auma®
Solutions for a world in motion

Part-turn actuators
SQEx 05.2 – SQEx 14.2
SQREx 05.2 – SQREx 14.2
Control unit: electromechanic
with actuator controls
AUMATIC ACExC 01.2 Intrusive

Control

→ Parallel

Profibus DP

Modbus

Foundation Fieldbus

Operation instructions Assembly, operation, commissioning

Read operation instructions first.

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

Purpose of the document:

This document contains information for installation, commissioning, operation and maintenance staff. It is intended to support device installation and commissioning.

Reference documents:

- Manual (Operation and setting) AUMATIC AC 01.2 Parallel

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

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1. Safety instructions

1.1. Basic information on safety

Standards/directives

AUMA products are designed and manufactured in compliance with recognised standards and directives. This is certified in a Declaration of Incorporation and an EC Declaration of Conformity.

The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation.

They include among others standards and directives such as IEC/EN 60079 “Electrical apparatus for explosive atmospheres" –

- Part 14: Electrical installations in hazardous areas (other than mines).
- Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines).

Safety instructions/warnings

All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.

Qualification of staff

Assembly, electrical connection, commissioning, operation, and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or contractor of the plant only.

Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.

Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant are responsible for respect and control of these regulations, standards, and laws.

Commissioning

Prior to commissioning, it is important to check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.

Operation

Prerequisites for safe and smooth operation:

- Correct transport, proper storage, mounting and installation, as well as careful commissioning.
- Only operate the device if it is in perfect condition while observing these instructions.
- Immediately report any faults and damage and allow for corrective measures.
- Observe recognised rules for occupational health and safety.
- Observe the national regulations.
- During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature using an appropriate thermometer and wearing protective gloves, if required, prior to working on the device.

Protective measures

The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.

Maintenance

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

Any device modification requires prior consent of the manufacturer.

1.2. Range of application

AUMA part-turn actuators 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 mounting flange or the valve stem (e.g. due to hot media), please consult AUMA. Temperatures > 40 °C are not considered with regards to the non-electrical explosion protection.

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

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

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

No liability can be assumed for inappropriate or unintended use.

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

Information These operation instructions are only valid for the "clockwise closing" standard version, i.e. driven shaft turns clockwise to close the valve.

1.3. Warnings and notes

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

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

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

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

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

Arrangement and typographic structure of the warnings

DANGER

Type of hazard and respective source!

Potential consequence(s) in case of non-observance (option)

→ Measures to avoid the danger

→ Further measure(s)

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)

✓ Important information before the next step. This symbol indicates what is required for the next step or what has to be prepared or observed.

M ▷ **Via the menu to parameter**

Describes the path within the menu to the parameter. By using the push buttons of the local controls you may quickly find the desired parameter in the display.

< > **Reference to other sections**

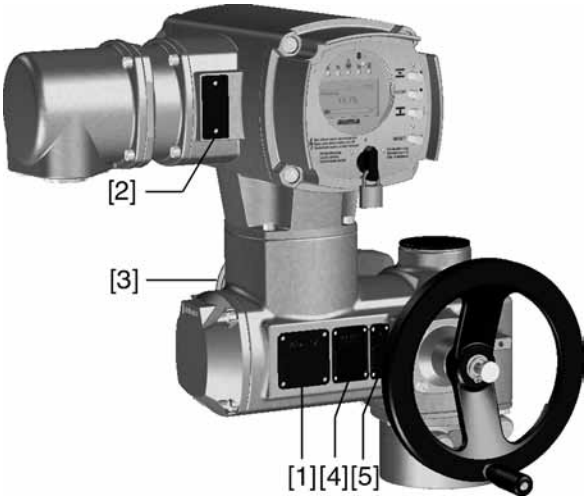
Terms in brackets shown above refer to other sections of the document which provide further information on this topic. These terms are either listed in the index, a heading or in the table of contents and may quickly be found.

2. Identification

2.1. Name plate

Each device component (actuator, controls, motor) is equipped with a name plate.

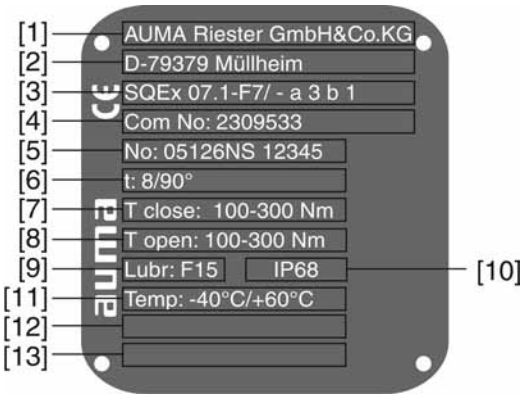
Figure 1: Arrangement of name plates



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

Description of actuator name plate

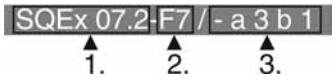
Figure 2: Actuator name plate (example)



[1] Name of manufacturer
[2] Address of manufacturer
[3] **Type designation** (see explanation below)
[4] **Commission number** (see explanation below)
[5] **Actuator serial number** (see explanation below)
[6] Operating time in [s] for a part-turn movement of 90°
[7] Torque range in direction CLOSE
[8] Torque range in direction OPEN
[9] Lubricant type – [10] enclosure protection
[11] Permissible ambient temperature
[12] Can be assigned as an option upon customer request
[13] Can be assigned as an option upon customer request

Type designation

Figure 3: Type designation (example)



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

Type and size

These instructions apply to the following devices types and sizes:

Part-turn actuators for open-close duty: SQEx 05.2, 07.2, 10.2, 12.2, 14.2

Part-turn actuators for modulating duty: SQ**R**Ex 05.2, 07.2, 10.2, 12.2, 14.2

Ex marking

Table 1: Marking for explosion protection (with example)

/	-	a	3	b	1	
1st position: Not used						
	–					
2nd position: Motor type						
		a	SDX or VDX: 3-phase AC motor			
3rd position: Protection type of electrical connection						
			3	Terminal compartment Ex **e** increased safety: Types: KP, KPH or KES		
			4	Terminal compartment Ex **d** flameproof enclosure: Type: KES-Exd		
4th position: Protection type of position transmitter						
				a	Without intrinsically safe electric circuit	
				b	Electric circuit Ex **i** Intrinsic safety: Type: RWG 5020.2Ex	
5th position: Protection type Ex fieldbus						
					1	No Ex fieldbus
					2	Ex **nL** non sparking Type: FNICO
					3	Ex **ic** non sparking Type: FISCO

Commission number

An order-relevant commission number (order number) is assigned to each device. This commission number can be used to directly download the wiring diagram (in German and English language), inspection records and further information regarding the device from the Internet: **http://www.auma.com**. For some details, the customer number might be required.

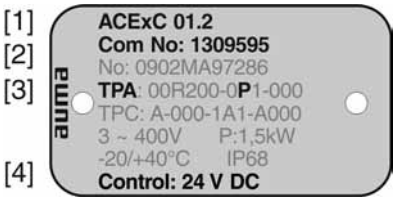
Actuator serial number

Table 2: Description of serial number (with example)

05	12	N S 12345	
1st + 2nd position: Assembly in week			
05	In our example: Week 05		
3rd + 4th position: Year of manufacture			
	12	In our example: Year of manufacture: 2012	
All other positions			
		N S 12345	Internal works number for unambiguous product identification

Description of controls name plate

Figure 4: Controls name plate



[1] **Type designation**
[2] Commission number
[3] **Wiring diagram**
[4] **Control**

Type designation ACExC 01.2 = Actuator controls AUMATIC

Wiring diagram 9th position in the **TPA** wiring diagram: Position transmitter (actuator):

Control unit: electromechanical:

0 = Without position transmitter

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

C, D, E, G, H, M, P, S, U = RWG (electronic position transmitter)

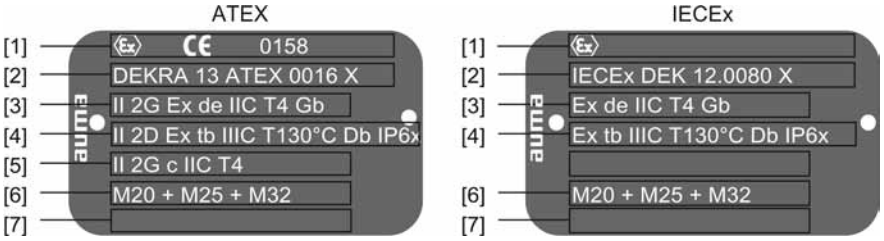
Control **24 V DC** = Control via parallel interface at 24 V DC control voltage

115 V AC = Control via parallel interface at 115 V AC control voltage

0/4 – 20 mA = Control via parallel interface via analogue input 0/4 – 20 mA

Description of approval plate in explosion-proof version

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



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

2.2. Short description

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

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

AUMA part-turn actuators are driven by an electric motor. A handwheel is provided for manual operation. Switching off in end positions may be either by limit or torque seating. Controls are required to operate or process the actuator signals.

Actuator controls

The AUMATIC actuator controls are used to operate AUMA actuators and are supplied ready for use. The controls may be mounted directly to the actuator or separately on a wall bracket.

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

Local controls/AUMA CDT

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

When set to local control, it is possible to

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

Intrusive - Non-Intrusive

- Intrusive version (control unit: electromechanical):
  Limit and torque setting is performed via switches in the actuator.
- Non-Intrusive version (control unit: electronic):
  Limit and torque setting is performed via the controls, actuator and controls housings do not have to be opened. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also supplying analogue torque feedback signals/torque indication and analogue position feedback signals/position indication.

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Hovering load!

Risk of death or serious injury.

→ Do NOT stand below hovering load.

→ Attach ropes or hooks for the purpose of lifting by hoist only to housing and NOT to handwheel.

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

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

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

3.2. Storage

NOTICE

Danger of corrosion due to inappropriate storage!

→ Store in a well-ventilated, dry room.

→ Protect against floor dampness by storage on a shelf or on a wooden pallet.

→ Cover to protect against dust and dirt.

→ Apply suitable corrosion protection agent to uncoated surfaces.

NOTICE

Damage on display caused by temperatures below permissible level!

→ The AUMATIC actuator controls must NOT be stored below –30 °C.

Long-term storage

If the device must be stored for a long period (more than 6 months) the following points must be observed in addition:

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

3.3. Packaging

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

4. Assembly

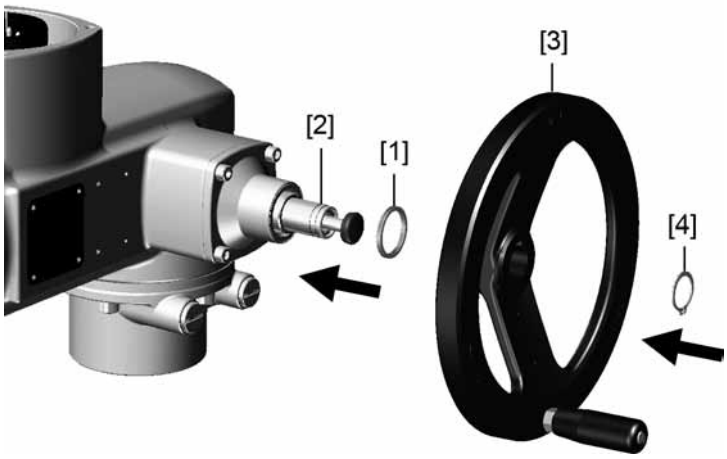
4.1. Mounting position

AUMA actuators and actuator controls can be operated without restriction in any mounting position.

4.2. Handwheel fitting

Information For transport purposes, handwheels from a diameter of 400 mm are supplied separately.

Figure 6: Handwheel



[1] Spacer
[2] Input shaft
[3] Handwheel
[4] Circlip

1. If required, fit spacer [1] onto input shaft [2].
2. Slip handwheel [3] onto input shaft.
3. Secure handwheel [3] using the circlip [4] supplied.

4.3. Actuator: mount to valve

NOTICE

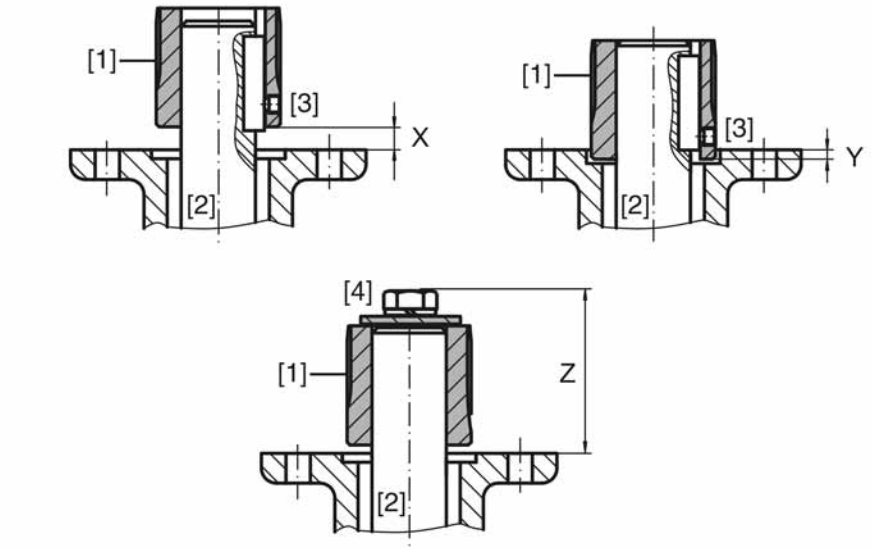
Danger of corrosion due to damage to paint finish and condensation!

→ 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.

Figure 7: Coupling fitting dimensions



[1] Coupling
[2] Valve shaft
[3] Grub screw
[4] Screw

Table 3: Coupling fitting dimensions

Type, size - output mounting flange	X max [mm]	Y max [mm]	Z max [mm]
SQEx/SQREx 05.2-F05	3	2	40
SQEx/SQREx 05.2-F07	3	2	40
SQEx/SQREx 07.2-F07	3	2	40
SQEx/SQREx 07.2-F10	3	2	66
SQEx/SQREx 10.2-F10	4	5	50
SQEx/SQREx 10.2-F12	4	5	82
SQEx/SQREx 12.2-F12	5	10	62
SQEx/SQREx 12.2-F14	5	10	102
SQEx/SQREx 14.2-F14	8	10	77
SQEx/SQREx 14.2-F16	8	10	127

1. Use handwheel to run actuator to mechanical end stop.

   Information: Assemble valve and actuator in the same end position.
   - For butterfly valves: Recommended mounting position is end position CLOSED.
   - For ball valves: Recommended mounting position is end position OPEN.

2. Thoroughly degrease mounting faces of the output mounting flanges.
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, a circlip or a screw. Thereby, ensure that dimensions X, Y or Z are observed (refer to figure and table <Coupling fitting dimensions>).
5. Apply non-acidic grease at splines of coupling.
6. Fit actuator.

   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 position by one tooth on the coupling.

8. Fasten actuator with screws [4].
   Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.

   → Fasten screws [4] crosswise with a torque according to table.

   Table 4: Tightening torques for screws

Screws Threads	Tightening torque T_A [Nm]
	Strength class 8.8
M6	11
M8	25
M10	51
M12	87
M16	211

4.4. Mounting positions of local controls

The mounting position of the local controls is selected 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 are possible.

Figure 8: Mounting positions A and B

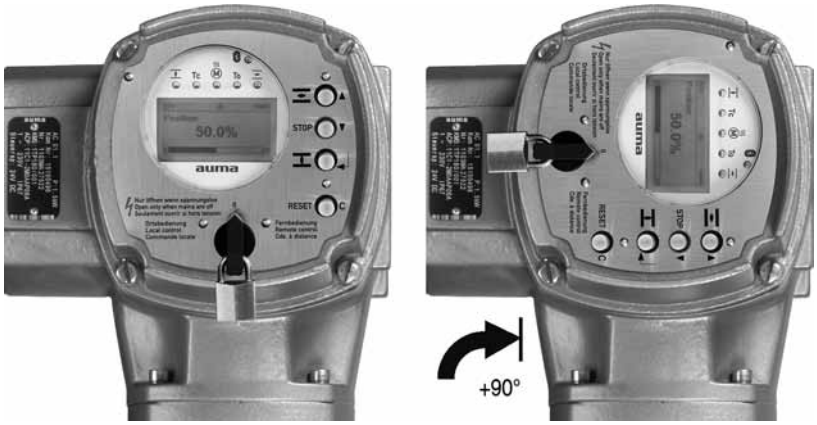
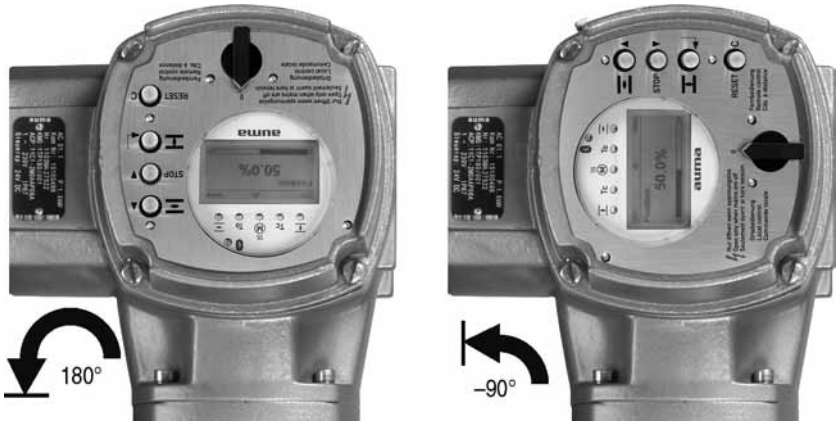


Figure 9: Mounting positions C and D



4.4.1. Mounting positions: modify

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

→ Before opening, ensure that there is no explosive gas and no voltage.
→ Handle cover and housing parts with care.
→ Joint surfaces must not be damaged or soiled in any way.
→ Do not jam cover during fitting.

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.

5. Electrical connection

5.1. Basic information

⚠ WARNING

Danger due to incorrect electrical connection

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

→ The electrical connection must be carried out exclusively by suitably qualified personnel.

→ Prior to connection, observe basic information contained in this chapter.

→ After connection but prior to applying the voltage, observe the <Commissioning> and <Test run> chapters.

Wiring diagram/terminal plan

The pertaining wiring diagram/terminal plan (in German and English language) is attached to the device in a weather-proof bag, together with these operation instructions. It can also be obtained from AUMA (state commission no., refer to name plate) or downloaded directly from the Internet (www.auma.com).

Permissible networks (supply networks)

The controls (actuators) are suitable for for use in TN and TT networks with directly earthed star point and a maximum voltage of 690 V AC. Use in IT networks is permitted while observing the respective <Protection on site> for for maiximum supply voltages of 600 V AC.

Protection on site

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

The current values for respective sizing is derived from the current consumption of the motor (refer to electrical data sheet) plus the current consumption of the controls.

Table 5: Current consumption controls

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

Table 6: Maximum permissible protection

Switchgear	Rated power	Max. protection
Reversing contactor A1	up to 1.5 kW	16 A (gL/gG)
Thyristor B1	up to 1.5 kW	16 A (g/R) I^2t<1,500A^2s

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

Use appropriate insulation monitors when working in power installations, for example an insulation monitor measuring the pulse code.

Power supply for the controls (electronics)

In case of external supply of the controls (electronics): The external power supply must have a reinforced insulation against the mains voltage in accordance with IEC 61010-1 and may only be supplied by a circuit limited to 150 VA in accordance with IEC 61010-1.

Potential of customer connections

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

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

Safety standards

All externally connected devices shall comply with the relevant safety standards.

Cable installation in accordance with EMC

Signal and bus cables are susceptible to interference.

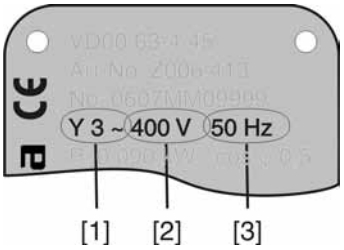
Motor cables are interference sources.

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and bus 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 long parallel paths with cables being either susceptible to interference or interference sources.
- For the connection of remote position transmitters, screened cables must be used.

Type of current, mains voltage and mains frequency

Type of current, mains voltage and mains frequency must match the data on the motor name plate.

Figure 10: Motor name plate (example)



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

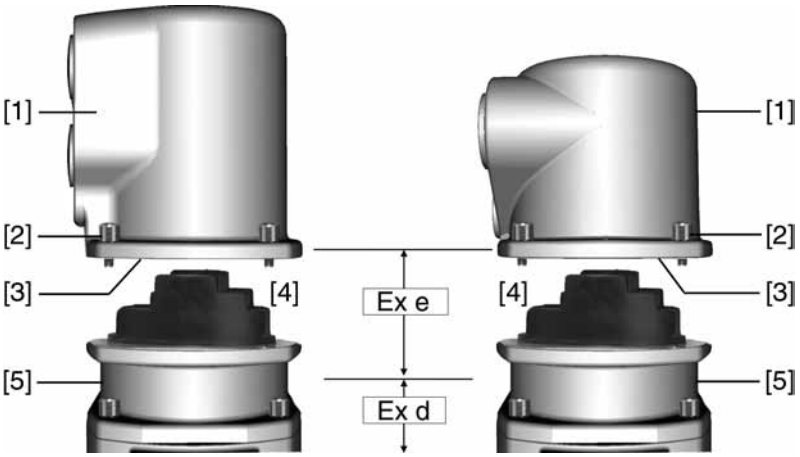
Connecting cables

- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- Use connecting cables with a minimum temperature range of +80 °C.
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.

5.2. Connecting via Ex plug/socket connector with screw-type terminals (KP, KPH)

5.2.1. Terminal compartment: open

Figure 11: Ex plug/socket connector KPH, KP



[1] Cover
[2] Screws for cover
[3] O-ring
[4] Terminal compartment
[5] Terminal board

DANGER

Hazardous voltage!

Risk of electric shock.

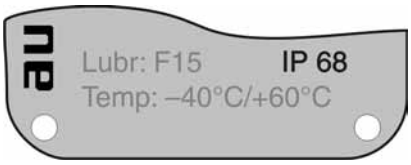
→ Disconnect device from the mains before opening.

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

➥ Terminal compartment [4] is designed for explosion protection Ex e (increased safety). The flameproof compartment (type of protection Ex d) remains hereby closed.

2. Insert cable glands with Ex e approval and of size suitable for connection cables.

➥ The enclosure protection IP… stated on the name plate is only ensured if suitable cable glands are used. Example: Name plate shows enclosure protection IP68.



3. Seal cable entries which are not used with approved plugs suitable for the required protection type.
4. Insert the wires into the cable glands.

5.2.2. Cable connection

Table 7: Terminal cross sections and tightening torques

Type	Terminal cross sections	Tightening torques
Power terminals (U1, V1, W1) PE connection	(1.5)[1)] 2.5 – 6 mm² (flexible or solid)	2 Nm
Control contacts (1 to 50)	0.75 – 1.5 mm² (flexible or solid)	1 Nm

1) with small clamp washers

NOTICE

Danger of corrosion: Damage due to condensation!

→ After mounting, commission the device immediately to ensure that heater minimises condensation.

1. Remove cable sheathing in a length of 120 – 140 mm.
2. Strip wires.
   → Controls max. 8 mm, motor 12 mm
3. For flexible cables: Use end sleeves according to DIN 46228.
4. Connect cables according to order-related wiring diagram.
   Information: Two wires for each connection permitted.
   → When using motor cables with a cross section of 1.5 mm²: Use small clamp washers for connection to terminals U1, V1, W1 and PE (the small clamp washers are provided in the electrical connection cover).

⚠ WARNING

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

Risk of electric shock.

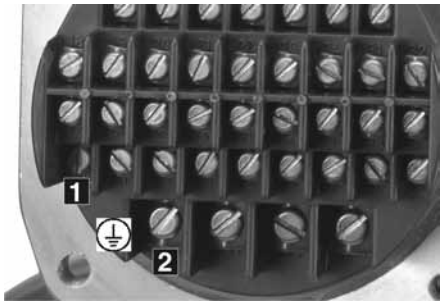
→ Connect all protective earth conductors.

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

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

5. Tighten protective earth firmly to PE connection

Figure 12: PE connection



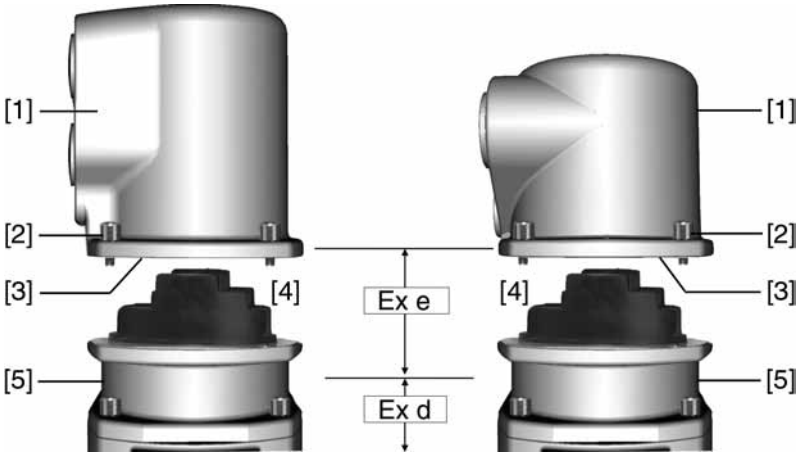
[1] PE connection, control cable

[2] PE connection, motor cable

Information Some actuators are equipped with an additional motor heater. The motor heater minimises condensation within the motor and improves the start-up behaviour for extremely low temperatures.

5.2.3. Terminal compartment: close

Figure 13: Ex plug/socket connector KPH, KP



[1] Cover

[2] Screws for cover

[3] O-ring

[4] Terminal compartment

[5] Terminal board

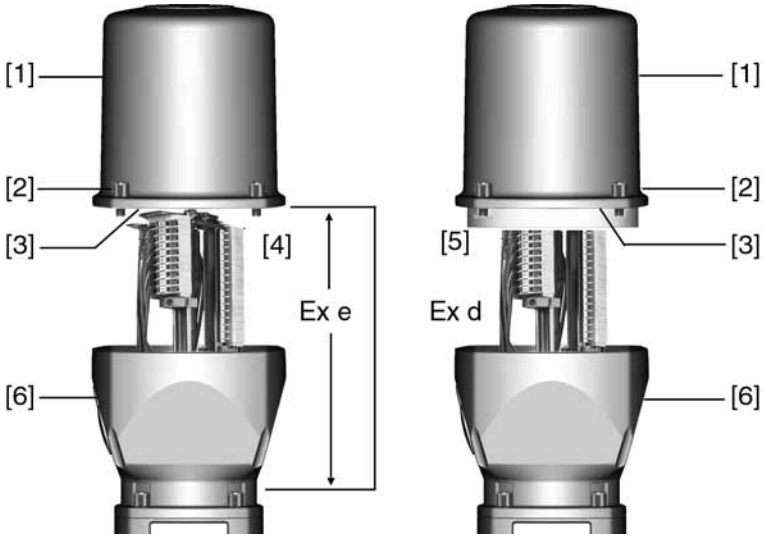
1. Clean sealing faces of cover [1] and housing.
2. Check whether O-ring [3] is in good condition, replace if damaged.
3. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.

4. Fit cover [1] and fasten screws [2] evenly crosswise.
5. Fasten cable glands with the specified torque to ensure the required enclosure protection.

5.3. Connecting via Ex plug/socket connector with terminal blocks (KES)

5.3.1. Terminal compartment: open

Figure 14: Ex plug/socket connector: left KES, right KES flameproof



[1] Cover
[2] Screws for cover
[3] O-ring
[4] Terminal compartment: Type of protection Ex e
[5] Terminal compartment: Type of protection Ex d
[6] Frame

DANGER

Hazardous voltage!

Risk of electric shock.

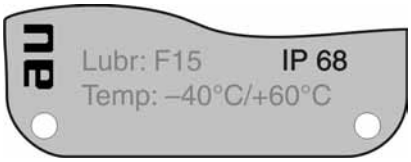
→ Disconnect device from the mains before opening.

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

➥ Terminal compartments [4] and [5] are designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure). Hereby, the flameproof interior compartment of the actuator (Ex d) remains closed.

2. Insert cable glands with Ex e approval and suitable for connection cables.

➥ The enclosure protection IP… stated on the name plate is only ensured if suitable cable glands are used. Example: Name plate shows enclosure protection IP68.



3. Seal cable entries unused cable entries with approved plugs suitable for the required protection type.
4. Remove cable sheathing and insert the wires into the cable glands.
5. Fasten cable glands with the specified torque to ensure required enclosure protection.

5.3.2. Cable connection

Table 8: Terminal cross sections and tightening torques

Type	Terminal cross sections	Tightening torques
Power terminals (U, V, W)	max. 10 mm² (flexible or solid)	1.5 – 1.8 Nm
PE connection	max. 10 mm² (flexible or solid)	3.0 – 4.0 Nm
Control contacts (1 to 50)	max.2.5 mm² (flexible or solid)	0.6 – 0.8 Nm

NOTICE

Danger of corrosion: Damage due to condensation!

→ After mounting, commission the device immediately to ensure that heater minimises condensation.

1. Strip wires.
2. For flexible cables: Use end sleeves according to DIN 46228.
3. Connect cables according to order-related wiring diagram.

⚠ WARNING

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

Risk of electric shock.

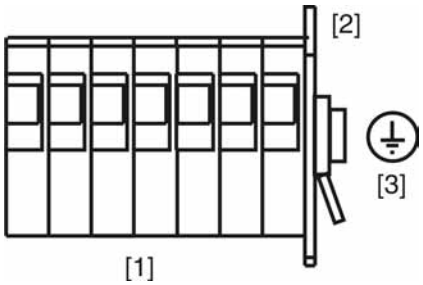
→ Connect all protective earth conductors.

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

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

4. Tighten protective earth firmly to PE connection

Figure 15: PE connection

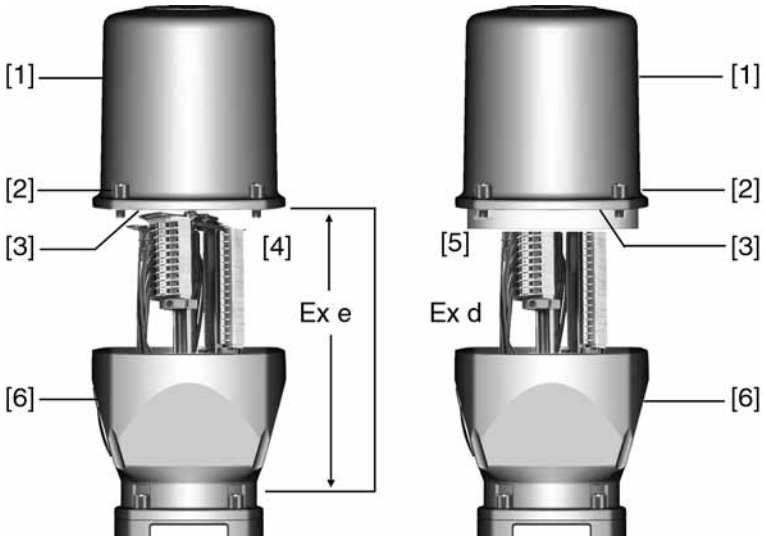


[1] Terminal blocks
[2] Terminal housing
[3] PE connection, symbol: ⏚

Information Some actuators are equipped with an additional motor heater. The motor heater minimises condensation within the motor and improves the start-up behaviour for extremely low temperatures.

5.3.3. Terminal compartment: close

Figure 16: Ex plug/socket connector: left KES, right KES flameproof



[1] Cover
[2] Screws for cover
[3] O-ring
[4] Terminal compartment: Type of protection Ex e
[5] Terminal compartment: Type of protection Ex d
[6] Frame

1. Clean sealing faces of cover [1] and housing.
2. 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 (e.g. petroleum jelly) to the O-ring and insert it correctly.

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

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

5.4. Accessories for electrical connection

— Option —

5.4.1. Controls mounted to wall bracket

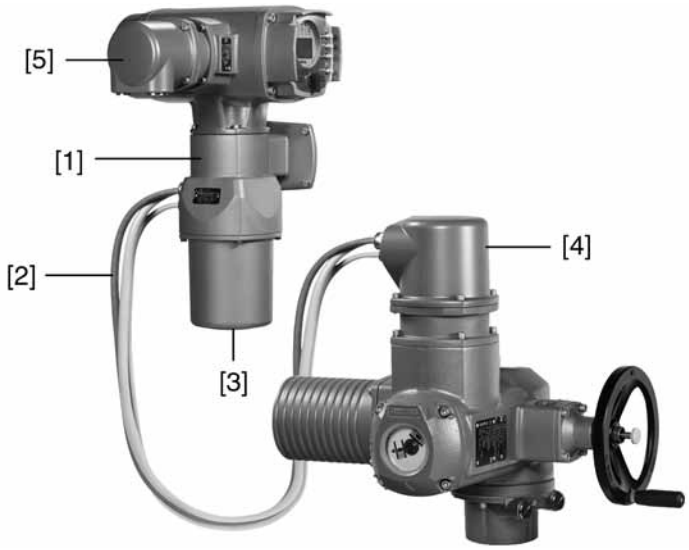
The wall bracket allows separate mounting of controls and actuator.

Application

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

Design

Figure 17: Design principle with wall bracket



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

Observe prior to connection

- Permissible length of connecting cables: max. 100 m.
- If the actuator is equipped with a position transmitter (RWG): Connecting cables must be available as shielded version.
- Versions with potentiometer in the actuator are not suitable.
- We recommend: AUMA cable sets LSW8-KES or LSW9-KP.
- If the AUMA cable set is not used: Use suitable flexible and screened connecting cables.
- When using connecting cables, e.g. of the heater or switch, requiring direct wiring from the actuator to the XK customer connector (XA-XM-XK, refer to wiring diagram), these connecting cables must be subject to an insulation test in compliance with EN 50178. Connecting cables of position transmitters (RWG, IWG, potentiometer) do not belong to this group. They may **not** be subject to an insulation test.

5.4.2. Parking frame

Application

Parking frame for safe storage of a disconnected plug.

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

Figure 18: Parking frame and Ex plug/socket connector with screw-type terminals (KP/KPH)

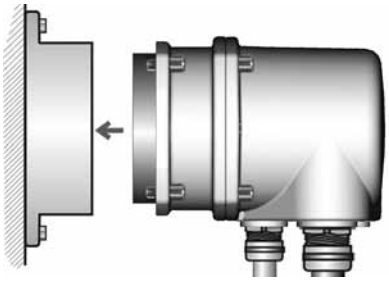
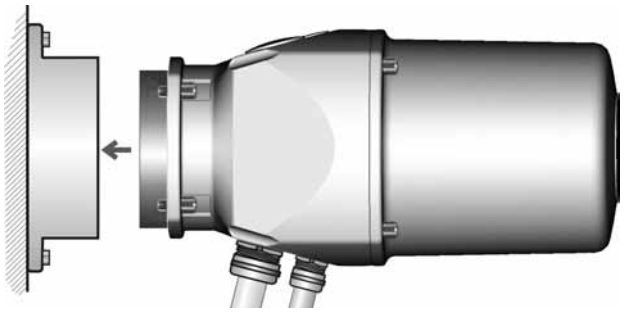


Figure 19: Parking frame and Ex plug/socket connector with terminal blocks (KES)



5.4.3. Protection cover

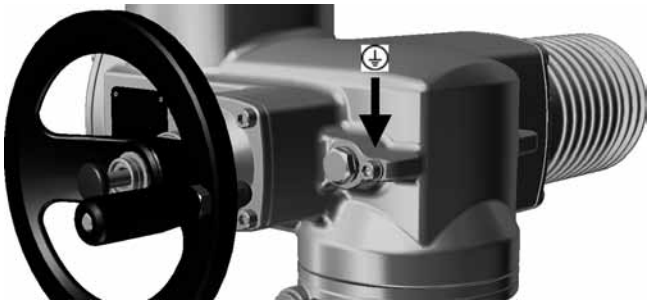
Protection cover for plug compartment when plug is removed.

The open terminal compartment can be closed using a protective cover (not illustrated).

5.4.4. Earth connection, external

The housing is equipped with an external earth connection (U-bracket) to connect the device to the equipotential earth bonding.

Figure 20: Earth connection



6. Operation

NOTICE

Valve damage due to incorrect basic setting!

→ Prior to electrical operation of the actuator, the basic settings i.e. type of seating, torque and limit switching have to be completed.

6.1. Manual operation

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

6.1.1. Manual operation: engage

NOTICE

Damage at the motor coupling due to faulty operation!

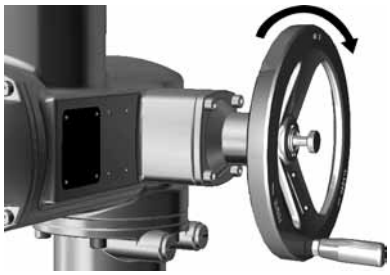
→ Engage manual operation only during motor standstill.

1. Press push button.

2. Turn handwheel in desired direction.

→ To close the valve, turn handwheel clockwise:

➥ Drive shaft (valve) turns clockwise in direction CLOSE.



6.1.2. Manual operation: disengage

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

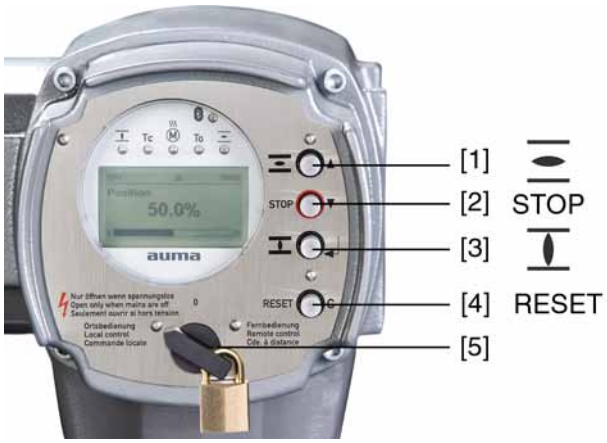
6.2. Motor operation

✔ Perform all commissioning settings and the test run prior to motor operation.

6.2.1. Local actuator operation

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

Figure 21: 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

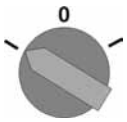
⚠ CAUTION

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

Danger of burns

→ Check surface temperature and wear protective gloves, if required.

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

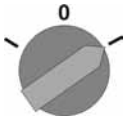


➥ The actuator can now be operated using the push buttons [1 – 3].

- 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].

6.2.2. Actuator operation from remote

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

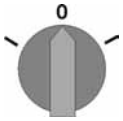


➥ Now, it is possible to operate the actuator via remote control, via operation commands (OPEN, STOP, CLOSE) or analogue setpoints (e.g. 0 – 20 mA).

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

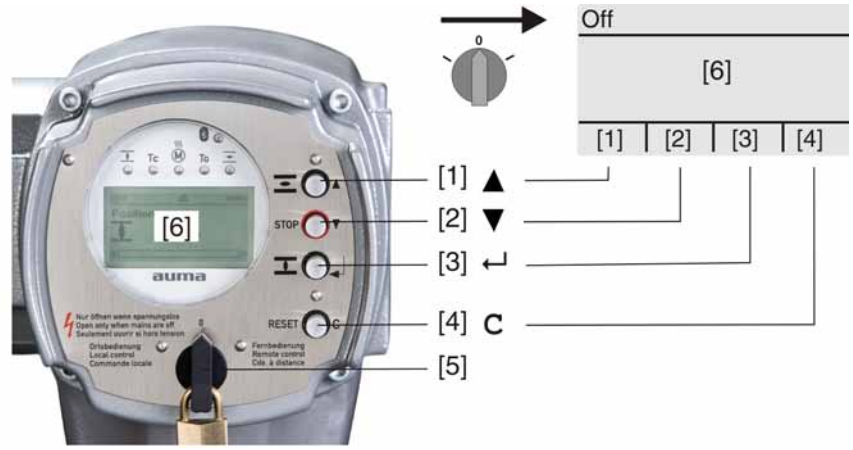
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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



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

Figure 22:



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

Table 9: Important push button functions for menu navigation

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

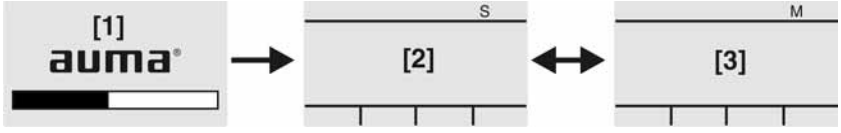
Backlight

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

6.3.1. Menu layout and navigation

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

Figure 23: Groups



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

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

Figure 24: Marking with ID

S ID starts with S = status menu

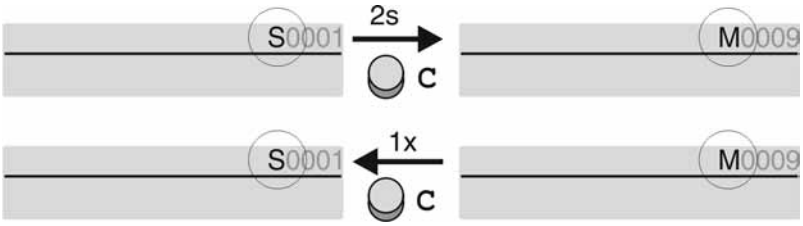
M ID starts with M = main menu

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 25: Select menu groups



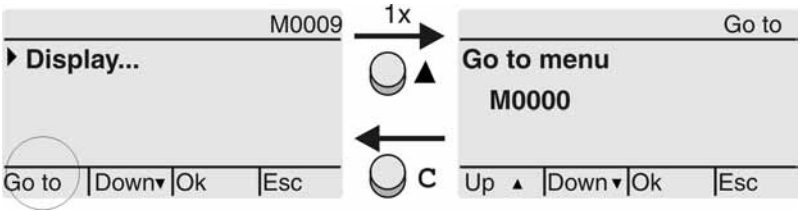
You return to the status menu if:

- 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 26: Direct display (example)



Display indicates in the bottom row: Go to

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

6.4. User level, password

User level

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

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

Figure 27: 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 10: User levels and authorisations

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

6.4.1. Password entry

1. Select desired menu and hold down push button ↵ for approx. 3 seconds.

➥ Display indicates the set user level, e.g Observer (1)

2. Press ▲ Up ▲ to select a higher user level and press ↵ Ok to confirm.

➥ Display shows: Password 0***

3. Use push buttons ▲ ▼ Up ▲ Down ▼ to select figures 0 to 9.
4. Confirm first digit of password via push button ↵ Ok.
5. Repeat steps 1 and 2 for all further digits.

➥ Having confirmed the last digit with ↵ Ok, access to all parameters within one user level is possible if the password entry is correct.

6.4.2. Password change

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

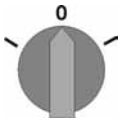
Example: The user is signed in as Specialist (4). This authorises him or her to modify the passwords between user levels (1) to (4).

M ▷ Device configuration M0053
Service functions M0222
Change passwords M0229

Menu point Service functions M0222 is only visible if user level has been set to Specialist (4) or higher.

Select main menu

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

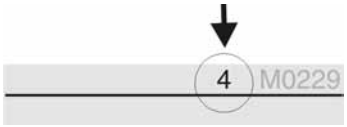


2. Press push button **C** Setup and hold it down for approx. 3 seconds.

➥ Display goes to main menu and indicates: ▸ Display...

Change passwords

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



- For user level 1 (view only), passwords cannot be changed. To change passwords, you must change to a higher user level. For this, enter a password via a parameter.

4. For a user level between 2 and 6: Press push button ↵ Ok.
➥ The display indicates the highest user level, e.g.: For user 4
5. Select user level via push buttons ▲▼ Up ▲ Down ▼ and confirm with ↵ Ok.
➥ Display indicates: ▸ Change passwords Password 0***
6. Enter current password (→ enter password).
➥ Display indicates: ▸ Change passwords Password (new) 0***
7. Enter new password (→ enter password).
➥ Display indicates: ▸ Change passwords For user 4 (example)
8. Select next user level via push buttons ▲▼ Up ▲ Down ▼ or cancel the process via Esc.

6.5. Language in the display

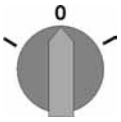
The AUMATIC display is multilingual.

6.5.1. Language change

M ▷ Display... M0009
Language M0049

Select main menu

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



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

Change language

3. Press ↵ Ok.
➥ Display indicates: ▸ Language
4. Press ↵ Ok.
➥ Display indicates the selected language, e.g.: ▸ Deutsch
5. The bottom row of the display indicates:
   → Save → continue with step 10
   → Edit → continue with step 6
6. Press ↵ Edit.
➥ Display indicates: ▸ Observer (1)
7. Select user level via ▲▼ Up ▲ Down ▼ resulting in the following significations:
   → black triangle: ▸ = current setting
   → white triangle: ▹ = selection (not saved yet)
8. Press ↵ Ok.
➥ Display indicates: Password 0***

9. Enter password (→ enter password).

➥ Display indicates: ▸ Language and Save (bottom row)

Language selection

10. Select new language via ▲▼ Up ▲ Down ▼ resulting in the following significations:
    - → black triangle: ▸ = current setting
    - → white triangle: ▹ = selection (not saved yet)
11. Confirm selection via ↵ Save.

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

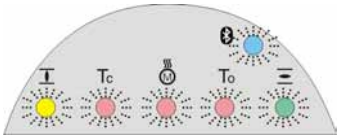
7. Indications

7.1. Indications during commissioning

LED test

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

Figure 28: LED test



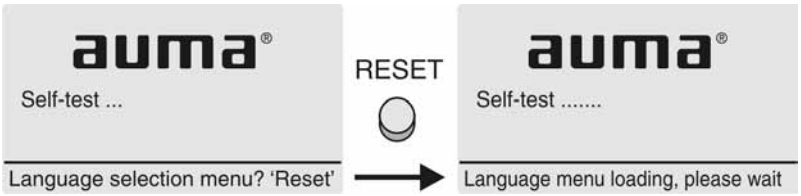
Language selection

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 [5] to position **0** (OFF).

Activate language selection:

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

Figure 29: Self-test

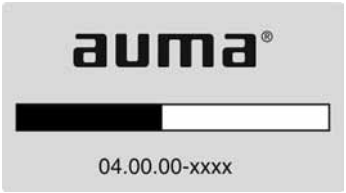


The language selection menu follows the startup menu.

Startup menu

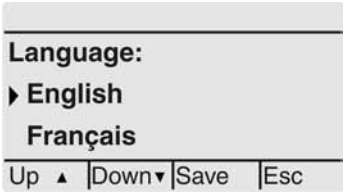
The current firmware version is displayed during the startup procedure:

Figure 30: Startup menu with firmware version: 04.00.00–xxxx



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

Figure 31: Language selection



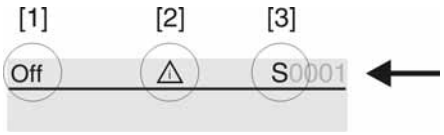
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

7.2. Indications in the display

Status bar

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

Figure 32: Information in the status bar (top)



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

Navigation support

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

Figure 33: Navigation support (bottom)

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

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

7.2.1. Feedback indications from actuator and valve

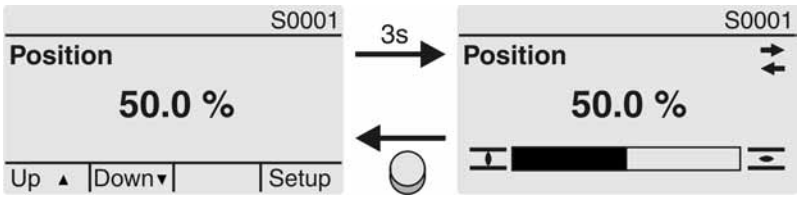
Display indications depend on the actuator version.

Valve position (S0001)

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

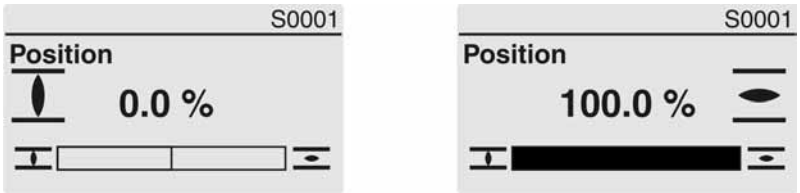
- S0001 on the display indicates the valve position in % of the travel.
- The bargraph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 34: Valve position and direction of operation



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

Figure 35: End position CLOSED/OPEN reached



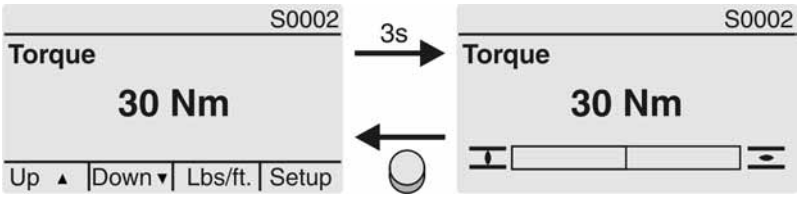
0% Actuator is in end position CLOSED
100% Actuator is in end position OPEN

Torque (S0002)

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

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

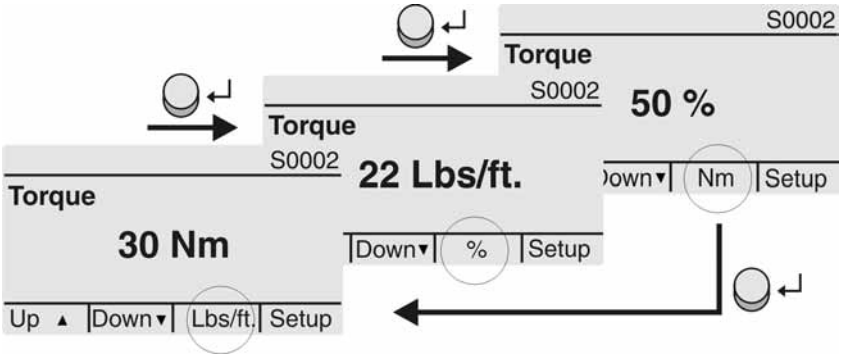
Figure 36: Torque



Select unit

The push button ↵ allows to select the unit displayed (percent %, Newton metre Nm or pounds per foot Lbs/ft.

Figure 37: Units of torque



Display in percent

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

Example: SA 07.5 with 20 – 60 Nm.

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

Operation commands (S0003)

The display S0003 indicates:

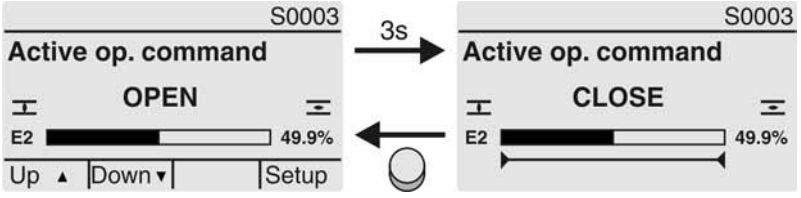
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bargraph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points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

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

OPEN - CLOSE control

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

Figure 38: Display for OPEN - CLOSE control



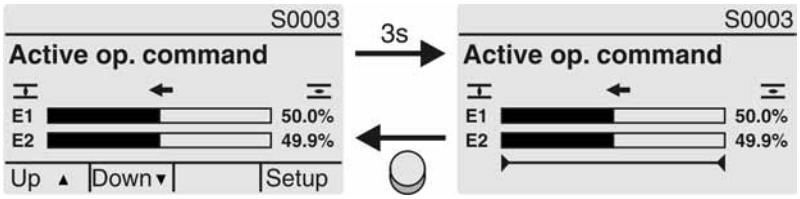
E2 Actual position value

Setpoint control

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

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

Figure 39: Display for setpoint control (positioner)



E1 Position setpoint

E2 Actual position value

Pivot point axis

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

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

Operation profile M0294

Timer CLOSE M0156

Timer OPEN M0206

Figure 40: Examples: on the left pivot points (intermediate positions); on the right stepping mode

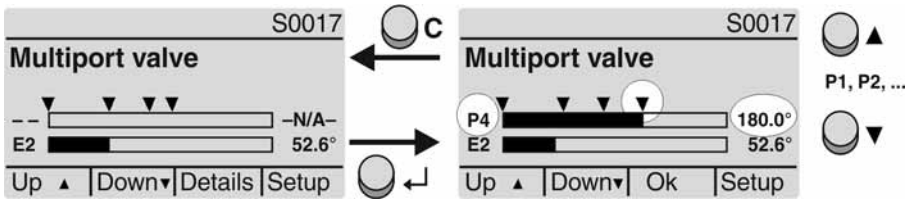
Table 11: Symbols along the pivot point axis

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

Multiport valve positions (S0017)

In case of active multiport valve function, the display S0017 indicates a second bargraph display with set positions (valve connections) above the actual position value E2. Positions (P1, P2, ...) are displayed with a black triangle ▼. Push buttons ▲▼ are used to select positions. Both positions and the actual position value E2 are displayed in degrees.

Figure 41: Status indication for multiport valve (example P4 = 180°)



P (P1, P2, ...) selected position (1, 2, ...)
(– –) no position selected

E2 Actual position value

7.2.2. Status indications according to AUMA classification

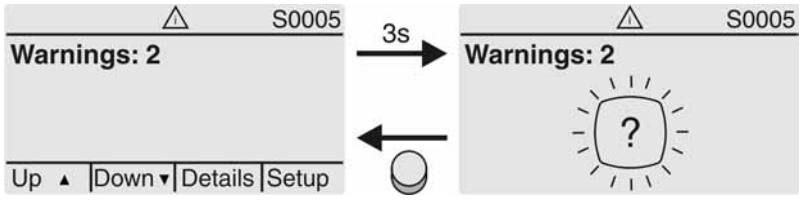
These indications are available, if the parameter Diagnostic classific. M0539 is set to AUMA.

Warnings (S0005)

If a warning has occurred, the display shows S0005:

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

Figure 42: Warnings



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

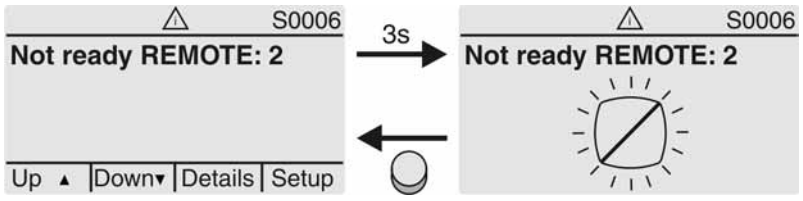
Not ready REMOTE (S0006)

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 43: Not ready REMOTE indications



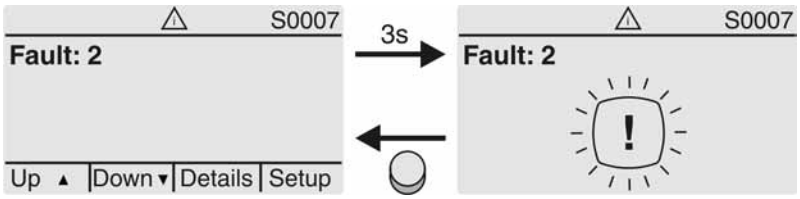
For further information, please also refer to <Corrective action>.

Fault (S0007)

If a fault has occurred, the display shows S0007:

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

Figure 44: Fault



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

7.2.3. Status indications according to NAMUR recommendation

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

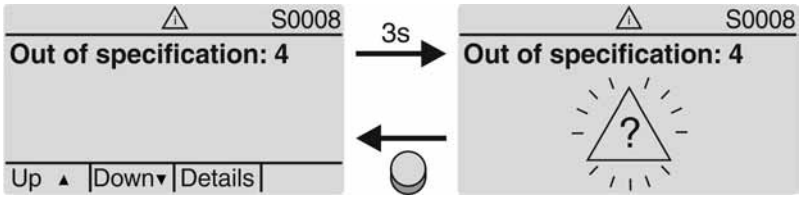
Out of Specification (S0008)

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

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

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

Figure 45: Out of specification



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

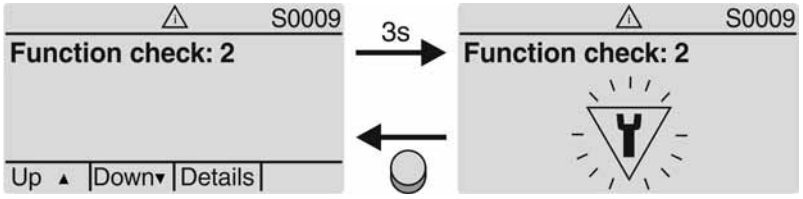
Function check (S0009)

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

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

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

Figure 46: Function check



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

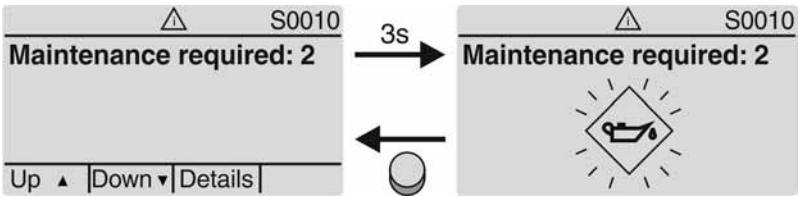
Maintenance required (S0010)

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

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

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

Figure 47: Maintenance required



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

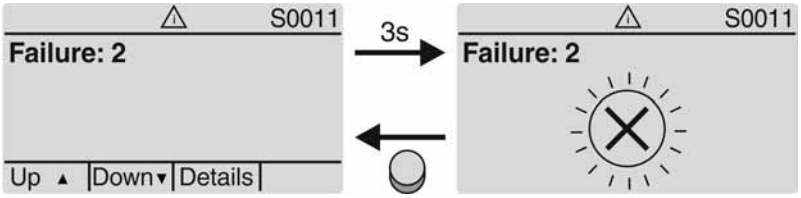
Failure (S0011)

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

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

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

Figure 48: Failure



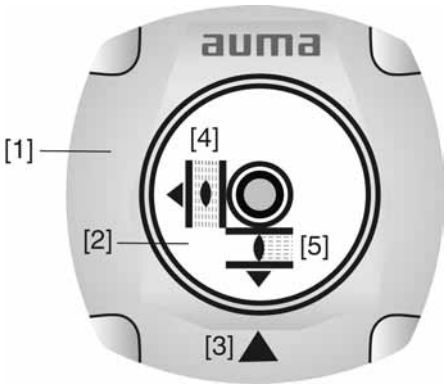
For further information, please also refer to <Corrective action>.

7.3. Mechanical position indicator/running indication

Mechanical position indicator:

- Continuously indicates the valve position
  (For a swing angle of 90°, the indicator disc [2] rotates by approximately 180°.)
- Indicates whether the actuator is running (running indication)
- Indicates that the end positions are reached (via indicator mark [3])

Figure 49: Mechanical position indicator



[1] Cover
[2] Indicator disc
[3] Mark
[4] Symbol for position OPEN
[5] Symbol for position CLOSED

7.4. Indication lights

Figure 50: Arrangement and signification of indication lights

[1] Marking with symbols (standard)

[2] Marking with figures 1 – 6 (option)

1 End position CLOSED reached (blinking: for operation in direction CLOSE)

2 Tc Torque fault CLOSE

3 Motor protection tripped

4 To Torque fault OPEN

5 End position OPEN reached (blinking: for operation in direction OPEN)

6 Bluetooth connection

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

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

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

8. Signals

8.1. Status signals via output contacts (digital outputs)

Characteristics

Output contacts are used to send status signals (e.g. reaching the end positions, selector switch position, faults...) as binary signals to the control room.

Status signals only have two states: active or inactive. Active means that the conditions for the signal are fulfilled.

8.1.1. Assignment of outputs

The output contacts (outputs DOUT 1 – 12) can be assigned to various signals.

Required user level: Specialist (4) or higher.

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

Default values:

Signal DOUT 1 = Fault
Signal DOUT 2 = End position CLOSED
Signal DOUT 3 = End position OPEN
Signal DOUT 4 = Selector sw. REMOTE
Signal DOUT 5 = Torque fault CLOSE
Signal DOUT 6 = Torque fault OPEN
Signal DOUT 7 = End position CLOSED
Signal DOUT 8 = End position OPEN
Signal DOUT 9 = Selector sw. REMOTE
Signal DOUT 10 = Torque fault CLOSE
Signal DOUT 11 = Torque fault OPEN
Signal DOUT 12 = Fault

8.1.2. Encoding of outputs

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

- High active = output contact closed = signal active
- Low active = output contact open = signal active

Required user level: Specialist (4) or higher.

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

Default values for DOUT 1 – 12: High active

8.2. Analogue signals

— (Option) —

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

Valve position

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

Designation in the wiring diagram:

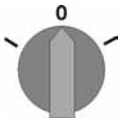
ANOUT1 (position)

ANOUT2 (position)

For further information on this topic, please refer to Manual (Operation and setting).

9. Commissioning (basic settings)

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



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

2. Switch on the power supply.

   Information: Please consider the heat-up time for ambient temperatures below –20 °C.

3. Perform basic settings.

9.1. End stops in part-turn actuator

The internal end stops limit the swing angle. They protect the valve in the event of limit switching failure.

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

⚠ CAUTION

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

Pinching and damage by valve or actuator.

→ End stops should be set by suitably qualified personnel only.

→ Never completely remove the setting screws [2] and [4] to avoid grease leakage.

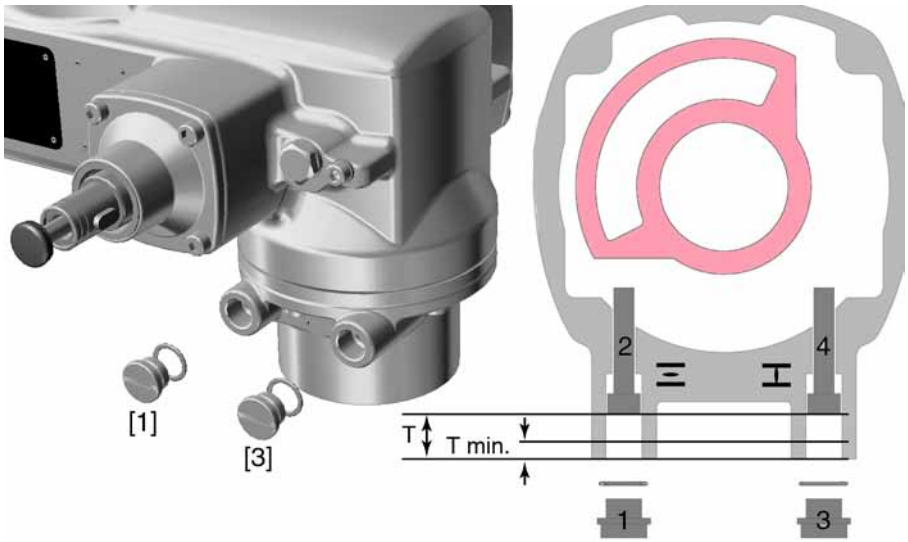
→ Observe dimension $T_{min.}$

Information

- The swing angle set in the factory is indicated on the name plate:

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

Figure 51: End stop



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

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

9.1.1. End stop CLOSED: set

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

4. Turn setting screw [4] clockwise to the stop.

➥ This completes the setting of end stop CLOSED.

5. Check O-ring in screw plug and replace if damaged.
6. Fasten and tighten screw plug [3].

Having completed this procedure, the end position detection CLOSED can be set immediately.

9.1.2. End stop OPEN: set

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

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

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

4. Turn setting screw [2] clockwise to the stop.

➥ This completes the setting of end stop OPEN.

5. Check O-ring in screw plug and replace if damaged.
6. Fasten and tighten screw plug [1].

Having completed this procedure, the end position detection OPEN can be set immediately.

9.2. Type of seating: set

NOTICE

Valve damage due to incorrect setting!

→ The type of seating must suit the valve.

→ Only change the setting with the consent of the valve manufacturer.

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

Default value: Limit

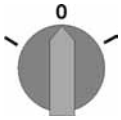
Setting values:

Limit — Seating in end positions via limit switching.

Torque — Seating in end positions via torque switching.

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display...

Select parameter

3. Select parameter either:
   → click via the menu M ▷ to parameter, or
   → via direct display: press ▲ and enter ID M0086 or M0087

➥ Display indicates: End position CLOSED

CLOSE or OPEN

4. Use ▲▼ Up ▲ Down ▼ to select:
   → ▸ End position CLOSED
   → ▸ End position OPEN

➥ The black triangle ▸ indicates the current selection.

5. Press ↵ Ok.
➥ Display indicates the current setting: Limit or Torque
➥ The bottom row of the display indicates either:
- Edit → continue with step 6
- Save → continue with step 10
6. Press ↵ Edit.
➥ Display indicates: ▸ Specialist (4)

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).
➥ The screen indicates the pre-set type of seating (▸ Limit or ▸ Torque) by means of a black triangle ▸.

Change settings

10. Select new setting ▲▼ Up ▲ Down ▼ resulting in the following significations:
➥ The symbols have the following meaning:
- black triangle: ▸ = current setting
- white triangle: ▹ = selection (not saved yet)
11. Confirm selection via ↵ Save.
➥ The setting for the type of seating is complete.
12. Back to step 4 (CLOSED or OPEN): Press↵ Esc .

9.3. Switch compartment: open

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

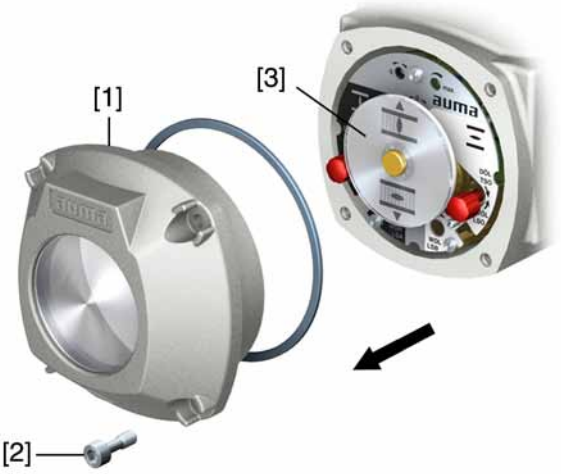
⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

→ Before opening, ensure that there is no explosive gas and no voltage.
→ Handle cover and housing parts with care.
→ Joint surfaces must not be damaged or soiled in any way.
→ Do not jam cover during fitting.

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



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

9.4. Torque switching: set

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

Information The torque switches may also trip during manual operation.

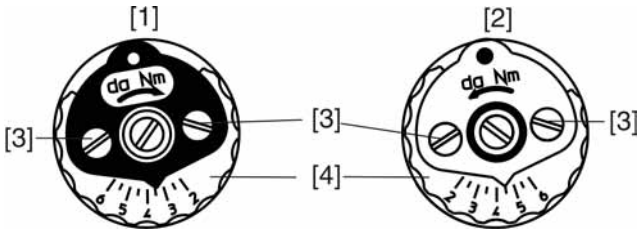
NOTICE

Valve damage due to excessive tripping torque limit setting!

→ The tripping torque must suit the valve.

→ Only change the setting with the consent of the valve manufacturer.

Figure 52: Torque switching heads



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

1. Loosen both lock screws [3] at the indicator disc.

2. Turn torque dial [4] to set the required torque (1 da Nm = 10 Nm).
3. Fasten lock screws [3] again.
   Information: Maximum tightening torque: 0.3 – 0.4 Nm

➥ The torque switch setting is complete.

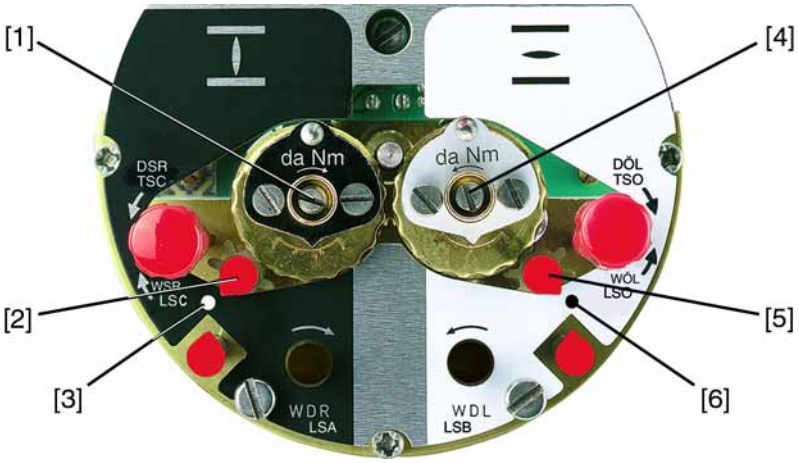
Example: The figure above shows the following settings:

- 3.5 da Nm = 35 Nm for direction CLOSE
- 4.5 da Nm = 45 Nm for direction OPEN

9.5. Limit switching: set

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

Figure 53: Setting elements for limit switching



Black section:

[1] Setting spindle: End position CLOSED
[2] Pointer: End position CLOSED
[3] Mark: End position CLOSED is set

White section:

[4] Setting spindle: End position OPEN
[5] Pointer: End position OPEN
[6] Mark: End position OPEN is set

9.5.1. End position CLOSED (black section): set

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

➥ The end position CLOSED setting is complete.

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

9.5.2. End position OPEN (white section): set

1. Engage manual operation.
2. Turn handwheel counterclockwise until valve is open.

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

➥ The end position OPEN setting is complete.

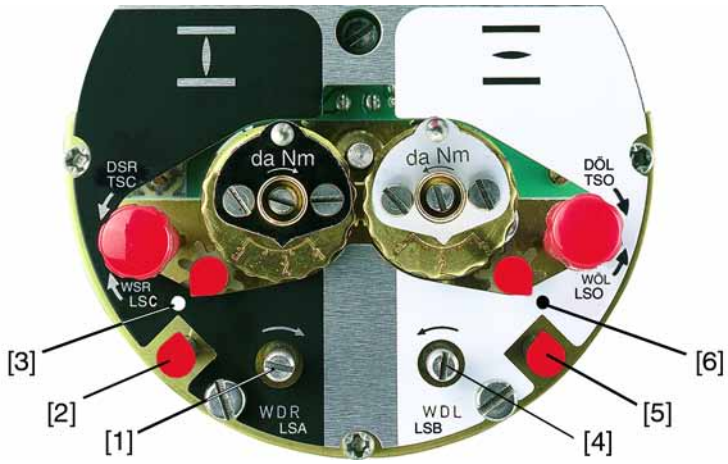
7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.6. Intermediate positions: set

— Option —

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

Figure 54: Setting elements for limit switching



Black section:

[1] Setting spindle: Running direction CLOSE

[2] Pointer: Running direction CLOSE

[3] Mark: Intermediate position CLOSED is set

White section:

[4] Setting spindle: Running direction OPEN

[5] Pointer: Running direction OPEN

[6] Mark: Intermediate position OPEN is set

9.6.1. Running direction CLOSE (black section): set

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

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

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

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

9.6.2. Running direction OPEN (white section): set

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

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

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

9.7. Test run

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

9.7.1. Direction of rotation: check

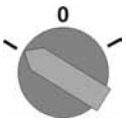
1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Switch on actuator in direction CLOSE and observe the direction of rotation on the indicator disc.

   → Switch off before reaching the end position.

➥ The direction of rotation is correct if **actuator runs in direction CLOSE** and **indicator disc turns counterclockwise**.

9.7.2. Limit switching: check

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



2. Operate actuator using push buttons OPEN, STOP, CLOSE.

➥ The limit switching is set correctly if (default indication):

- the yellow indication light/LED1 is illuminated in end position CLOSED
- the green indication light/LED5 is illuminated in end position OPEN
- the indication lights go out after travelling into opposite direction.

➥ The limit switching is set incorrectly if:

- the actuator comes to a standstill before reaching the end position
- one of the red indication lights/LEDs is illuminated (torque fault)
- the status indication S0007 in the display signals a fault.

3. If the end position setting is incorrect: Reset limit switching.
4. If the end position setting is correct and no options (e.g. potentiometer, position transmitter) are available: Close switch compartment.

9.7.3. Reference operation position feedback: perform

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

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

9.8. Potentiometer setting

— Option —

The potentiometer as travel sensor records the valve position.

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

Figure 55: View of control unit

[1] Potentiometer

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

➥ End position CLOSED corresponds to 0 %

➥ End position OPEN corresponds to 100 %

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

9.9. Electronic position transmitter RWG: set

— Option —

The electronic position transmitter RWG records the valve position. On the basis of the actual position value measured by the potentiometer (travel sensor), it generates a current signal between 0 – 20 mA or 4 – 20 mA.

Table 12: Technical data RWG 4020

Wiring		3-wire or 4-wire system
Terminal plan	TPA	9th position = E or H
Output current	I_A	0 – 20 mA, 4 – 20 mA
Power supply	U_V	24 V DC, ±15 % smoothed
Max. current consumption	I	24 mA at 20 mA output current
Max. load	R_B	600 Ω

Figure 56: View of control unit

[1] Potentiometer (travel sensor)
[2] Potentiometer min. (0/4 mA)
[3] Potentiometer max. (20 mA)
[4] Measuring point (+) 0/4 – 20 mA
[5] Measuring point (–) 0/4 – 20 mA

1. Connect voltage to electronic position transmitter.
2. Move valve to end position CLOSED.
3. Connect ammeter for 0 – 20 mA to measuring points [4 and 5].
4. Turn potentiometer [1] clockwise to the stop.
5. Turn potentiometer [1] slightly in opposite direction.
6. Turn potentiometer [2] clockwise until output current starts to increase.
7. Turn potentiometer [2] in opposite direction until the following value is reached:

- for 0 – 20 mA approx. 0.1 mA
- for 4 – 20 mA approx. 4.1 mA

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

8. Move valve to end position OPEN.
9. Set potentiometer [3] to end value 20 mA.
10. Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.

9.10. Mechanical position indicator: set

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

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

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

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

9.11. Switch compartment: close

NOTICE

Danger of corrosion due to damage to paint finish!

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

1. Clean sealing faces of housing and cover.
2. Preserve joint surfaces with an acid-free corrosion protection agent.
3. Check whether O-ring [3] is in good condition, replace if damaged.
4. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

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

10. Corrective action

10.1. Faults during commissioning

Table 13: Faults during commissioning

Fault description	Possible causes	Remedy
Mechanical position indicator cannot be set.	Reduction gearing is not suitable for turns/stroke of the actuator.	Exchange reduction gearing.
Fault in end position Actuator runs to end stop although the limit switches work properly.	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 controls.	Determine overrun: Overrun = travel covered from switching off until complete standstill. Set limit switching again considering the overrun (turn handwheel back by the amount of the overrun).
Limit and/or torque switches do not trip.	Switch is defective or switch setting is incorrect.	Check setting, if required, reset end positions. → **Check switches** and replace them, if required.

Switch check

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

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

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

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

10.2. Fault indications and warning indications

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

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

Collective signals include further indications which can be displayed via the ↵ Details push button.

Table 14: Faults and warnings via status indications in the display

Indication on display	Description/cause	For indicated value > 0:
Warnings S0005	Collective signal 02: Indicates the number of active warnings.	Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
Not ready REMOTE S0006	Collective signal 04: Indicates the number of active signals.	Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
Fault S0007	Collective signal 03: Indicates the number of active faults. The actuator cannot be operated.	Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.
Out of specification S0008	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions.	Press push button ↵ Details. For details refer to <Warnings and Out of specification> table.

Indication on display	Description/cause	For indicated value > 0:
Function check S0009	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.	Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
Maintenance required S0010	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.	Press push button ↵ Details to display a list of detailed indications.
Failure S0011	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid	Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.

Table 15: 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.
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.
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 on time running	Warning on time max. running time/h exceeded	• Check modulating behaviour of actuator. • Check parameter Perm. running time/h M0356, re-set if required.
Wrn on time starts	Warning on time max. number of motor starts (starts) exceeded	• Check modulating behaviour of actuator. • Check parameter Permissible starts/h M0357, re-set if required.
Failure behav. active	The failure behaviour is active since all required setpoints and actual values are incorrect.	Verify signals: • Setpoint E1 • Actual value E2 • Actual process value E4
Wrn input AIN 1	Warning: Loss of signal analogue input 1	Check wiring.
Wrn input AIN 2	Warning: Loss of signal analogue input 2	Check wiring.
Wrn setpoint position	Warning: Loss of signal of actuator setpoint position Possible causes: Input signal for setpoint = 0 (signal loss)	Check setpoint signal.
Op. time warning	The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED.	The warning indications are automatically cleared once a new operation command is executed. • Check valve. • Check parameter Perm.op. time, manual M0570.
Wrn controls temp.	Temperature within controls housing too high	Measure/reduce ambient temperature.
Wrn motor temp.	Temperature within motor winding too high	Check actuator sizing, correct accordingly.
Wrn gearbox temp.	Temperature within actuator gear housing too high	Check actuator sizing, correct accordingly.
RTC not set	Real time clock has not yet been set.	Set time.
RTC button cell	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).

Indication on display	Description/cause	Remedy
PVST abort	Partial Valve Stroke Test (PVST) was aborted or could not be started.	Perform RESET or restart PVST.
Wrn no reaction	No actuator reaction to operation commands within the set reaction time.	• Check movement at actuator. • Check parameter Reaction time M0634.
Wrn FOC	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	Warning: FO cable system reserve reached (critical or permissible Rx receive level)	Check/repair FO cables.
Wrn FOC connection	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 OPEN M0768, re-set if required.
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769, re-set if required.

Table 16: 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.
Config. error REMOTE	Collective signal 22: Configuration error has occurred.	Press push button ↵ Details to display a list of individual indications.
Internal error	Collective signal 14: Internal error has occurred.	AUMA service Press push button ↵ Details to display a list of individual indications.
Torque fault CLOSE	Torque fault in direction CLOSE	Perform one of the following measures: • Issue operation command in direction OPEN. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.
Torque fault OPEN	Torque fault in direction OPEN	Perform one of the following measures: • Issue operation command in direction CLOSE. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.
Phase fault	• When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.	Test/connect phases.
Incorrect phase seq	The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system.	Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases.
Mains quality	Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring.	• Check mains voltage. • Check parameter Tripping time M0172, extend time frame if required.

Indication on display	Description/cause	Remedy
Thermal fault	Motor protection tripped	• Cool down, wait. • If the fault indication display persists after cooling down: - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. • Check fuses.
Fault no reaction	No actuator reaction to operation commands within the set reaction time.	Check movement at actuator.

Table 17: Not ready REMOTE and Function check (collective signal 04)

Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: • Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SETPOINT operation simultaneously) • A setpoint is present and the positioner is not active • For fieldbus: Setpoint exceeds 100.0 %	• Check operation commands (send one operation command only). • Set parameter Positioner to Function active. • Check setpoint. Press push button ↵ Details to display a list of individual indications.
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 service software AUMA CDT.	Exit service software.
Disabled	Actuator is in operation mode Disabled.	Check setting and status of function <Local controls enable>.
EMCY stop active	The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected.	• Enable EMERGENCY stop switch. • Reset EMERGENCY stop state by means of Reset command.
EMCY behav. active	Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input.	• Detect cause for EMERGENCY signal. • Verify failure source. • Apply +24 V DC at EMERGENCY input.
I/O interface	The actuator is controlled via the I/O interface (parallel).	Check I/O interface.
Handwheel active	Manual operation is activated.	Start motor operation.
Interlock	An interlock is active.	Check interlock signal.
Interlock by-pass	By-pass function is interlocked.	Check states of main and by-pass valve.
PVST active	Partial Valve Stroke Test (PVST) is active.	Wait until PVST function is complete.

10.3. Fuses

10.3.1. Fuses within the actuator controls

Fuses used

F1/F2 Primary fuses on power supply unit

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

F3 Internal 24 V DC supply

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

F4 Internal 24 V AC supply (115 V AC) for:

- Heater, switch compartment, reversing contactors control
- PTC tripping device
- for 115 V AC also control inputs OPEN - STOP - CLOSE

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

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

Replace fuses F1/F2

Information Only valid for version with electrical connection of KES type.

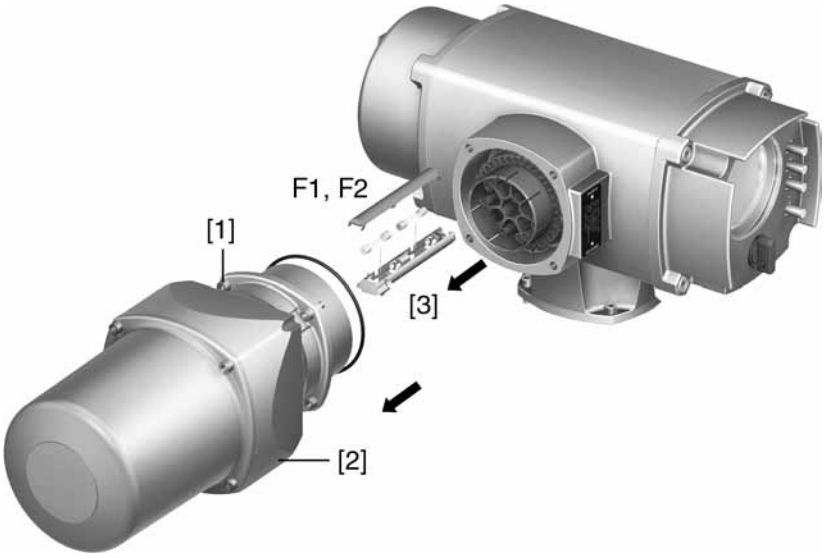
DANGER

Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

1. Loosen screws [1] and remove plug/socket connector [2].

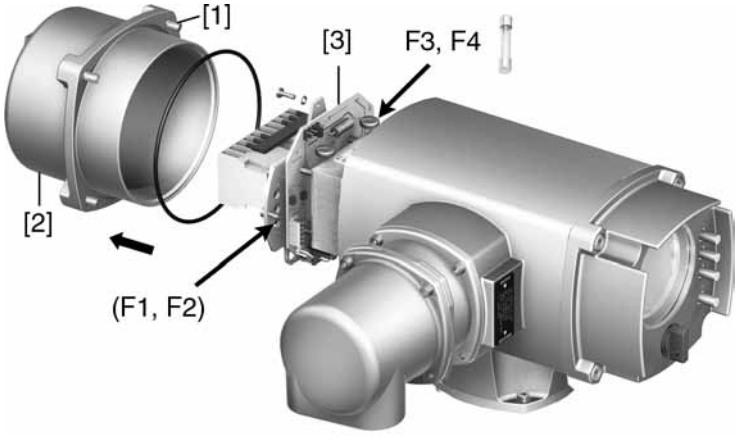


2. Pull fuse holder [3] out of pin carrier, open fuse cover and replace old fuses by new ones.

Fuses F3/F4 (F1/F2): test /replace

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

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



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

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

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

NOTICE

Cable damage due to pinching!

Risk of functional failures.

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

10.3.2. Motor protection (thermal monitoring)

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

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

- LED 3 (thermal fault) on the local controls is illuminated.
- Status indication S0007 displays a fault. The fault Thermoswitch is displayed when selecting Details.

The motor has to cool down before the operation can be resumed. Depending on the parameter setting, the fault signal is either automatically reset or the fault signal has to be reset using the push button **Reset** in selector switch position LOCAL.

For further information to this topic, please refer to Manual (Operation and setting).

11. Servicing and maintenance

CAUTION

Damage caused by inappropriate maintenance!

→ Servicing and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or the contractor of the plant. Therefore, we recommend contacting our service.

→ Only perform servicing and maintenance tasks when the device is switched off.

AUMA Service & Support

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

11.1. Preventive measures for servicing and safe operation

The following measures are required to ensure safe device operation:

6 months after commissioning and then every year

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

For enclosure protection IP68

After continuous immersion:

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

11.2. Disconnection from the mains

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

WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

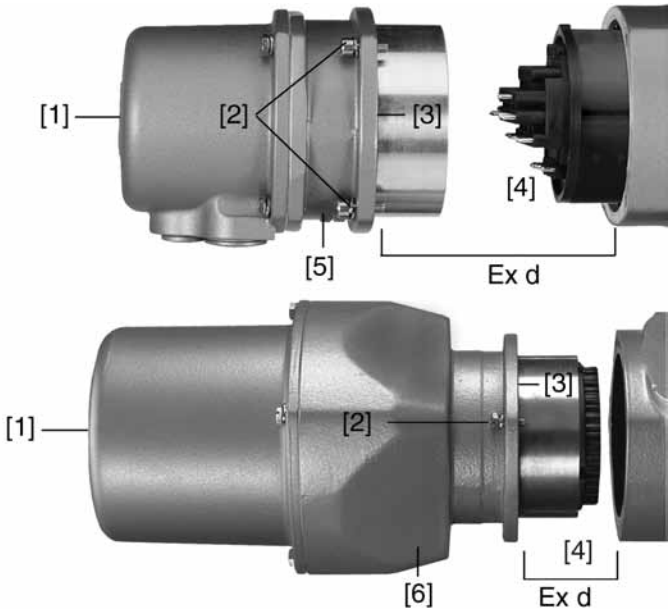
→ Before opening, ensure that there is no explosive gas and no voltage.

→ Handle cover and housing parts with care.

→ Joint surfaces must not be damaged or soiled in any way.

→ Do not jam cover during fitting.

Figure 57: top: KP/KPH, bottom: KES



[1] Cover
[2] Screws for housing
[3] O-ring
[4] Terminal compartment
[5] Terminal board (KP, KPH)
[6] Frame (KES)

Removing the plug:

1. Loosen the screws [2].
2. Remove plug/socket connector.

➥ Hereby, cover [1] and terminal board [5] or frame [6] remain together.

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

Fitting the plug:

4. Clean sealing faces at the cover and the 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 plug/socket connector and fasten screws evenly crosswise.

11.3. Maintenance

Maintenance intervals

After 3 years at the latest for Ex certified products.

Lubrication

- In the factory, the gear housing is filled with grease.
- 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 rarely (open-close duty).
- We recommend exchanging the seals when changing the grease.
- No additional lubrication of the gear housing is required during operation.

Notes regarding the maintenance

- Perform visual inspection of actuator. Ensure that no outside damage or changes are visible.
- Electrical connection cables must be placed properly and in perfect condition.
- Thoroughly touch up any possible damage to painting to prevent corrosion. Original paint in small quantities can be supplied by AUMA.

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

11.4. Disposal and recycling

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

- electronic scrap
- various metals
- plastics
- greases and oils

The following generally applies:

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

12. Technical data

Information The following technical data includes standard and optional features. For detailed information on the customer-specific version, refer to the order-relevant data sheet. This data sheet can be downloaded from the Internet at **http://www.auma.com** in German and English (indication of commission number required).

12.1. Features and functions of actuator

Explosion protection	Standard version (ATEX): • II2G Ex de IIC T4 (T3) Gb • II2G c IIC T4 (T3) • II2D Ex tb IIIC T130 °C (T190 °C) Db IP6x Standard version (IECEx): • Ex de IIC T4 (T3) Gb • Ex tb IIIC T130°C (T190 °C) Db IP6x For actual version, refer to actuator name plate.
Ex certificates	DEKRA 13 ATEX 0016 X IECEx DEK 12.0080X
Type of protection	• Ex **d** flameproof enclosure: - Motor compartment - Switch compartment - Controls housing - Terminal compartment (for electrical connection: KES-Exd) • Ex **e** increased safety: - Terminal compartment (for electrical connection: KP, KPH or KES) • **c** constructional safety: - Gear housing
Type of duty[1)]	• SQEx: Short-time duty S2 - 15 min • SQREx: Intermittent duty S4 - 25 %
Torque range	Refer to actuator name plate
Operating time for 90°	Refer to actuator name plate
Motor	Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC/EN 60034 Part 1
Motor voltage and frequency	Refer to motor name plate Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 %
Insulation class	Standard: F, tropicalized Option: H, tropicalized
Motor protection	Standard: PTC thermistors (according to DIN 44082) Option: Thermoswitches (NC) in the actuator and in the thermal overload relay of controls
Motor heater (option)	Voltages: 110 – 120 V AC, 220 – 240 V AC or 400 V AC (externally supplied) Power depending on the size 12.5 – 25 W
Swing angle	Standard: Adjustable between 75° and < 105° Options: 15° to < 45°, 45° to < 75°, 105° to < 135°
Self-locking	Self-locking 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
Indication for manual operation (option)	Indication whether manual operation is active/not active via switch (1 change-over contact)
Connection to controls	AUMA plug/socket connector with screw-type connection
Coupling	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

Electromechanical control unit	
Limit switching	Counter gear mechanism for end positions CLOSED and OPEN Standard: Single switches (1 NC and 1 NO; not galvanically isolated) for each end position Options: • Tandem switches (2 NC and 2 NO) for each end position, switches galvanically isolated • Triple switches (3 NC and 3 NO) for each end position, switches galvanically isolated • Intermediate position switch (DUO limit switching), adjustable for any position
Torque switching	Torque switching adjustable for directions OPEN and CLOSE Standard: Single switch (1 NC and 1 NO) for each direction, switches not galvanically isolated Options: Tandem switches (2 NC and 2 NO) for each direction, switches galvanically isolated
Position feedback signal, analogue (option)	Potentiometer or 0/4 – 20 mA (RWG)
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Heater in switch compartment	Standard: Resistance type heater, 5 W, 24 V AC, (internal supply)

1) For nominal voltage and 40 °C ambient temperature and an average load with running torque or modulating torque according to separate technical data. The type of duty must not be exceeded.

Technical data for limit and torque switches	
Mechanical lifetime	2 x 10^6 starts
Silver plated contacts:	
U min.	30 V AC/DC
U max.	250 V AC/DC
I min.	20 mA
I max. AC current	5 A at 250 V (resistive load) 3 A at 250 V (inductive load, cos phi = 0.6)
I max. DC current	0.4 A at 250 V (resistive load) 0.03 A at 250 V (inductive load, L/R = 3 µs) 7 A at 30 V (resistive load) 5 A at 30 V (inductive load, L/R = 3 µs)
Gold plated contacts:	
U min.	5 V
U max.	30 V
I min.	4 mA
I max.	400 mA

Technical data for blinker transmitter	
Mechanical lifetime	10^7 starts
Silver plated contacts:	
U min.	10 V AC/DC
U max.	250 V AC/DC
I max. AC current	3 A at 250 V (resistive load) 2 A at 250 V (inductive load, cos phi ≈ 0.8)
I max. DC current	0.25 A at 250 V (resistive load)

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

12.2. Features and functions of actuator controls

Power supply Mains frequency	For mains voltage and mains frequency, refer to name plates at the controls and the motor Permissible variation of the mains voltage: ±10 % Permissible variation of the mains frequency: ±5 % Option: Permissible variation of the mains voltage: ±30 %
External supply of the electronics (option)	24 V DC +20 % / –15 % Current consumption: Basic version approx. 250 mA, with options up to 500 mA The external power supply must have a reinforced insulation against the mains voltage in accordance with IEC 61010-1 and may only be supplied by a circuit limited to 150 VA in accordance with IEC 61010-1.
Current consumption	Current consumption of the controls depending on the mains voltage: For permissible variation of mains voltage by ±10 %: • 100 to 120 V AC = max. 740 mA • 208 to 240 V AC = max. 400 mA • 380 to 500 V AC = max. 250 mA • 515 to 690 V AC = max. 200 mA For permissible variation of mains voltage by ±30 %: • 100 to 120 V AC = max. 1,200 mA • 208 to 240 V AC = max. 750 mA • 380 to 500 V AC = max. 400 mA • 515 to 690 V AC = max. 400 mA Motor current consumption: Refer to motor name plate
Overvoltage category	Category III according to IEC 60364-4-443
Rated power	The controls are designed for the rated motor power, refer to motor name plate
Switchgear[1) 2)]	Standard: Reversing contactors (mechanically and electrically interlocked) for motor power up to power class A1 Options: • Thyristor unit for mains voltage up to 500 V AC (recommended for modulating actuators) for AUMA power class B1
Control	Standard: Via digital inputs OPEN, STOP, CLOSE, EMERGENCY (via opto-isolator, OPEN, STOP, CLOSE with one common), respect minimum pulse duration for modulating actuators Option: Additional enable inputs for directions OPEN and CLOSE
Voltage and current values for control inputs[3)]	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 110 V DC, current consumption: approx. 8 mA per input 115 V DC, current consumption: approx. 15 mA per input 115 V AC, current consumption: approx. 15 mA per input

Status signals	Standard: 6 programmable output contacts: • 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) - Default configuration: End position CLOSED, end position OPEN, selector switch in 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) Options: 6 programmable output contacts: • 5 change-over contacts with one common, max. 250 V AC, 5 A (resistive load) • 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) 12 programmable output contacts:[4)] • 10 potential-free NO contacts, one common for respectively 5 contacts, max. 250 V AC, 1 A (resistive load) • 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load) 6 programmable output contacts: • 6 potential-free change-over contacts **without** one common, per contact max. 250 V AC, 5 A (resistive load) 10 programmable output contacts:[4)] • 10 potential-free change-over contacts **without** one common, per contact max. 250 V AC, 5 A (resistive load) All output signals must be supplied with the same potential.
Position feedback signal	Galvanically isolated analogue output E2 = 0/4 – 20 mA (load max. 500 Ω)
Voltage output	Standard: Auxiliary voltage 24 V DC, max. 100 mA for supply of the control inputs, galvanically isolated from internal voltage supply Option: Auxiliary voltage 115 V AC, max. 30 mA to supply the control inputs[5)], galvanically isolated from internal voltage supply
Local controls	Standard: • Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET • 6 indication lights: - End position CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue) • Graphic LC display, illuminated Options: • Special colours for the 5 indication lights: - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (white), end position OPEN (red)
Bluetooth Communication interface	Bluetooth class II chip, version 2.0 with a range up to 10 m in industrial environments. Supports the SPP Bluetooth profile (Serial Port Profile). Programming software: AUMA CDT, commissioning and diagnostic tool for windows based PCs, PDAs and smart phones

Application functions	Standard: • Switch-off mode adjustable - Limit or torque seating for end position OPEN and end position CLOSED • Torque by-pass, adjustable up to 5 seconds (no torque monitoring during this time) • Start and end of stepping mode as well as ON and OFF time (1 up to 1,800 seconds) can be programmed individually for directions OPEN and CLOSE. • Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable Options: • Positioner - Position setpoint via analogue input E1 = 0/4 – 20 mA - Automatic adaptation of the dead band (adaptive behaviour can be selected) - Split Range operation - MODE input for selecting between OPEN - CLOSE duty and modulating duty
Failure functions	Standard: • EMERGENCY operation, behaviour programmable - Digital input low active, reaction can be selected: Stop, move to end position CLOSED, move to end position OPEN, move to intermediate position - Torque monitoring can be by-passed during EMERGENCY operation. Options: • Enabling local controls via digital input Enable LOCAL. Thus, the actuator operation can be enabled or disabled via push buttons on the local controls. • 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. • Interlock, enabling the operation commands OPEN or CLOSE via digital inputs Interlock OPEN or Interlock CLOSE
Monitoring functions	Standard: • Valve overload protection (adjustable), results in switching off and generates fault indication • Motor temperature monitoring (thermal monitoring), results in switching off and generates fault indication • Monitoring the heater within the 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 indication • Automatic correction of the direction of rotation upon wrong phase sequence (3-phase AC currrent)

Diagnostic functions	• Electronic device ID with order and product data • Logging of operating data: A resettable counter and a lifetime counter each for: - Motor running time, number of starts, torque switch trippings in end positions 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 setting, operation and fault history: - Status signals in compliance with NAMUR recommendation NE 107: "Failure", ”Function check", "Out of specification", "Maintenance required" • Torque characteristics - 3 torque characteristics (torque-travel characteristic) for opening and closing directions, can be saved separately. Torque characteristics stored can be shown on the display.
Electrical connection	Standard: Plug/socket connector with screw-type terminals (KP, KPH) Ex e (increased safety) and M-threads Options: • Plug/socket connector with terminal blocks (KES) Ex e (increased safety) • Plug/socket connector with terminal blocks (KES) Ex d (flameproof enclosure) • Pg-threads, NPT-threads, G-threads, special threads • Parking frame for wall mounting of the disconnected plug • Protection cover for plug compartment (when plug is removed)
Wiring diagram	Refer to name plate

1) The reversing contactors are designed for a lifetime of 2 million starts.
2) For the assignment of AUMA power classes, please refer to electrical data on actuator.
3) All input signals must be supplied with the same potential.
4) Not possible for low temperature versions with heating system
5) Not possible in combination with PTC tripping device

12.3. Service conditions

Use	Indoor and outdoor use permissible
Mounting position	Any position
Installation altitude	≤ 2,000 m above sea level for > 2,000 m above sea level, please contact AUMA
Humidity	Up to 100 % relative humidity over the entire permissible temperature range
Ambient temperature	Standard: • –40 °C to +60 °C For actual version, refer to actuator/controls name plate.
Enclosure protection according to EN 60529	Standard: IP68 with AUMA 3-phase AC motor/1-phase AC motor According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during continuous immersion • Modulating duty is not possible during continuous immersion. For enclosure protection IP68, the terminal compartment is additionally sealed against the interior – double sealed. For actual version, refer to actuator/controls name plate.
Pollution degree	Pollution degree 4 (when closed) according to EN 50178
Vibration resistance according to IEC 60068–2–6	1 g, from 10 to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this.

Corrosion protection	Standard: • KS: Suitable for installation in industrial units, in water or power plants with a low pollutant concentration as well as for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. wastewater treatments plants, chemical industry) Options: • KX: Suitable for installation in extremely aggressive atmospheres with high humidity and high pollutant concentration • KX-G : same as KX, however aluminium-free version (outer parts)
Finish coating	Powder coating
Colour	Standard: AUMA silver-grey (similar to RAL 7037)
Lifetime	AUMA part-turn actuators meet or even exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.
Weight	Refer to separate technical data

12.4. Accessories

Wall bracket[1)]	AUMATIC mounted separately from the actuator, including plug/socket connector. Connecting cables on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service
Programming software for PC	AUMA CDT

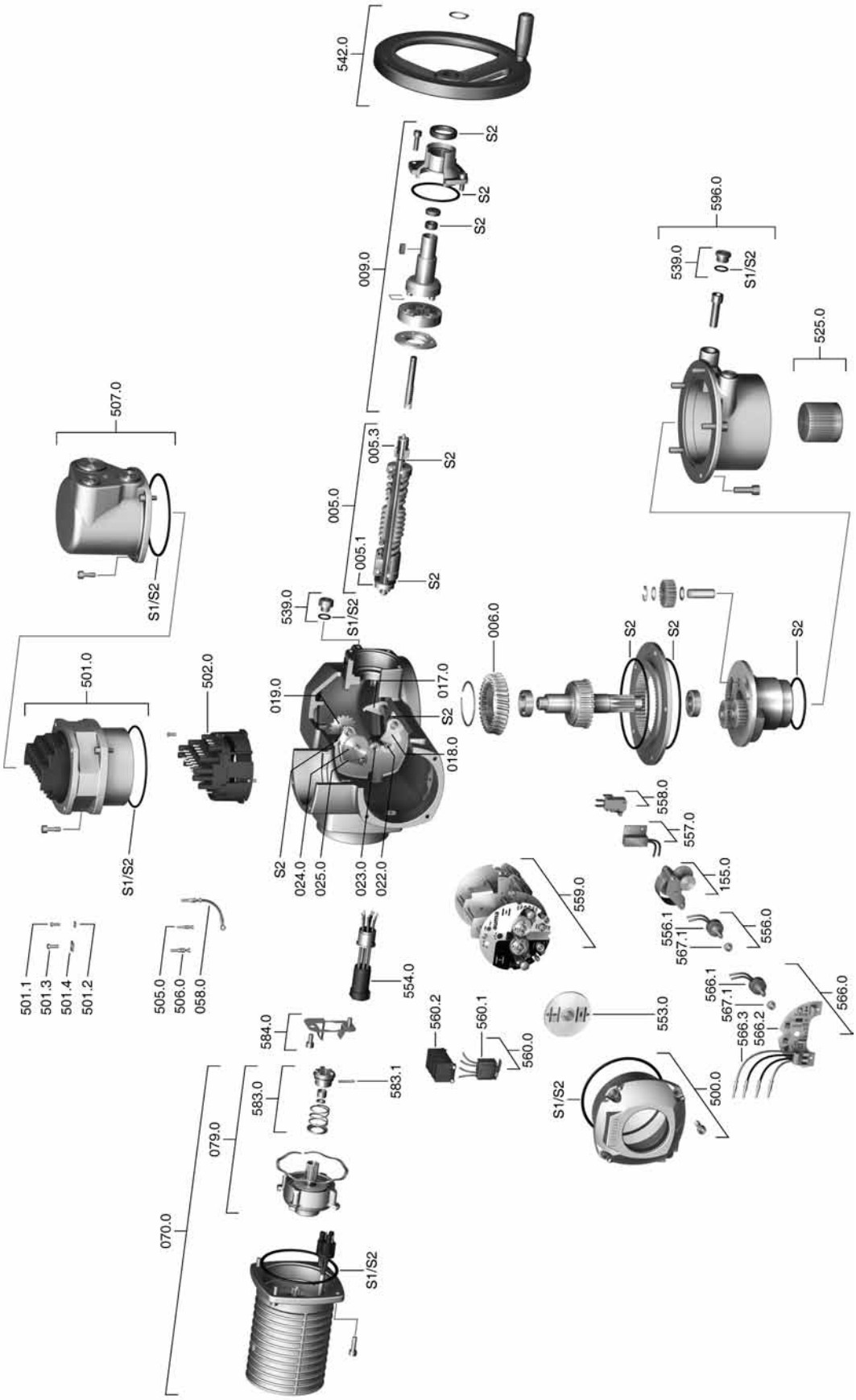
1) Cable length between actuator and AUMATIC max. 100 m. Not suitable for version with potentiometer in the actuator. Instead of the potentiometer, an RWG has to be used.

12.5. Further information

EU Directives	• ATEX Directive: (94/9/EC) • Electromagnetic Compatibility (EMC): (2004/108/EC) • Low Voltage Directive: (2006/95/EC) • Machinery Directive: (2006/42/EC)

13. Spare parts

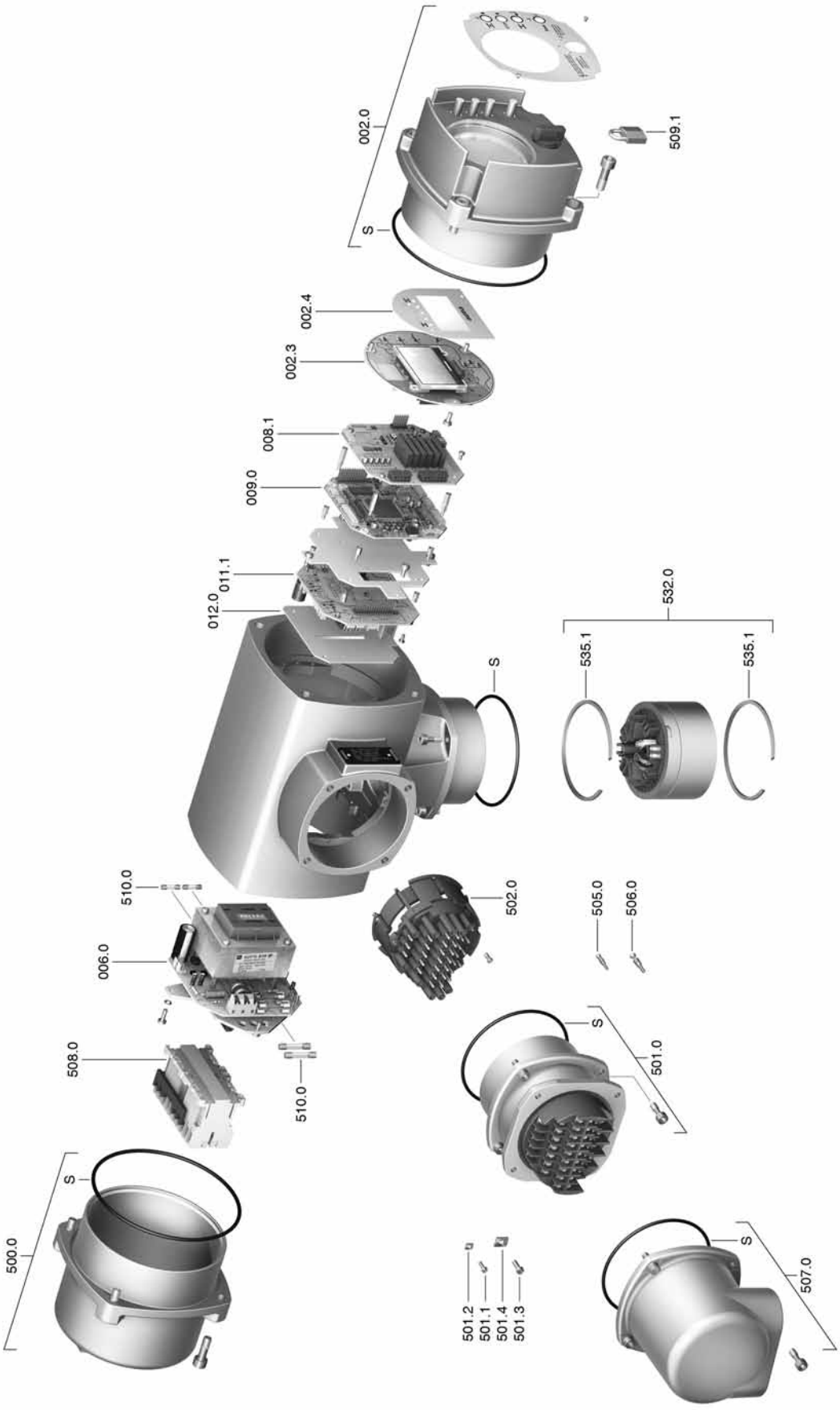
13.1. Part-turn actuator SQEx 05.2 – SQEx 14.2/SQREx 05.2 – SQREx 14.2 with Ex plug/socket connector and screw-type terminals (KP, KPH)



Information: Please state type and commission no. of the device (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. Delivered spare parts may slightly vary from the representation in these instructions.

No.	Designation	Type	No.	Designation	Type
005.0	Drive shaft	Sub-assembly	525.0	Coupling	Sub-assembly
005.1	Motor coupling	Sub-assembly	539.0	Screw plug	
005.3	Manual drive coupling	Sub-assembly	542.0	Handwheel with ball handle	Sub-assembly
006.0	Worm wheel		553.0	Mechanical position indicator	Sub-assembly
009.0	Planetary gearing for manual drive	Sub-assembly	554.0	Socket carrier for motor plug/ socket connector with cable harness	Sub-assembly
017.0	Torque lever	Sub-assembly	556.0	Potentiometer for position transmitter	Sub-assembly
018.0	Gear segment		556.1	Potentiometer without slip clutch	Sub-assembly
019.0	Crown wheel	Sub-assembly	557.0	Heater	Sub-assembly
022.0	Drive pinion II for torque switching		558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
023.0	Output drive wheel for limit switching	Sub-assembly	559.0	Control unit with torque switching heads and switches	Sub-assembly
024.0	Drive wheel for limit switching	Sub-assembly	559.0	Control unit with magnetic limit and torque transmitter (MWG) for Non-intrusive version in combination with AUMATIC integral controls	Sub-assembly
025.0	Locking plate	Sub-assembly	560.0	Switch stack for direction OPEN	Sub-assembly
058.0	Wire for protective earth	Sub-assembly	560.0	Switch stack for direction CLOSE	Sub-assembly
070.0	Motor (VD motor incl. ref. no. 079.0)	Sub-assembly	560.1	Switch for limit/torque	Sub-assembly
079.0	Planetary gear for motor drive (SQ 05.2 – 14.2 for VD motor)	Sub-assembly	560.2	Switch case	
155.0	Reduction gearing	Sub-assembly	566.0	Position transmitter RWG	Sub-assembly
500.0	Cover	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	Sub-assembly
501.0	Ex Ex plug/socket connector with screw-type terminals (KP, KPH)	Sub-assembly	566.2	Position transmitter board for RWG	Sub-assembly
501.1	Screw for control terminal	Sub-assembly	566.3	Wire harness for RWG	Sub-assembly
501.2	Washer for control terminal	Sub-assembly	567.1	Slip clutch for potentiometer	Sub-assembly
501.3	Screw for power terminal	Sub-assembly	583.0	Motor coupling on motor shaft	Sub-assembly
501.4	Washer for power terminal		583.1	Pin for motor coupling	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly	584.0	Retaining spring for motor coupling	
505.0	Pin for controls	Sub-assembly	596.0	Output drive flange with end stop	Sub-assembly
506.0	Pin for motor	Sub-assembly	S1	Seal kit, small	Set
507.0	Cover for electrical connection	Sub-assembly	S2	Seal kit, large	Set

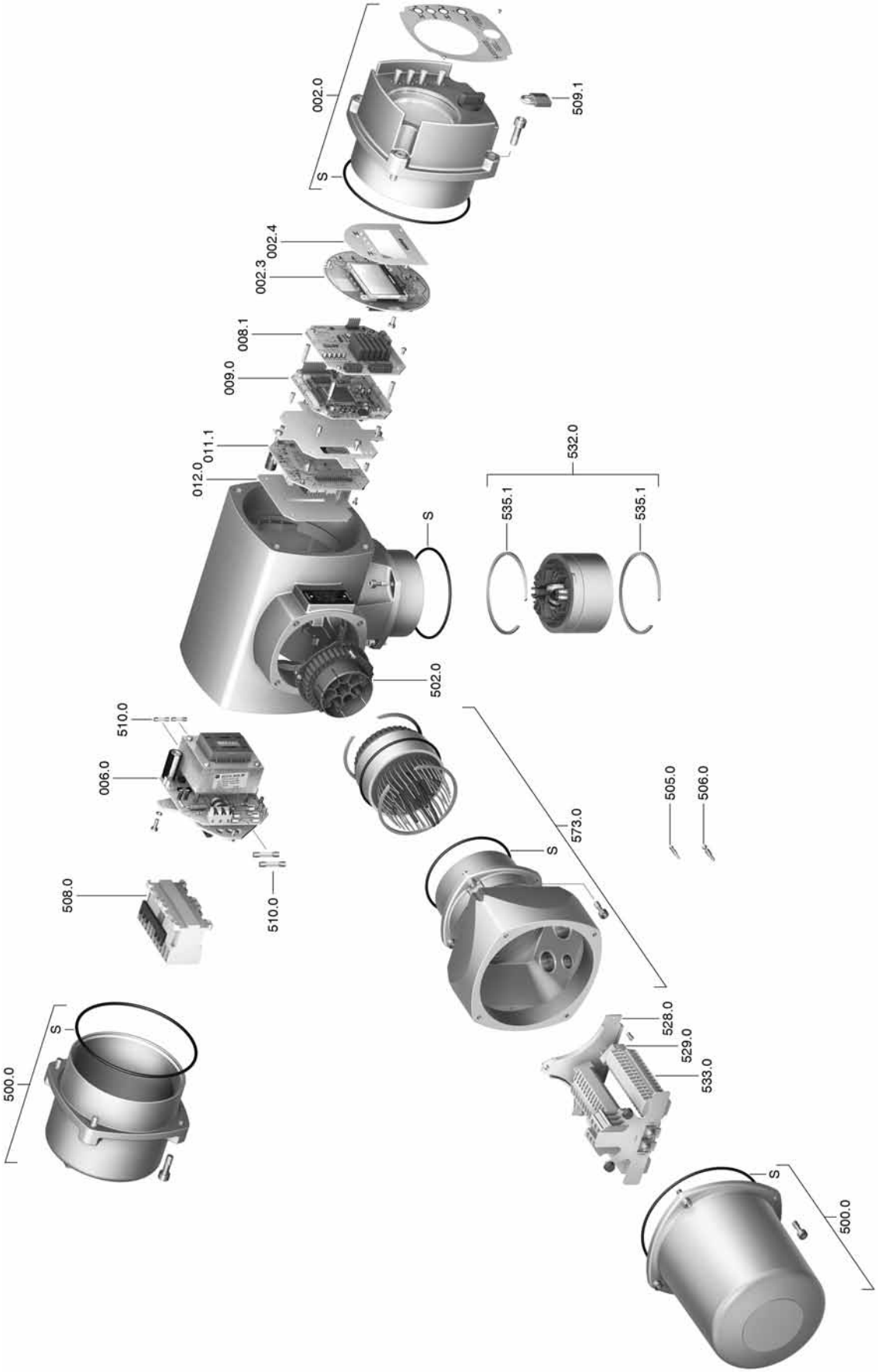
13.2. Actuator controls AUMATIC ACExC 01.2 with Ex plug/socket connector and screw-type terminals (KP, KPH)



Information: Please state type and commission no. of the device (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. Delivered spare parts may slightly vary from the representation in these instructions.

No.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	Sub-assembly
006.0	Power supply unit	Sub-assembly
008.1-1	I/O board	Sub-assembly
008.1-2	Fieldbus board	Sub-assembly
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.1	Option board	Sub-assembly
500.0	Cover	Sub-assembly
501.0	Terminal board	Sub-assembly
501.1	Screw for control terminal	
501.2	Washer for control terminal	
501.3	Screw for power terminal	
501.4	Washer for power terminal	
502.0	Pin carrier (without pins)	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Plug cover	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
510.0	Fuse kit	Sub-assembly
532.0	Cable conduit (actuator connection)	Sub-assembly
535.1	Circlip	
S	Seal kit	Set

13.3. Actuator controls AUMATIC ACExC 01.2 with Ex plug/socket connector and terminal blocks (KES)



Information: Please state type and commission no. of the device (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. Delivered spare parts may slightly vary from the representation in these instructions.

No.	Designation	Type
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	Sub-assembly
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008.1-1	I/O board	Sub-assembly
008.1-2	Fieldbus board	Sub-assembly
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.1	Option board	Sub-assembly
500.0	Cover	Sub-assembly
502.0	Pin carrier (without pins)	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
510.0	Fuse kit	Sub-assembly
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End piece	
532.0	Cable conduit (actuator connection)	Sub-assembly
533.0	Terminals for motor/controls	
535.1	Circlip	
573.0	Plug-in electrical connection	Sub-assembly
S	Seal kit	Set

14. Certificates

14.1. Declaration of Incorporation and EC Declaration of Conformity

AUMA Riester GmbH & Co. KG
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Fax +49 7631 809-1250
Riester@auma.com

auma®
Solutions for a world in motion

Original Declaration of Incorporation of Partly Completed Machinery (EC Directive 2006/42/EC) and EC Declaration of Conformity in compliance with the Directives on EMC, Low Voltage and Explosion Protection

for electric AUMA Actuators of the type ranges

Multi-turn actuators	**SAEx 07.2 – SAEx 16.2 and SAREx 07.2 – SAREx 16.2**
Part-turn actuators	**SQEx 05.2 – SQEx 14.2 and SQREx 05.2 – SQREx 14.2**

in versions **AUMA NORM**, **AUMA SEMIPACT**, **AUMA MATIC** or **AUMATIC**.

AUMA Riester GmbH & Co. KG as manufacturer declares herewith, that the above mentioned multi-turn and part-turn actuators meet the following basic requirements of the EC Machinery Directive 2006/42/EC: Annex I, articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4

The following harmonised standards within the meaning of the Machinery Directive have been applied:

EN ISO 12100: 2010 EN ISO 5211: 2001
EN ISO 5210: 1996

With regard to the partly completed machinery, the manufacturer commits to submitting the documents to the competent national authority via electronic transmission upon request. The relevant technical documentation pertaining to the machinery described in Annex VII, part B has been prepared.

AUMA multi-turn and part-turn actuators are designed to be installed on industrial valves. AUMA multi-turn and part-turn actuators must not be put into service until the final machinery into which they are to be incorporated has been declared in conformity with the provisions of the EC Directive 2006/42/EC.

Authorised person for documentation: Peter Malus, Aumastrasse 1, D-79379 Muellheim

As partly completed machinery, the multi-turn and part-turn actuators further comply with the requirements of the following directives and the respective approximation of national laws as well as the respective harmonised standards as listed below:

(1) Equipment and protective systems intended for use in potentially explosive atmospheres (94/9/EC)

EN 60079-0: 2012	EN 60079-11: 2012	EN 13463-1: 2009
EN 60079-1: 2007	EN 60079-31: 2009	EN 1127-1: 2011
EN 60079-7: 2007	EN 13463-5: 2011	

The EC type examination certificate DEKRA 11ATEX0008 X issued by the DEKRA Certification B.V. is available for the multi-turn actuators mentioned above.

The EC type examination certificate DEKRA 13ATEX0016 X issued by the DEKRA Certification B.V. is available for the part-turn actuators mentioned above.

(2) Directive relating to Electromagnetic Compatibility (EMC) (2004/108/EC)

EN 61000-6-4: 2007 / A1: 2011
EN 61000-6-2: 2005 / AC: 2005

(3) Low Voltage Directive (2006/95/EC)

EN 60204-1: 2006 / AC: 2010
EN 60034-1: 2010 / AC: 2010
EN 50178: 1997

Muellheim, 2014-01-01

H. Newerla, General Management

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

Y006.331/003/en

14.2. ATEX certificate

CERTIFICATE

EC-Type Examination

(1) EC-Type Examination

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

(3) EC-Type Examination Certificate Number: **DEKRA 13ATEX0016 X** Issue Number: **2**

(4) Equipment: **Part-Turn actuator, Types SQ.Ex 05.2 to SQ.Ex 14.2 in version AUMA NORM, AUMA SEMIPACT, AUMA MATIC or AUMATIC and wall bracket WH01.1**

(5) Manufacturer: **Auma Riester GmbH & Co. KG**

(6) Address: **Aumastraße 1, 79379 Müllheim, Germany**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report number NL/DEK/ExTR13.0014/**.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2009 **EN 60079-1 : 2007** **EN 60079-7 : 2007** **EN 60079-11 : 2007**
EN 60079-15 : 2005 **EN 60079-27 : 2006/2008** **EN 60079-31 : 2009**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 2 G **Ex d ...IIC T4 or T3 Gb**
II 2 (3) G **Ex d ... [... Gc] IIC T4 or T3 Gb**
II 2 D **Ex tb IIIC T130°C or T190°C Db IP6x**

This certificate is issued on 27 November 2013 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

DEKRA Certification B.V.

T. Pijpker
Certification Manager

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
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DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 13ATEX0016 X** Issue No. **2**

(15) **Description**

The Part-turn actuators, types SQ.Ex 05.2 to SQ.Ex 14.2 in version AUMA NORM comprise a motor, a switch mechanism compartment and a terminal compartment. Version AUMA SEMIPACT, AUMA MATIC and AUMATIC comprise a motor, a switch mechanism compartment, integral controls and a terminal compartment. The integral controls can be mounted on an explosion proof wall bracket type WH01.1.

The motor is in the type of protection Ex d. In order to guarantee the temperature class, the motor is equipped either with thermo switches and a thermal overload relay or with three PTC's integrated in each winding and a suitable electronic device for switching off in case of over temperature. The Part-turn actuators are classified for explosion group IIC and temperature class T4.

The switch mechanism compartment is in type of protection Ex d and may optionally also be provided with the position indicator type RWG5020.2Ex in the type of protection Ex ib.

The terminal compartment type KES-Exd is in type of protection Ex d. The alternative terminal compartments types KP, KPH and KES are in type of protection Ex e.

The integral controls are in type of protection Ex d.
The integral control type AUMATIC ACExC 01.1 may optionally be provided with a FNICO Fieldbus interface in type of protection Ex nL and/or a FISCO Fieldbus interface in the type of protection Ex ic.
The integral control type AUMATIC ACExC 01.2 may optionally be provided with a FISCO Fieldbus interface in the type of protection Ex ic.

The integral controls may optionally be installed on a wall-bracket type WH01.1. The electrical connection of the wall-bracket is in type of protection Ex e or in type of protection Ex d.

All Part-turn actuators are in type of protection Ex t Db for environments containing combustible dust substances.

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 13ATEX0016 X** Issue No. **2**

Type designation

Part-turn actuator:

SQ . Ex 05 . 2 - F05 / - a 3 a 1
I II III IV V VI VII VIII IX X XI

Designation	Explanation	Value	Explanation
I	General	SQ	Part-turn actuator
II	Duty	none R	short-time duty S2 xx min or Class A or Class B intermittent duty S4 xx % or Class C
III	Area classification	Ex	For use in environments containing flammable gas / vapour combustible dust substances
IV	Actuator size	05 07 10 12 14	Indicator for standardized actuator sizes
V	Design generation	2	Indicator for generation series
VI	Flange size	F***	Indicator for standardized flange sizes
VII	Blank	-	not used yet
VIII	Motor	a	Type 3ph VDX or SDX
IX	Terminal connection	3 4	Type KP or KPH or KES (Ex e) Type KES-Exd (Ex d)
X	Position transmitter	A b	without RWG5020.2Ex with RWG5020.2Ex (Ex i)
XI	Ex-Fieldbus	1 2 3	without Ex-Fieldbus with FNICO (Ex nL) with FISCO (Ex ic)

Optional integral controls:

AM ExC 01 . 1
I II III IV

Designation	Explanation	Value	Explanation
I	Controls indicator	AM AMB SEM AC	AUMA MATIC AUMA MATIC Basic AUMA SEMIPACT AUMATIC
II	Area classification	Ex	For use in environments containing flammable gas / vapour combustible dust substances.
III	Size	01	Indicator for standardized actuator sizes
IV	Design generation	1 2	Design series 1 Design series 2, ACExC controls only

Versions without optional controls are called AUMA NORM.

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 13ATEX0016 X** Issue No. **2**

Thermal data

Ambient temperature range: -60 °C to +60 °C or
-20 °C to +60 °C in combination with ACExC 01.1
with cylindrical joint and special fasteners M6

The Part-turn actuators are classified for the temperature class T4/T130 °C and may be classified for the temperature class T3/T190 °C if required, for instance prolonged running times.

Marking

The marking of the Part-turn actuators types SQ.Ex 05.2 to SQ.Ex 14.2 for use in explosive gas atmospheres includes the following:

Fieldbus interface	Terminal compartment	Position transmitter	Marking
--	KES-Exd	--	II 2 G Ex d IIC T4 or T3 Gb
		RWG5020.2Ex	II 2 G Ex d ib IIC T4 or T3 Gb
	KP, KPH and KES	--	II 2 G Ex d e IIC T4 or T3 Gb
		RWG5020.2Ex	II 2 G Ex d e ib IIC T4 or T3 Gb
FISCO	KES-Exd	--	II 2(3) G Ex d [ic Gc] IIC T4 or T3 Gb
		RWG5020.2Ex	II 2(3) G Ex d ib [ic Gc] IIC T4 or T3 Gb
	KP, KPH and KES	--	II 2(3) G Ex d e [ic Gc] IIC T4 or T3 Gb
		RWG5020.2Ex	II 2(3) G Ex d e ib [ic Gc] IIC T4 or T3 Gb
FNICO	KES-Exd	--	II 2(3) G Ex d [nL Gc] IIC T4 or T3 Gb
		RWG5020.2Ex	II 2(3) G Ex d ib [nL Gc] IIC T4 or T3 Gb
	KP, KPH and KES	--	II 2(3) G Ex d e [nL Gc] IIC T4 or T3 Gb
		RWG5020.2Ex	II 2(3) G Ex d e ib [nL Gc] IIC T4 or T3 Gb

For use in explosive dust atmospheres, the marking of the Part-turn actuators additionally or alternately includes the following: II 2 D Ex tb IIIC T130 °C or T190 °C Db

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 13ATEX0016 X** Issue No. **2**

Electrical data

3-phase AC motor:

Actuator size	Motor size	Power (1)
SQ.Ex 05.2	VDX 63 SDX 63	0.02 – 0.06 kW 0.01 kW
SQ.Ex 07.2 (2)	VDX 63 SDX 63	0.03 – 0.12 kW 0.01 kW
SQ.Ex 10.2	VDX 63 SDX 63	0.10 – 0.19 kW 0.02 – 0.06 kW
SQ.Ex 12.2	VDX 63 SDX 63	0.10 – 0.19 kW 0.04 – 0.06 kW
SQ.Ex 14.2 (2)	VDX 63 SDX 63	0.10 – 0.19 kW 0.06 kW

1) Nominal power at operating torque (corresponds to approx. 35% of maximum torque).
2) Size SQ.Ex 05.2 and SQ.Ex 07.2 uses the same actuators housing, the difference is only in the size of the flange

Motor type:	3-phase AC squirrel cage motor
Motor voltage:	690 V max.
Motor current:	25 A max.
Control voltage:	250 V max.
Control current:	5 A max.
Frequency:	50/60 Hz
Isolation class:	F or H
Type of connection	Star or triangle connection
Operation type:	S2 - ... min or Class A, Class B S4 - ... % or Class C

Position Transmitter 4..20 mA type RWG5020.2Ex according PTB 03 ATEX 2176:
Only for connection to certified intrinsically safe circuit.
Maximum values of RWG5020.2EX:
Ui = 28,5 V; Ii = 200 mA; Pi = 0,9 W; Ci and Li are negligible small.
The electronic position transmitter is considered as being earthed in terms of safety.

Fieldbus interface FNICO and FISCO:
In type of protection energy limitation Ex nL IIC in accordance with FNICO (ACExC 01.1) and/or intrinsic safety Ex ic IIC in accordance with FISCO (ACExC 01.1 and ACExC 01.2).

Installation instructions

The instructions provided with the equipment shall be followed in detail to assure safe operation.

(16) **Test Report**

No. NL/DEK/ExTR13.0014/**.

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 13ATEX0016 X** Issue No. **2**

(17) **Special conditions for safe use**

For information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. NL/DEK/ExTR13.0014/**.

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