMERGENCY operation (programmable behaviour) <ul style="list-style-type: none"> Via additional input (option, low active) or via fieldbus interface Reaction can be selected: STOP, run to position at defined speed Torque monitoring can be by-passed during EMERGENCY operation
	Options: <ul style="list-style-type: none"> Enabling local controls via Enable LOCAL digital input: Thus, actuator operation can be enabled or disabled via push buttons on local controls.
Monitoring function	<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
Diagnostic functions	<ul style="list-style-type: none"> Electronic device ID with order and product data Logging of operating data: 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: <ul style="list-style-type: none"> 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	PTC tripping device (TMS module) in combination with PTC thermistors within actuator motor
Electrical connection	Standard: AUMA Ex plug/socket connector (KT); screw-type motor terminals; push-in type control terminals
	Options: <ul style="list-style-type: none"> AUMA Ex plug/socket connector with terminal blocks (KES) AUMA Ex plug/socket connector with screw-type terminals (KP)
Threads for cable entries	Standard: Metric threads
	Options: Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate

For version with MWG within actuator

Setting of limit and torque switching via local controls

Torque feedback signal	Via fieldbus interface Galvanically isolated analogue output 0/4 – 20 mA (load max. 500 Ω).
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Settings/programming the Modbus RTU interface

Setting the Modbus RTU interface	Baud rate, parity and Modbus address are set via the display of actuator controls
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General data of the Modbus RTU interface			
Communication protocol	Modbus RTU according to IEC 61158 and IEC 61784		
Network topology	<ul style="list-style-type: none"> Line (fieldbus) structure. When using repeaters, tree structures can also be implemented. Coupling and uncoupling of devices during operation without affecting other devices is possible. 		
Transmission medium	Twisted, screened copper cable according to IEC 61158		
Fieldbus interface	EIA-485 (RS-485)		
Transmission rate/cable length	Redundant line topology:		
	Baud rate (kbit/s)	Max. cable length (segment length) without repeater	Possible cable length with repeater (total network cable length)
	9.6 – 115.2	1,200 m	approx. 10 km
	Redundant ring topology:		
	Baud rate (kbit/s)	Max. cable length between actuators (without repeater)	Max. possible cable length of redundant loop
	9.6 – 115.2	1,200 m	approx. 290 km
Device types	Modbus slave, e.g. devices with digital and/or analogue inputs/outputs such as actuators, sensors		
Number of devices	32 devices in each segment without repeater, with repeaters expandable to 247		
Fieldbus access	Polling between master and slaves (query response)		
Supported Modbus functions (services)	01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Force Single Coil 15 (0FHex) Force Multiple Coils 06 Preset Single Register 16 (10Hex) Preset Multiple Registers 17 (11Hex) Report Slave ID 08 Diagnostics: <ul style="list-style-type: none"> 00 00 Loopback 00 10 (0AHex) Clear Counters and Diagnostic Register 00 11 (0BHex) Return Bus Message Count 00 12 (0CHex) Return Bus Communication Error Count 00 13 (0DHex) Return Bus Exception Error Count 00 14 (0EHex) Return Slave Message Count 00 15 (0FHex) Return Slave No Response Count 00 16 (10Hex) Return Slave NAK Count 00 17 (11Hex) Return Slave Busy Count 00 18 (12Hex) Return Character Overrun Count 		

Commands and signals of the Modbus RTU interface	
Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable LOCAL, Interlock OPEN/CLOSE
Process representation input (feedback signals)	<ul style="list-style-type: none"> • 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
Process representation input (fault signals)	<ul style="list-style-type: none"> • Motor protection tripped • Torque switch tripped in mid-travel • One phase missing
Behaviour on loss of communication	<p>The behaviour of the actuator is programmable:</p> <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	<p>≤ 2 000 m above sea level</p> <p>> 2,000 m above sea level on request</p>
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	<p>IP68</p> <p>Terminal compartment additionally sealed against interior (double sealed)</p> <p>According to AUMA definition, enclosure protection IP68 meets the following requirements:</p> <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. <p>For exact version, refer to actuator controls name plate.</p>
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)
Vibration resistance according to IEC 60068-2-6	<p>1 g, from 10 Hz to 200 Hz</p> <p>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)</p>
Corrosion protection	<p>Standard: KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.</p>
	<p>Option: KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.</p>
Coating	<p>Double layer powder coating</p> <p>Two-component iron-mica combination</p>
Colour	Standard: AUMA silver-grey (similar to RAL 7037)
	Option: Available colours on request

Accessories	
Wall bracket	<p>For actuator controls mounted separately from the actuator, including plug/socket connector. Connecting cable on request.</p> <p>Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service.</p> <p>Cable length between actuator and actuator controls is max. 16 m.</p>
Programming software	<p>AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC)</p> <p>AUMA Assistant App (Commissioning and Diagnostic Tool)</p>

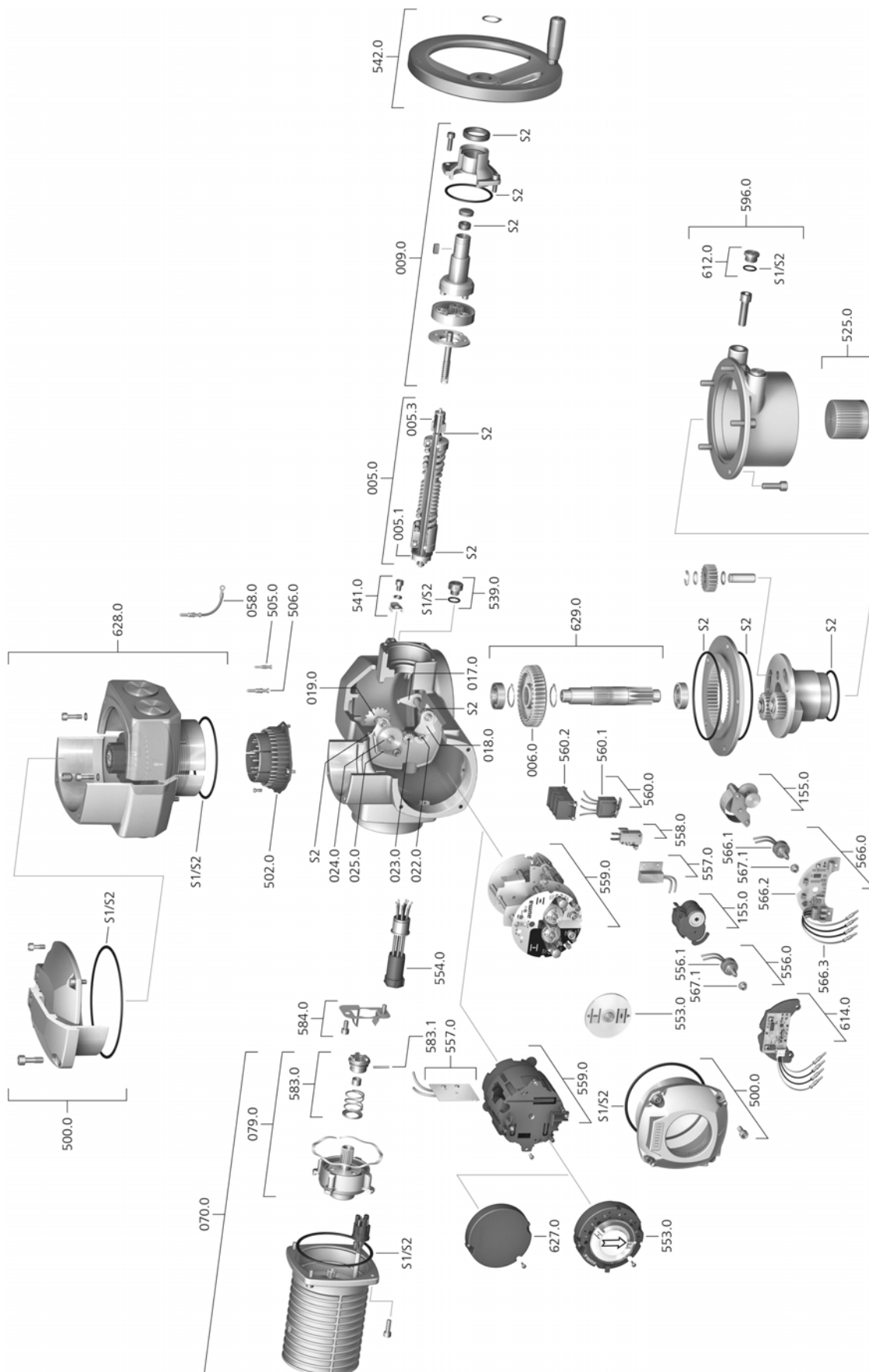
Further information	
Weight	Approx. 12 kg (with AUMA Ex plug/socket connector)
EU Directives	ATEX Directive 2014/34/EU Machinery Directive 2006/42/EC Low Voltage Directive 2014/35/EU EMC Directive 2014/30/EU RoHS Directive 2011/65/EU RED Directive 2014/53/EU
Reference documents	Dimensions SAVEx 07.2 – SAVEx 16.2/SARVEx 07.2 – SARVEx 16.2 with ACVExC 01.2 Dimensions SQVEx 05.2 – SQVEx 14.2/SQRVEx 07.2 – SQRVEx 16.2 with ACVExC 01.2 Electrical data SAVEx 07.2 – SAVEx 16.2/SARVEx 07.2 – SARVEx 16.2 Electrical data SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 14.2

13.3. Tightening torques for screws

Table 30:

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

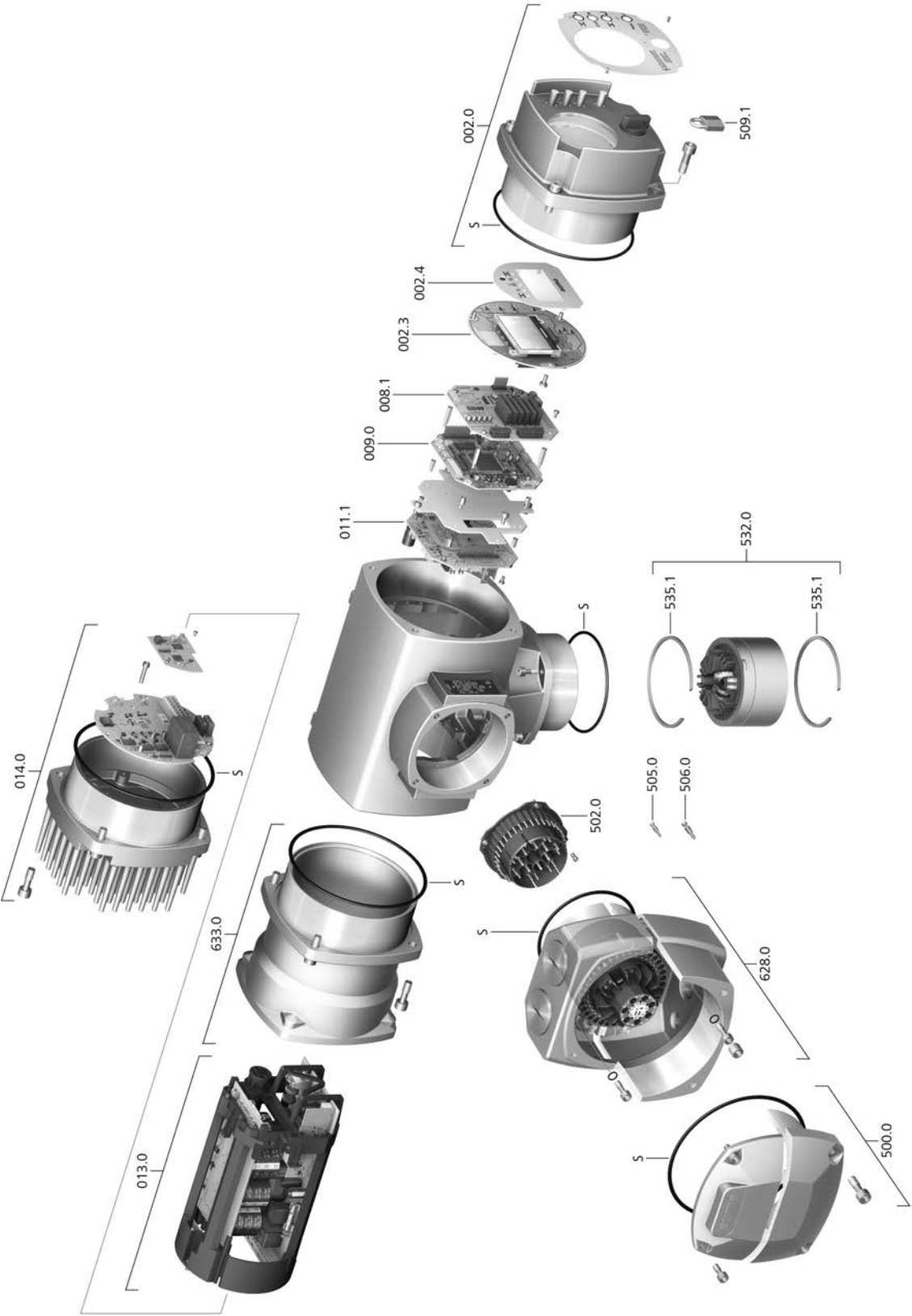
14.1. Part-turn actuators SQVEx 05.2 – SQVEx 14.2/SQRVEx 05.2 – SQRVEx 14.2 KT/KM



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

Ref. no.	Designation	Type	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			

14.2. ACVExC 01.2 KT/KM actuator controls

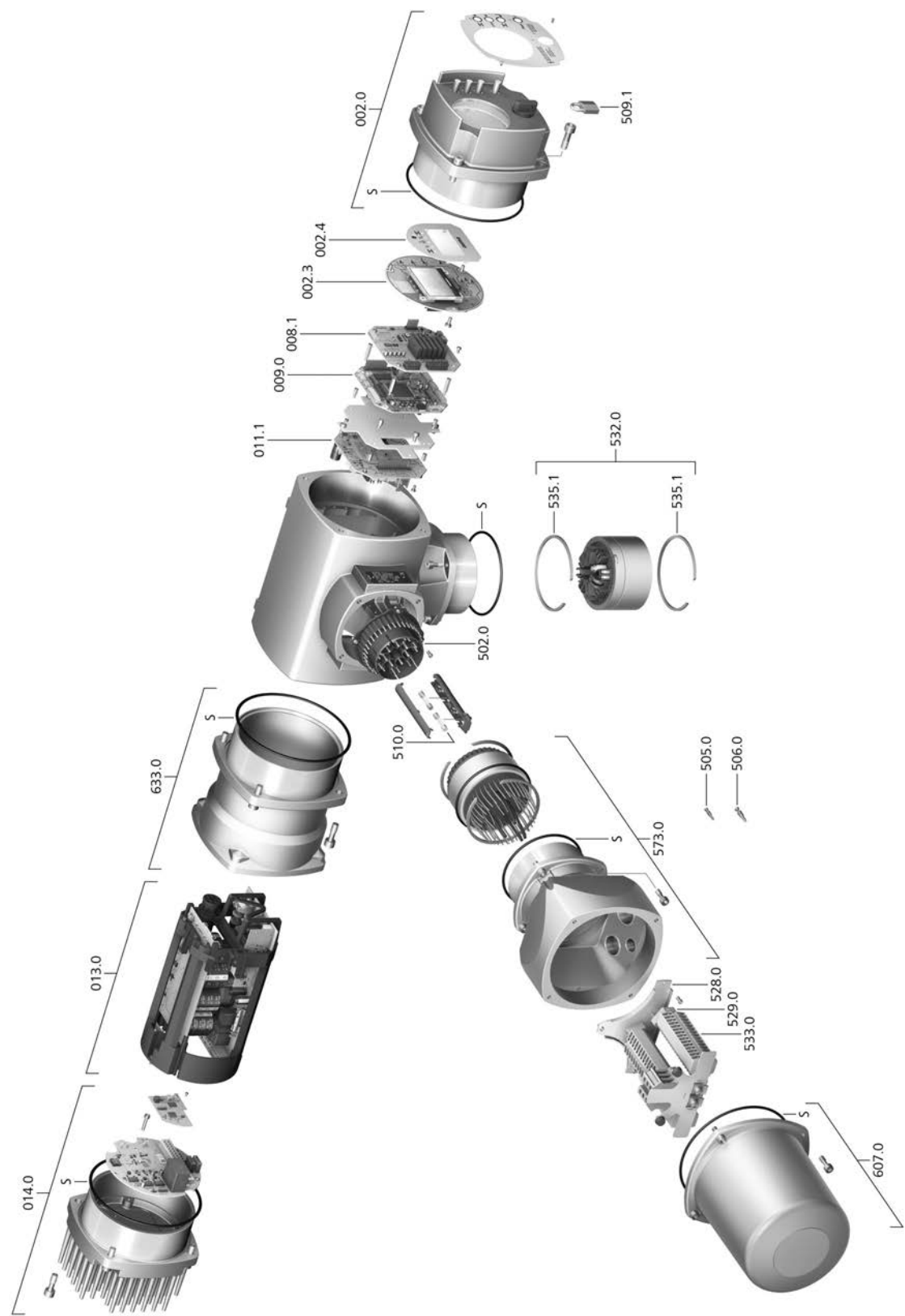


Spare parts

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	
008.1	I/O board	
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	ACV control board	Sub-assembly
013.0	Power supply unit/DC link	
014.0	Motor controller/switchgear	Sub-assembly
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
509.1	Padlock	Sub-assembly
532.0	Cable conduit (actuator connection)	
535.1	Retaining ring	
628.0	Ex plug/socket connector (KT, KM)	
633.0	Switchgear housing	Sub-assembly
S	Seal kit	Set

14.3. ACVExC 01.2 KES 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	
008.1	I/O board	
008.1	Fieldbus board	Sub-assembly
009.0	Logic board	Sub-assembly
011.1	ACV control board	Sub-assembly
013.0	Power supply unit/DC link	
014.0	Motor controller/switchgear	Sub-assembly
502.0	Pin carrier without pins	
505.0	Pin for controls	
506.0	Pin for motor	Sub-assembly
509.1	Padlock	
510.0	Fuse kit	Sub-assembly
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End clamp	
532.0	Cable conduit (actuator connection)	Sub-assembly
533.0	Terminals for motor/controls	
535.1	Retaining ring	
573.0	Ex plug/socket connector with terminal blocks (KES)	Sub-assembly
607.0	Cover	
633.0	Switchgear housing	Sub-assembly
S	Seal kit	Set

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