



Multi-turn actuators

SAEx 07.2 – SAEx 16.2

SAREx 07.2 – SAREx 16.2

with actuator controls

AUMA MATIC AMExC 01.1



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:

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	<p>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.</p> <p>The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation.</p> <p>They include among others standards and directives such as IEC/EN 60079 "Electrical apparatus for explosive atmospheres" –</p> <ul style="list-style-type: none">• 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	<p>All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.</p>
Qualification of staff	<p>Assembly, electrical connection, commissioning, operation, and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or contractor of the plant only.</p> <p>Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.</p> <p>Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant are responsible for respect and control of these regulations, standards, and laws.</p>
Commissioning	<p>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.</p>
Operation	<p>Prerequisites for safe and smooth operation:</p> <ul style="list-style-type: none">• Correct transport, proper storage, mounting and installation, as well as careful commissioning.• Only operate the device if it is in perfect condition while observing these instructions.• Immediately report any faults and damage and allow for corrective measures.• Observe recognised rules for occupational health and safety.• Observe 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	<p>The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.</p>
Maintenance	<p>To ensure safe device operation, the maintenance instructions included in this manual must be observed.</p> <p>Any device modification requires prior consent of the manufacturer.</p>

1.2. Range of application

AUMA multi-turn actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, 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
- Continuous submersion (observe enclosure protection)
- Potentially explosive areas of zones 0 and 20
- Potentially explosive areas of group I (mining)
- Radiation exposed areas in nuclear power plants

No liability can be assumed for inappropriate or unintended use.

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

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).



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



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



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



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



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.

< > **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.

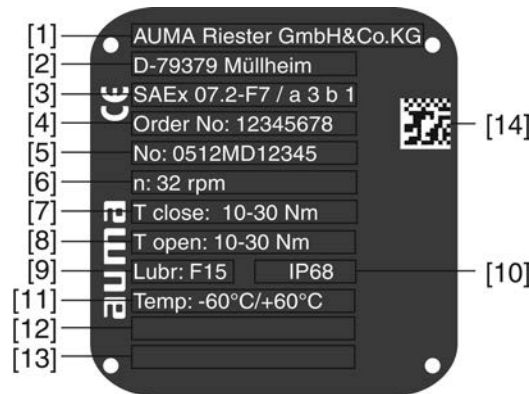
Figure 1: Arrangement of name plates



- [1] Actuator name plate
- [2] Actuator 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**
- [4] **Order number**
- [5] **Serial number**
- [6] Speed
- [7] Torque range in direction CLOSE
- [8] Torque range in direction OPEN
- [9] Type of lubricant
- [10] 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
- [14] **Data Matrix code**

Description of actuator controls name plate

Figure 3: Actuator controls name plate

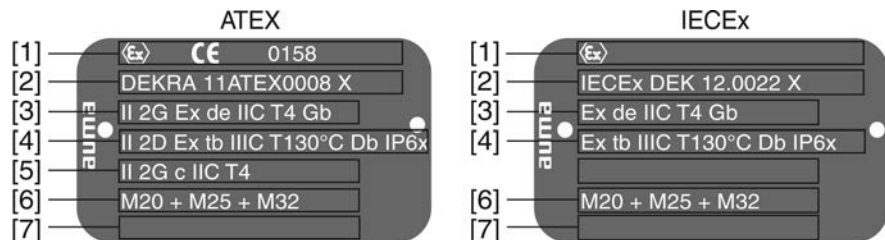


- [1] **Type designation**
- [2] Order number
- [3] Serial number
- [4] Actuator terminal plan
- [5] Actuator controls terminal plan
- [6] Mains voltage
- [7] **AUMA power class for switchgear**
- [8] Permissible ambient temperature
- [9] Enclosure protection
- [10] **Control**
- [11] Data Matrix code

Descriptions

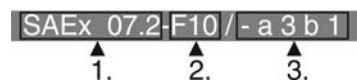
Approval plate in explosion-proof version

Figure 4: 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

Type designation Figure 5: 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:

SAEx 07.2, 07.6, 10.2, 14.2, 14.6, 16.2 = multi-turn actuators for open-close duty
 SAREx 07.2, 07.6, 10.2, 14.2, 14.6, 16.2 = multi-turn actuators for modulating duty

AMExC 01.1= AUMA MATIC actuator controls

Ex marking

Table 1: Marking for explosion protection (with example)

/	-	a	3	b	1	
Position 1: Not used						
						-
Position 2: Motor type						
		a	ADX or VDX: 3-phase AC motor			
		b	AEX, ACX, VEX and VCX: 1-phase AC motor			
Position 3: 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		
Position 4: Protection type of position transmitter						
			a	Without intrinsically safe electric circuit		
			b	Electric circuit Ex i Intrinsic safety: Type: RWG 5020.2Ex		
Position 5: Protection type Fieldbus						
				1	Standard fieldbus connection	
				2	Ex nL non-incendive fieldbus connection	
				3	Ex ic intrinsically safe fieldbus connection	

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

Please always state this number for any product inquiries.

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

Serial number Table 2: Description of serial number (with example)

05	14	MD12345
1st+2nd position: Assembly in week		
05	Week 05	
3rd+4th position: Year of production		
	14	Year of production: 2014
All other positions		
	MD12345	Internal number for unambiguous product identification

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

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

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

Figure 6: Link to the App store:



Control

Table 3: Control examples (indications on controls name plate)

Input signal	Description
24 V DC	Control voltage 24 V DC for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)
115 V AC	Control voltage 115 V AC for OPEN-CLOSE control via digital inputs (OPEN, STOP, CLOSE)

2.2. Short description

- Multi-turn actuator** Definition in compliance with EN ISO 5210:
 A multi-turn actuator is an actuator which transmits to the valve a torque for at least one full revolution. It is capable of withstanding thrust.
 AUMA multi-turn actuators are driven by an electric motor and are capable of withstanding thrust in combination with output drive type A. For manual operation, a handwheel is provided. Switching off in end positions may be either by limit or torque seating. Controls are required to operate or process the actuator signals.
- Actuator controls** The AUMA MATIC actuator controls are used to operate AUMA actuators and are supplied ready for use. The controls can be mounted directly to the actuator but also separately on a wall bracket. The functions of the AUMA MATIC controls include standard valve control in OPEN - CLOSE duty, position indications and different signals right through to position control.
- Local controls** Operation (via push buttons), setting and indication can be performed directly at the controls (contents of these instructions).

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.



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



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.

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

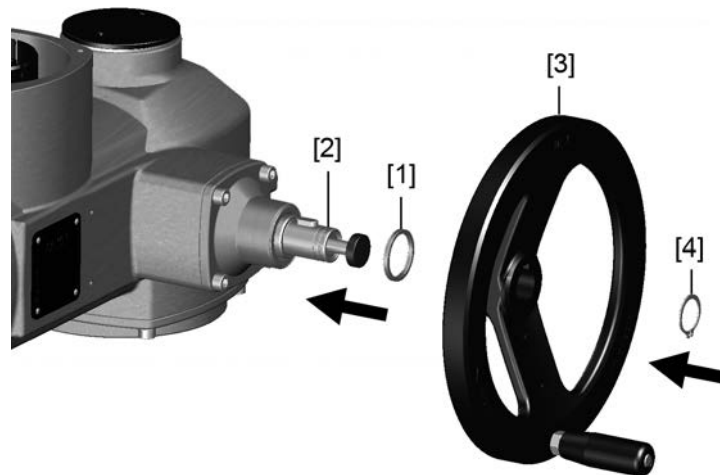
4.1. Mounting position

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 7: Handwheel



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

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

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

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.

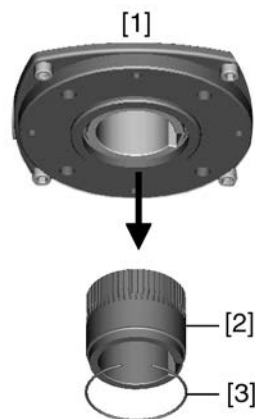
4.3.1. Output drive types B, B1 – B4 and E

- Application**
- For rotating, non-rising valve stem
 - Not capable of withstanding thrust

Design Output drive bore with keyway:

- Types B1 – B4 with bore according to EN ISO 5210
- Types B and E with bore according to DIN 3210
- Later change from B1 to B3, B4, or E is possible.

Figure 8: Output drive



- [1] Output drive types B, B1 – B4, E and C
- [2] Output drive sleeve/output drive plug sleeve with bore and keyway
- [3] Circlip

Information Spigot at flanges should be loose fit.

4.3.1.1. Multi-turn actuator (with output drive types B1 – B4 or E): mount to valve/gearbox

1. Check if mounting flanges fit together.
2. Check whether bore and keyway match the input shaft.
3. Apply a small quantity of grease to the input shaft.
4. Place multi-turn actuator.

Information: Ensure that the spigot fits uniformly in the recess and that the mounting faces are in complete contact.
5. Fasten multi-turn actuator with screws according to table.

Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.
6. Fasten screws crosswise to a torque according to table.

Table 4: Tightening torques for screws

Screws	Tightening torque T_A [Nm]
Threads	Strength class 8.8
M8	25
M10	51
M12	87
M16	214
M20	431

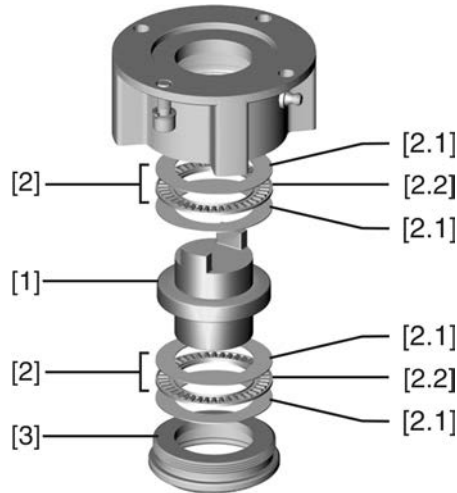
4.3.2. Output drive type A

- Application**
 - Output drive for rising, non-rotating valve stem
 - Capable of withstanding thrust
- Design** Torque is transmitted by means of a stem nut.
- Information** To adapt the actuators to available output drive types A with flanges F10 and F14 (year of manufacture: 2009 and earlier), an adapter is required. The adapter can be ordered from AUMA.

4.3.2.1. Stem nut: finish machining

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

Figure 9: Design of output drive type A



- [1] Stem nut
- [2] Bearing
- [2.1] Bearing race
- [2.2] Bearing rim
- [3] Spigot ring

1. Remove spigot ring [3] from output drive.
2. Remove stem nut [1] together with bearings [2].
3. Remove bearing races [2.1] and bearing rims [2.2] from stem nut [1].
4. Drill and bore stem nut [1] and cut thread.

Information: When fixing in the chuck, make sure stem nut runs true!

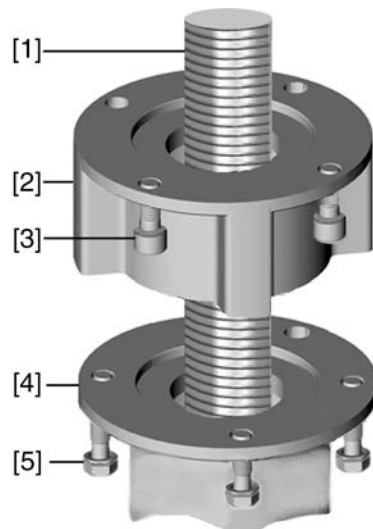
5. Clean the machined stem nut [1].
6. Apply sufficient Lithium soap EP multi-purpose grease to bearing rims [2.2] and bearing races [2.1], ensuring that all hollow spaces are filled with grease.
7. Place greased bearing rims [2.2] and bearing races [2.1] onto stem nut [1].
8. Re-insert stem nut [1] with bearings [2] into output drive.

Information: Ensure that dogs or splines are placed correctly in the keyway of the hollow shaft.

9. Screw in spigot ring [3] until it is firm against the shoulder.

4.3.2.2. Multi-turn actuator (with output drive type A): mount to valve

Figure 10: Assembly with output drive type A



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

1. If the output drive type A is already mounted to the multi-turn actuator: Loosen screws [3] and remove output drive type A [2].
2. Check if the flange of output drive type A matches the valve flange [4].
3. Apply a small quantity of grease to the valve stem [1].
4. Place output drive type A on valve stem and turn until it is flush on the valve flange.
5. Turn output drive type A until alignment of the fixing holes.
6. Screw in fastening screws [5], however do not completely tighten.
7. Fit multi-turn actuator on the valve stem so that the stem nut dogs engage into the output drive sleeve.
- ➔ The flanges are flush with each other if properly engaged.
8. Adjust multi-turn actuator until alignment of the fixing holes.
9. Fasten multi-turn actuator with screws [3].
10. Fasten screws [3] crosswise with a torque according to table.

Table 5: Tightening torques for screws

Screws	Tightening torque T_A [Nm]
Threads	Strength class 8.8
M6	11
M8	25
M10	51
M12	87
M16	214
M20	431

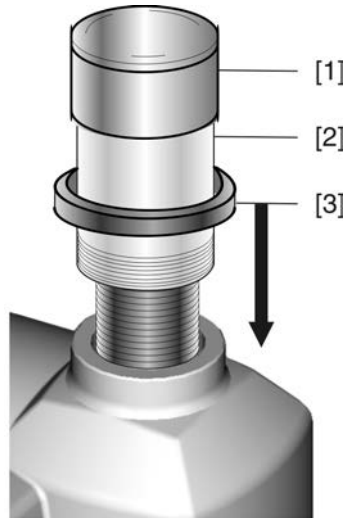
11. Turn multi-turn actuator with handwheel in direction OPEN until valve flange and output drive A are firmly placed together.
12. Tighten fastening screws [5] between valve and output drive type A crosswise applying a torque according to table.

4.4. Accessories for assembly

4.4.1. Stem protection tube for rising valve stem

— Option —

Figure 11: Assembly of the stem protection tube



- [1] Cap for stem protection tube
- [2] Stem protection tube
- [3] Sealing ring

1. Seal thread with hemp, Teflon tape, or thread sealing material.
2. Screw stem protection tube [2] into thread and tighten it firmly.
3. Push down the sealing ring [3] onto the housing.
4. Check whether cap for stem protection tube [1] is available and in perfect condition.

4.5. 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 12: Mounting positions A and B



Figure 13: Mounting positions C and D



4.5.1. Mounting positions: modify



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 and remove the local controls.
2. Loosen 3 screws of the board, turn board to the new position and fasten the screws.
3. Check whether O-ring is in good condition, correctly insert O-ring.
4. 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.

5. Fasten screws evenly crosswise.

5. Electrical connection

5.1. Basic information



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

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 6: Current consumption controls

Mains voltage	Max. current consumption
100 to 120 V AC (±10 %)	575 mA
208 to 240 V AC (±10 %)	275 mA
380 to 500 V AC (±10 %)	160 mA
24 V DC (+20 %/–15 %) and AC motor	500 mA

Table 7: Maximum permissible protection

Switchgear	Rated power	Max. protection
Reversing contactor A1	up to 1.5 kW	16 A (gL/gG)
Reversing contactor A2	up to 7.5 kW	32 A (gL/gG)
Reversing contactor A3	up to 11 kW	63 A (gL/gG)
Thyristor B1	up to 1.5 kW	16 A (g/R) I ² t<1,500A ² s
Thyristor B2	up to 3 kW	32 A (g/R) I ² t<1,500A ² s
Thyristor B3	up to 5.5 kW	63 A (g/R) I ² t<5,000A ² s

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

Power supply for the controls (electronics)

If the controls (electronics) are supplied externally with 24 V DC, the power supply is smoothed via an internal 1,000 µF capacitor). When selecting a power supply, care must be taken to consider the capacitor inrush current upon powering the unit up.

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.

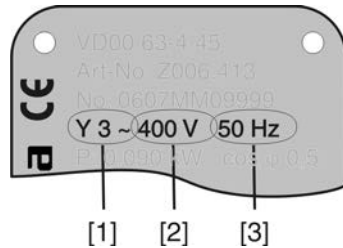
- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and bus cables increases if the cables are laid close to the earth potential.
- If possible, avoid laying long cables and make sure that they 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 14: Motor name plate (example)



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

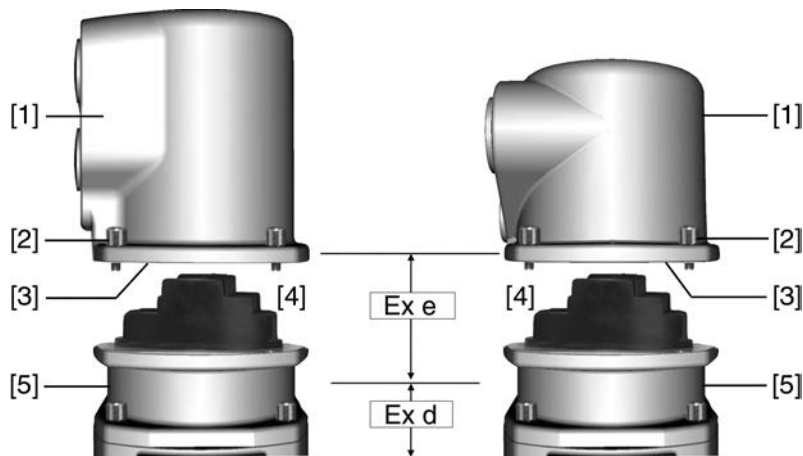
Connecting cables

- 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 15: Ex plug/socket connector KPH, KP



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



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 8: Cross sections and tightening torques

Type	Cross sections	Tightening torques
Power terminals (U1, V1, W1) PE connection	(1.5) ¹⁾ 2.5 – 6 mm ² (flexible or solid)	2 Nm
Control contacts (1 to 38)	0.75 – 1.5 mm ² (flexible or solid)	1 Nm

1) with small clamp washers



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).



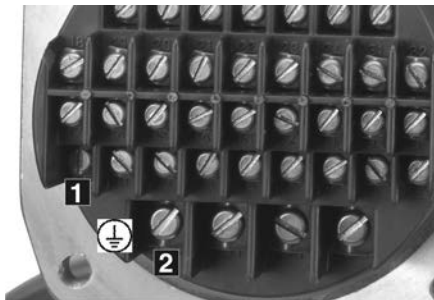
In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

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 16: PE connection

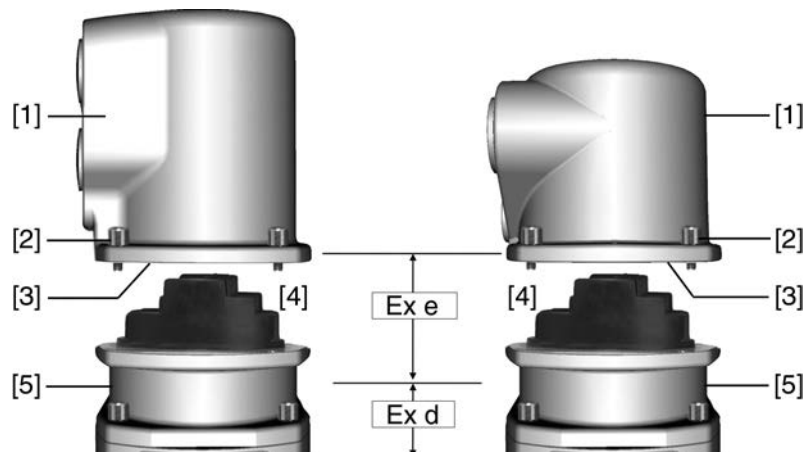


- [1] PE connection, control cable
- [2] PE connection, motor cable

Information Some actuators are equipped with an additional motor heater. The motor heater minimises condensation in the motor.

5.2.3. Terminal compartment: close

Figure 17: Ex plug/socket connector KPH, KP



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

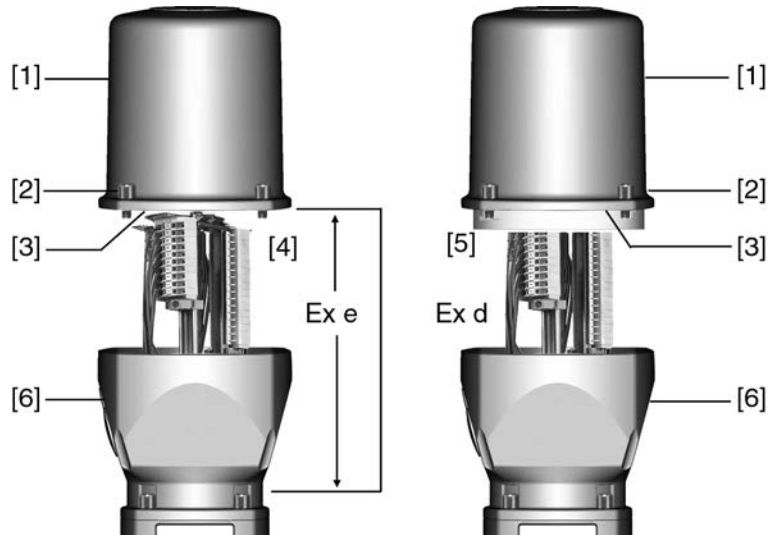
1. Clean sealing faces of cover [1] and housing.
2. Check whether O-ring [3] is in good condition, replace if damaged.
3. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.
4. Fit cover [1] and fasten screws [2] evenly crosswise.

- 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 18: 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



Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

- 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.
- 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.



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

5.3.2. Cable connection

Table 9: Cross sections and tightening torques

Type	Cross sections	Tightening torques
Power terminals (U, V, W)	max. 10 mm ² (flexible or solid)	1.5 – 1.8 Nm
PE connection	max. 10 mm ² (flexible or solid)	3.0 – 4.0 Nm
Control contacts (1 to 50)	max. 2.5 mm ² (flexible), or max. 4 mm ² (solid)	0.6 – 0.8 Nm

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.

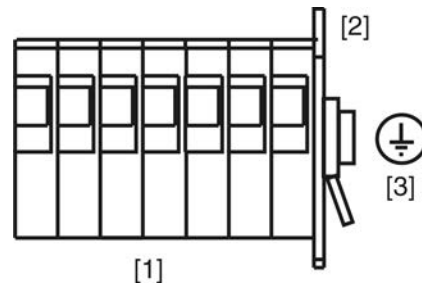
WARNING**In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!**

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 19: PE connection

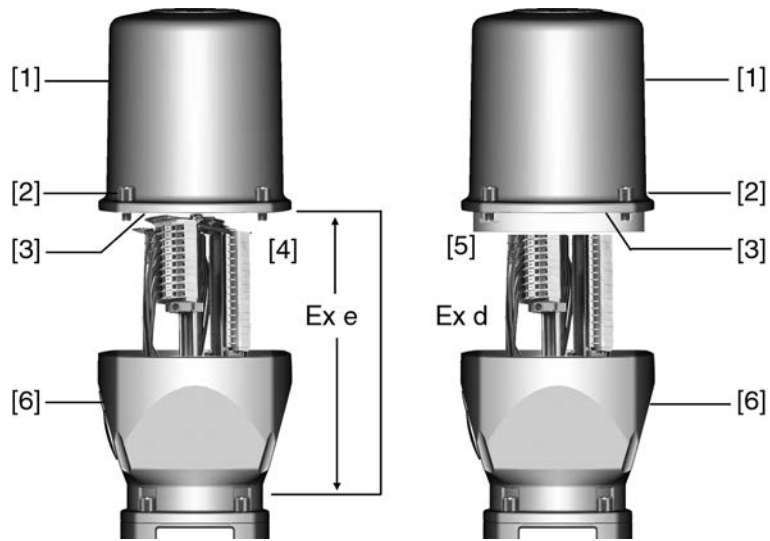


- [1] Terminal blocks
- [2] Terminal housing
- [3] PE connection, symbol: ⊕

Information Some actuators are equipped with an additional motor heater. The motor heater minimises condensation in the motor.

5.3.3. Terminal compartment: close

Figure 20: 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.



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

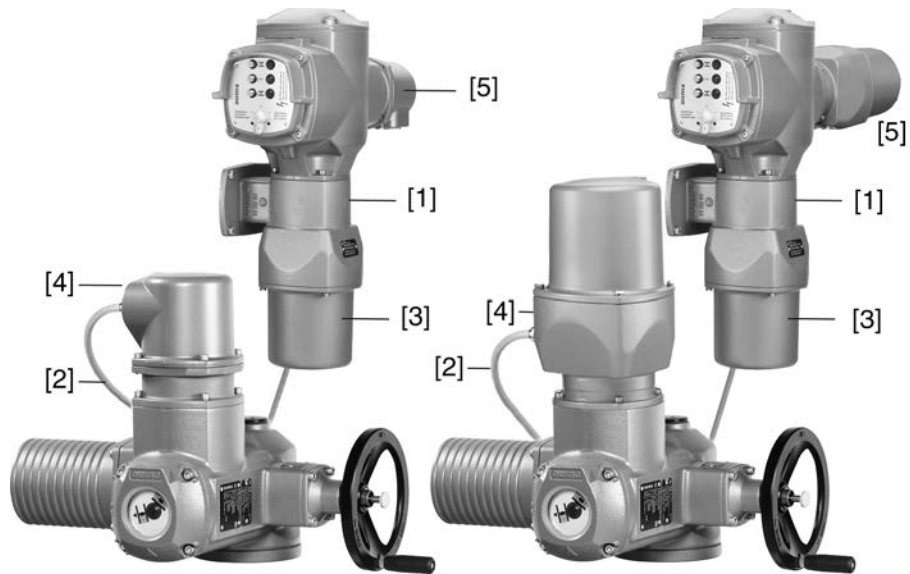
5.4.1. Controls mounted to wall bracket

The wall bracket allows separate mounting of controls and actuator.

Application

- When mounted in confined spaces.
- If the actuator is subjected to high temperatures.
- In case of heavy vibration of the valve.

Design Figure 21: Design principle with wall bracket (KP on the left, KES on the right)



- [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 plug

Observe prior to connection

- Permissible length of connecting cables: max. 100 m.
- If the actuator is equipped with a position transmitter (EWG/RWG): Connecting cables must be available as shielded version.
- Versions with potentiometer in the actuator are not suitable.
- We recommend using an AUMA cable set "LSW".
- 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 plug (XA-XM-XK, refer to wiring diagram), these connecting cables must be subject to an insulation test in compliance with EN 50178. Connecting cables of position transmitters (EWG, RWG, IWG, potentiometer) do not belong to this group. They may **not** be subject to an insulation test.

5.4.2. Parking frame

— Option —

Application Parking frame for safe storage of a disconnected plug.

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

Figure 22: Parking frame and Ex plug/socket connector with screw-type terminals (KP/KPH)

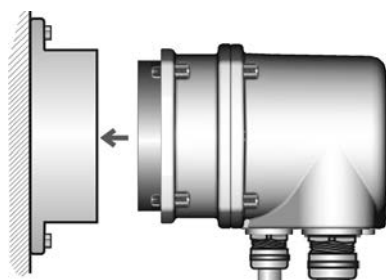
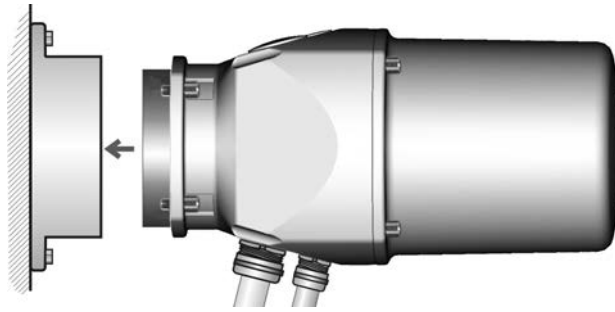


Figure 23: Parking frame and Ex plug/socket connector with terminal blocks (KES)



5.4.3. Protection cover

— Option —

Application 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. External earth connection

Application External earth connection (terminal clamp) for connection to equipotential compensation.

Figure 24: Earth connection



Cross sections of earth connection:

- 2 x 2.5 mm² to 6 mm² (solid and stranded conductors) or
- 2 x 1.5 mm² to 4 mm² (fine stranded conductors)

6. Operation

6.1. Manual operation

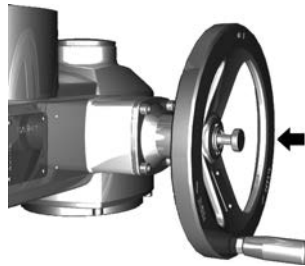
For purposes of setting and commissioning, in case of motor failure or power failure, the actuator may be operated manually. Manual operation is engaged by an internal change-over mechanism.

6.1.1. Manual operation: engage

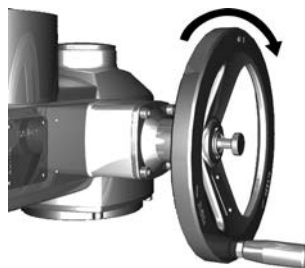
NOTICE**Damage at the motor coupling due to faulty operation!**

→ 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.

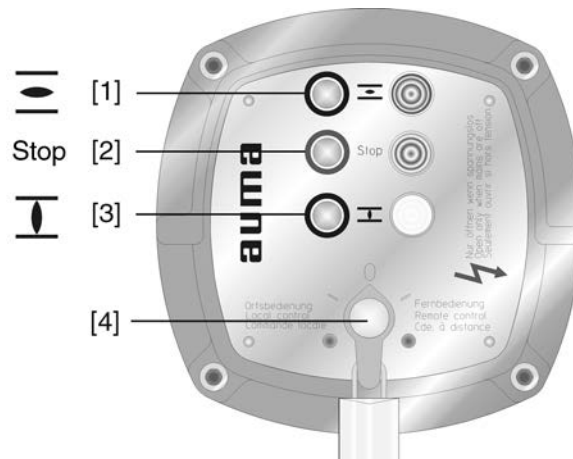
6.2. Motor operation

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

6.2.1. Local operation

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

Figure 25: 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] Selector switch



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 [4] 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 [2] **Stop**.
 - Run actuator in direction CLOSE: Press push button [3]

Information

The OPEN - CLOSE operation commands can be given either in push-to-run operation mode or in self-retaining mode. In self-retaining mode, the actuator runs to the defined end position after pressing the button, unless another command has been received beforehand.

6.2.2. Actuator operation from remote

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



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

Information For actuators equipped with positioner, it is possible to optionally **select** between **open-close duty** (REMOTE OPEN-CLOSE) and **modulating duty** (REMOTE SETPOINT). Selection is made via REMOTE MANUAL input, e.g. based on a 24 V DC signal (refer to wiring diagram).

Behaviour in modulating duty for version with positioner:

In case of signal loss of setpoint E1 or actual value E2, the actuator moves to a preset position. The following reactions are possible:

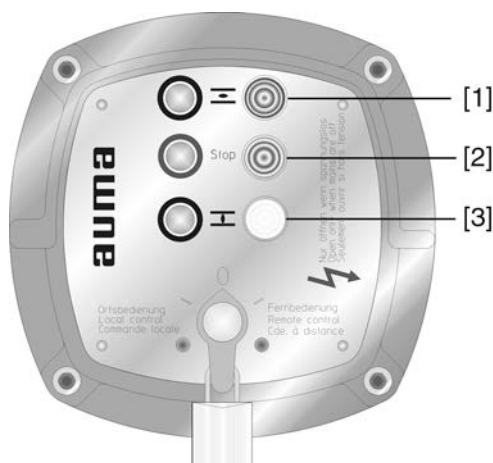
- **Fail as is:** Actuator stops immediately and remains in this position.
- **Fail close:** Actuator moves the valve to end position CLOSED.
- **Fail open:** Actuator moves the valve to end position OPEN.

The behaviour on loss of signal can be set via a switch in the controls.

7. Indications

7.1. Indication lights

Figure 26: Local controls with indication lights



- [1] illuminated (default: green): End position OPEN reached
- [2] illuminated (default: red): Collective fault signal
- [3] illuminated (default: yellow): End position CLOSED reached

Information The three indication lights can be provided in different colours (deviating from the standard).

Collective fault signal The collective fault signal [2] appears if one of the following events occurs (default configuration):

- Torque fault: The set torque was exceeded before reaching an end position. (This signal can be activated/deactivated via a switch in the controls.)
- Thermal fault: Motor protection has tripped, i.e. the motor is overheated.
- Phase failure: One phase is missing (3-ph AC motors only).
- PTC tripping device: Test complete

Running indication If the actuator is equipped with a blinker transmitter (wiring diagram designation: S5), indication lights [1] and [3] can be used as running indication. The running indication can be activated/deactivated via a switch in the controls. If the running indication is active, the respective indication light blinks during operation.

7.2. Mechanical position indicator/running indication

— Option —

Mechanical position indicator:

- Continuously indicates the valve position (For complete travel from OPEN to CLOSED or vice versa, the indicator disc [2] rotates by approximately 180° to 230°.)
- Indicates whether the actuator is running (running indication)
- Indicates that the end positions are reached (via indicator mark [3])

Figure 27: Mechanical position indicator



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

8. Signals

8.1. Feedback signals via output contacts (binary)

The output contacts can be used to indicate operation modes of the actuator or the controls as binary signals.

The signals are assigned according to the order. Example:

Output contact open = end position CLOSED not reached

Output contact closed = end position CLOSED reached

Collective fault signal Switches: 1 NC and 1 NO (standard)

Designation in the wiring diagram: K9

The collective fault signal appears if one of the following events occurs (default configuration):

- Torque fault: The set torque was exceeded before reaching an end position. (This signal can be activated/deactivated via a switch in the controls.)
- Thermal fault: Motor protection has tripped, i.e. the motor is overheated.
- Phase failure: One phase is missing (3-ph AC motors only).
- PTC tripping device: Test complete

4 output contacts: Switches: 1 NC (standard)

Designation in the wiring diagram: K5, K6, K7, K8

Default configuration:

- K5: Selector switch is in position **Remote control** (REMOTE).
- K6: Selector switch is in position **Local control** (LOCAL).
- K7: End position OPEN reached
- K8: End position CLOSED reached

8.2. Feedback signals (analogue)

— (Option) —

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

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

Designation in the wiring diagram: E2 (actual value)

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 $-20\text{ }^{\circ}\text{C}$.

3. Perform basic settings.

9.1. Heat-up time for low temperature version

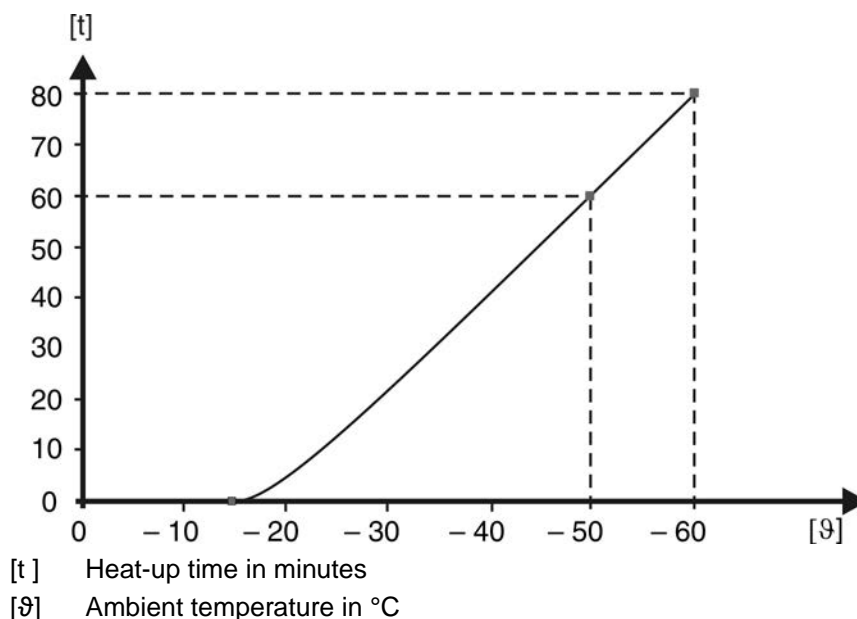
Please note that for low temperature versions, the controls require a heat-up time.

This heat-up time is applicable in case the actuator and the controls are not live and have cooled down to ambient temperature. Under these conditions and after connection to the voltage supply, the following heat-up times must be complied with prior to commissioning:

For $-50\text{ }^{\circ}\text{C}$ = 60 min.

For $-60\text{ }^{\circ}\text{C}$ = 80 min.

Figure 28: Sketch illustrating the heat-up time



9.2. Switch compartment: open

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

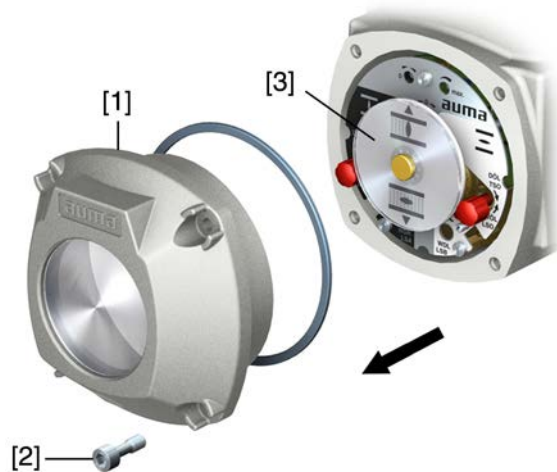


Flameproof enclosure, danger of explosion!

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.



9.3. Torque switching: set

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

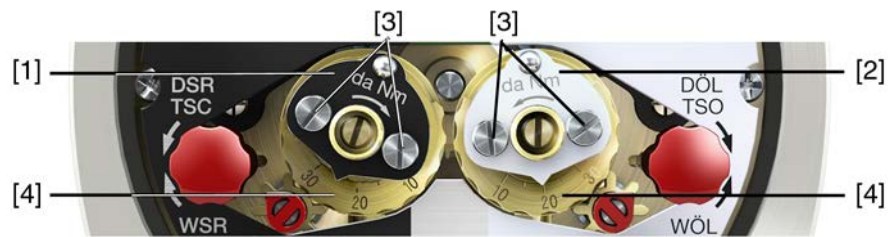
Information The torque switches may also trip during manual operation.



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 29: Torque measuring heads



[1] Torque switching head black in direction CLOSE

[2] Torque switching head white in direction OPEN

[3] Lock screws

[4] Torque dials

1. Loosen both lock screws [3] at the indicator disc.
2. Turn torque dial [4] to set the required torque (1 da Nm = 10 Nm). Example:
 - Black torque switching head set to approx. 25 da Nm $\hat{=}$ 250 Nm for direction CLOSE
 - White torque switching head set to approx. 20 da Nm $\hat{=}$ 200 Nm for direction OPEN
3. Fasten lock screws [3] again.

Information: Maximum tightening torque: 0.3 – 0.4 Nm

➔ The torque switch setting is complete.

9.4. Limit switching: set

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

Figure 30: 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

9.4.1. 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.

9.4.2. 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.

9.5. 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 31: Setting elements for limit switching



Black section:

- [1] Setting spindle: Running direction CLOSE
- [2] Pointer: Running direction CLOSE
- [3] Mark: Intermediate position CLOSED is set

White section:

- [4] Setting spindle: Running direction OPEN
- [5] Pointer: Running direction OPEN
- [6] Mark: Intermediate position OPEN is set

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

9.5.1. 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.

9.5.2. 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.

9.6. Test run

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

9.6.1. Direction of rotation: check

NOTICE

Valve damage due to incorrect direction of rotation!

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

1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Set selector switch to position **Local control** (LOCAL).

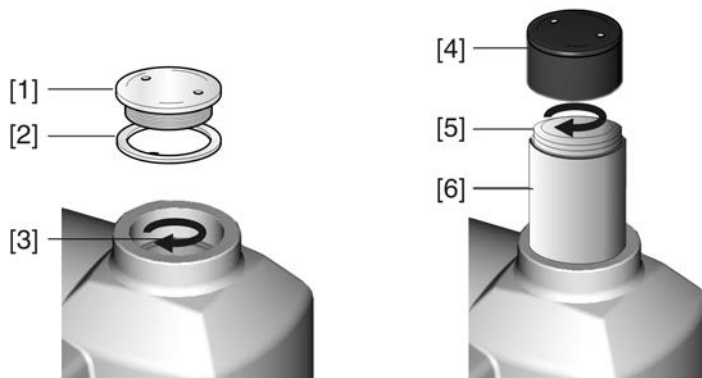


3. Switch on actuator in running direction **CLOSE** and observe the direction of rotation:
 with indicator disc: step 4
 without indicator disc: step 5 (hollow shaft)
 → Switch off before reaching the end position.
4. With indicator disc:
 → Observe direction of rotation.
 ➔ The direction of rotation is correct, if **actuator runs in direction CLOSE** and **indicator disc turns counterclockwise**.



5. Without the indicator disc:
 → Unscrew threaded plug [1] and seal [2] or cap for stem protection tube [4] and observe direction of rotation at hollow shaft [3] or the stem [5].
 ➔ The direction of rotation is correct, if **actuator runs in direction CLOSE** and hollow shaft or stem **turn clockwise**.

Figure 32: Hollow shaft/stem



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

9.6.2. Limit switching: check

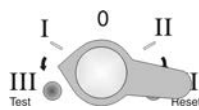
1. Set selector switch to position **Local control (LOCAL)**.



2. Operate actuator using push buttons OPEN - STOP - CLOSE.
 - The limit switching is set correctly if (default indication):
 - the yellow indication light is illuminated in end position CLOSED
 - the green indication light is illuminated in end position OPEN
 - the indication lights go out after travelling into the opposite direction.
 - The limit switching is set incorrectly if:
 - the actuator comes to a standstill before reaching the end position
 - the red indication light is illuminated (torque 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.

9.6.3. PTC tripping device (option): test

1. Turn selector switch to position **Test** (spring return).



- If the PTC tripping device is working properly, the tripping of the motor protection is signalled via the red indication light "collective fault signal" on the local controls.

2. Turn selector switch to position **Reset**.



- The fault signal is reset if the device is working properly.
3. If no fault signal is initiated: Request AUMA service to check both wiring and selector switch.

9.7. Electronic position transmitter EWG 01.1

— Option —

The electronic position transmitter EWG 01.1 signals the remote position or the valve position. On the basis of the actual valve position sensed by hall sensor, a current signal between 0 – 20 mA or 4 – 20 mA is generated.

Technical data

Table 10: EWG 01.1

Data	3-wire or 4-wire system	2-wire system
Output current I_a	0 – 20 mA, 4 – 20 mA	4 – 20 mA
Power supply U_V ¹⁾	24 V DC (18 – 32 V)	24 V DC (18 – 32 V)
Max. current consumption	LED off = 26 mA, LED on = 27 mA	20 mA
Max. load R_B	600 Ω	$(U_V - 12 V)/20 mA$
Impact of power supply	0.1 %	
Load influence	0.1 %	
Temperature impact	< 0.1 ‰/K	
Ambient temperature ²⁾	-60 °C to +80 °C	

- 1) Power supply possible via: AC, AM controls or external power supply
- 2) Depending on temperature range of the actuator: Refer to name plate

Setting elements

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

All settings are made via the two push buttons [S1] and [S2].

Figure 33: View on control unit when switch compartment is open



- [S1] Push button: Set 0/4 mA
- [S2] Push button: Set 20 mA
- LED Optical aid for setting
- [1] Measuring point (+) 0/4 – 20 mA
- [2] Measuring point (–) 0/4 – 20 mA

The output current (measuring range 0 – 20 mA) can be checked at measuring points [1] and [2].

Table 11: Short overview on push button functions

Push buttons	Function
[S1] + [S2]	→ press simultaneously for 5 s: Activate setting mode
[S1]	→ press in setting mode for 3 s: Set 4 mA → press in setting mode for 6 s: Set 0 mA → press in operation for 3 s: Switch on/off LED end position signalling. → touch in end position: Reduce current value by 0.02 mA
[S2]	→ press in setting mode for 3 s: Set 20 mA → press in operation for 3 s: Switch on/off LED end position signalling. → touch in end position: Increase current value by 0.02 mA

9.7.1. Measuring range: set

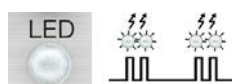
For measuring range setting, voltage must be applied at the position transmitter.

- Information**
- Both measuring ranges 0/4 – 20 mA and 20 – 0/4 mA (inverse operation) can be set. During setting process, the measuring range (normal or inverse operation) is assigned to the end positions by push button S1/S2 assignment.
 - Setting mode activating clears the setting in both end positions and sets the output current to a value of 3.5 mA. After activation, both end values (0/4 mA and 20 mA) need to be reset.
 - In case of inadvertent incorrect adjustment, the settings can always be reset by renewed activation of the setting mode (simultaneous pressing of [S1] and [S2]).




- Activate setting mode**
1. Press both push buttons [S1] and [S2] and hold down for 5 seconds:



- ➔ By pulsing double flashes, the LED indicates that the setting mode is correctly activated:



- ➔ For any other LED flash sequence (single/triple flashing): Refer to <Faults during commissioning>.

- Set measuring range**
2. Operate valve in one of the end positions (OPEN/CLOSED).
 3. Set desired output current (0/4 mA or 20 mA):
 - for **4 mA**: Hold down push button [S1] for approx. 3 seconds, until **LED is slowly blinking** .
 - for **0 mA**: Hold down push button [S1] for approx. 6 seconds, until **LED is blinking fast** .
 - for **20 mA**: Hold down push button [S2] for approx. 3 seconds, until **LED is illuminated** .
 4. Operate valve into opposite end position.
 - ➔ The value set in end position (0/4 mA or 20 mA) does not change during travel in setting mode.
 5. Perform setting in the second end position following the same steps.
 6. Approach both end positions again to check the setting.
 - If the measuring range cannot be set: Refer to <Faults during commissioning>.
 - If the current values (0/4/20 mA) are incorrect: Refer to <Current values: adjust>.
 - If the current value fluctuates (e.g. between 4.0 – 4.2 mA): <LED end position signalling: switch on/off>.

9.7.2. Current values: adjust

The current values (0/4/20 mA) set in end positions can be adjusted at any time. Conventional values are e.g. 0.1 mA (instead of 0 mA) or 4.1 mA (instead of 4 mA).

Information If the current value fluctuates (e.g. between 4.0 – 4.2 mA), the <LED end position signalling> must be switched on for current adjustment.




- Operate valve in desired end position (OPEN/CLOSED).
 - Reduce current value: Press push button [S1] (the current is reduced by 0.02 mA every time the push button is pressed)
 - Increase current value: Press push button [S2] (the current is increased by 0.02 mA every time the push button is pressed)

9.7.3. LED end position signalling: switch on/off

The LED behaviour for end position reached can be set as follows: blinking/continuous illumination or no illumination. During setting mode, end positions signalling is switched on.

- Switching on and off**
1. Operate valve in one of the end positions (OPEN/CLOSED).
 2. Hold down push buttons [S1] or [S2] for approx. 3 seconds.
 - ➔ End position signalling is switched on or off.

Table 12: LED behaviour when end position signalling is switched on

Set output current	LED behaviour in end position
4 mA	 LED is blinking slowly
0 mA	 LED is blinking fast
20 mA	 LED is illuminated

9.8. Potentiometer

— Option —

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

Information This setting is only required if the potentiometer is directly wired to the customer connection XK (refer to wiring diagram).

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

Setting is made via potentiometer [1].

Figure 34: View on control unit



[1] Potentiometer

9.8.1. Potentiometer setting

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

1. Move valve to end position CLOSED.
2. Turn potentiometer [1] clockwise to the stop.
 - ➔ End position CLOSED corresponds to 0 %
 - ➔ End position OPEN corresponds to 100 %
3. Turn potentiometer [1] slightly in opposite direction.
4. Perform fine-tuning of the zero point at external setting potentiometer (for remote indication).

9.9. Electronic position transmitter RWG

— 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.

Technical data

Table 13: RWG 4020

Data	3-wire or 4-wire system	2-wire system
Output current I_a	0 – 20 mA, 4 – 20 mA	4 – 20 mA
Power supply U_V ¹⁾	24 V DC (18 – 32 V)	14 V DC + (I x R _B), max. 30 V
Max. current consumption	24 mA at 20 mA output current	20 mA
Max. load R _B	600 Ω	(U _V – 14 V)/20 mA
Impact of power supply	0.1 %/V	0.1 %/V
Load influence	0.1 %/(0 – 600 Ω)	0.1 %/100 Ω
Temperature impact	< 0.3 ‰/K	
Ambient temperature ²⁾	–60 °C to +80 °C	
Transmitter potentiometer	5 kΩ	

1) Power supply possible via: AC, AM controls or external power supply

2) Depending on temperature range of the actuator: Refer to name plate

Setting elements The RWG is housed in the actuator switch compartment. The switch compartment must be opened to perform any settings. Refer to <Switch compartment: open>. Setting is made via three potentiometers [1], [2] and [3].

Figure 35: View on control unit when switch compartment is open



- [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

The output current (measuring range 0 – 20 mA) can be checked at measuring points [4] and [5].

9.9.1. Measuring range: set

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


1. Move valve to end position CLOSED.
2. Connect ammeter for 0 – 20 mA to measuring points [4 and 5].
3. Turn potentiometer [1] clockwise to the stop.
4. Turn potentiometer [1] slightly in opposite direction.
5. Turn potentiometer [2] clockwise until output current starts to increase.
6. Turn 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.
7. Move valve to end position OPEN.
8. Set potentiometer [3] to end value 20 mA.
9. Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.

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


9.10. Mechanical position indicator: set

— Option —


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:
 - 7.1 Repeat setting procedure.
 - 7.2 Check whether the appropriate reduction gearing has been selected, if required.

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.





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. Commissioning – controls settings

The controls are set in the factory according to the order. The settings only have to be changed if the device is used for applications other than those specified in the order. In case the device is equipped with a positioner (option), subsequent setting may be required.

The following settings are described in these operation instructions:

- Type of seating (limit or torque seating): set
- Push-to-run operation or self-retaining: set
- Running indication (blinker transmitter) (option): activate/deactivate
- Torque fault in collective fault signal: activate/deactivate
- Positioner setting (option)

10.1. Controls: open



Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

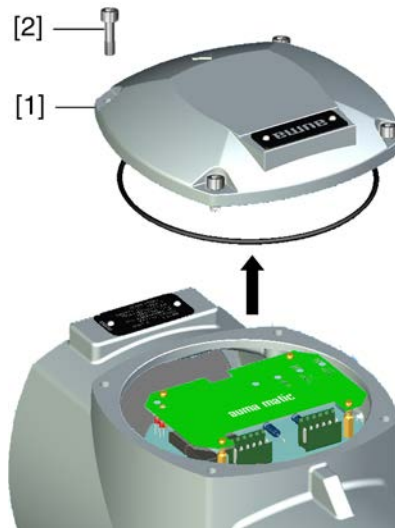
- Before opening, ensure that there is no explosive gas and no voltage.
- Handle cover and housing parts with care.
- Joint surfaces must not be damaged or soiled in any way.
- Do not jam cover during fitting.

NOTICE

Electrostatic discharge ESD!

Risk of damage to electronic components.

- Earth both operators and devices.
- Loosen screws [2] and remove cover [1].



10.2. 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.

The type of seating can be set via two DIP switches on the logic board.

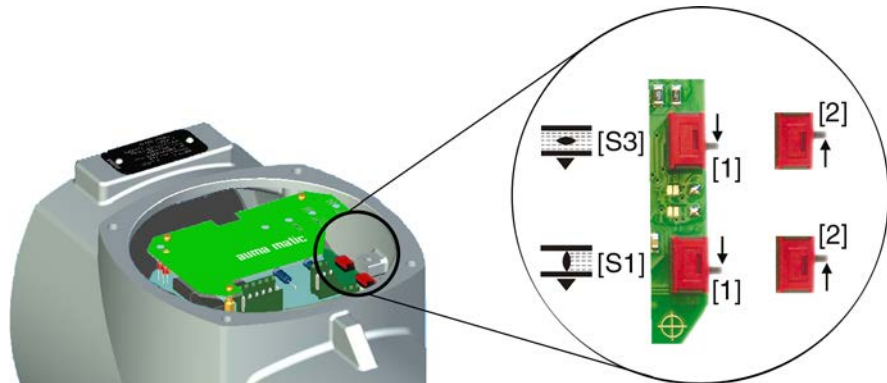
Limit seating The limit switching is set in such a way that the actuator switches off at the desired switching points. The torque switching acts as overload protection for the valve.

Torque seating The torque switching is set to the desired tripping torque. After reaching the tripping torque, the actuator is turned off.

The limit seating is used to signal that the limit switching will trip shortly **before** reaching the set tripping torque. If this is not the case, either the indication light on the local controls or the alarm contact K9 (collective fault signal) will signal a fault.

→ Set type of seating for end positions via DIP switches [S1] and [S3].

Figure 36: DIP switches on logic board



[S1] DIP switch for end position CLOSED

[S3] DIP switch for end position OPEN

[1] Position [1] = limit seating

[2] Position [2] = torque seating

10.3. Push-to-run operation or self-retaining: set

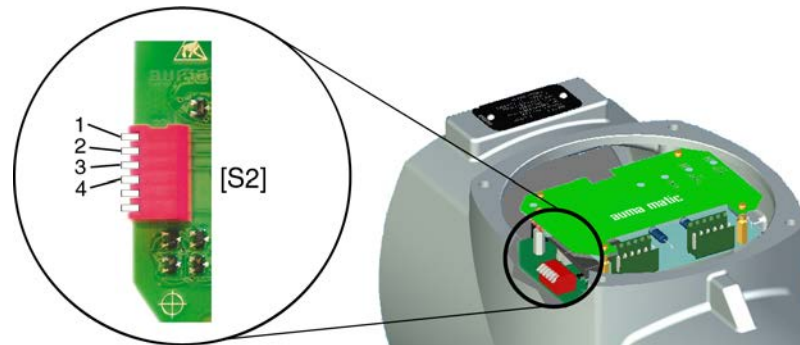
Push-to-run operation or self-retaining is set via a DIP switch on the logic board.

Push-to-run operation Actuator only runs in direction OPEN or CLOSE while an operation command is being received. The actuator stops if the operation command is cancelled.

Self-retaining After receiving an operation command, the actuator continues to run in direction OPEN or CLOSE, even if the operation command is cancelled (self-retaining). The actuator is either stopped by the STOP command or if an end position or intermediate position has been reached.

→ Set push-to-run operation or self-retaining via DIP switch [S2].

Figure 37: DIP switch on logic board



[S2] 6-way DIP, switches [1 – 4]:

- 1 for operation commands CLOSE from remote
- 2 for operation commands OPEN from remote
- 3 for operation commands CLOSE via push button at local controls
- 4 for operation commands OPEN via push button at local controls

- ➔ Switch in lower position (position ON): Self-retaining
- ➔ Switch in upper position (position OFF): Push-to-run operation

Information If the controls are equipped with a positioner, switches 1 and 2 (operation commands from remote) must be in position OFF (push-to-run operation).

10.4. Running indication (blinker transmitter): activate/deactivate

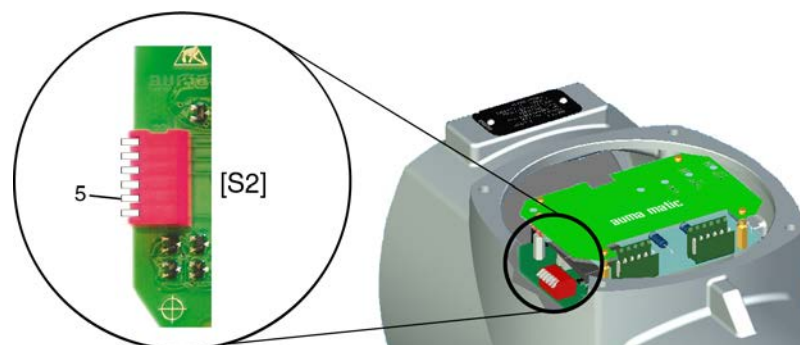
— (Option) —

If the actuator is equipped with a blinker transmitter (wiring diagram designation: S5), indication lights (OPEN/CLOSE) on the local controls can be used as running indication. If the running indication is active, the respective indication light blinks during actuator operation.

The running indication is activated/deactivated via a DIP switch on the logic board.

→ Set running indication (blinker) via DIP switch [S2].

Figure 38: DIP switch on logic board



[S2] 6-way DIP, switch 5

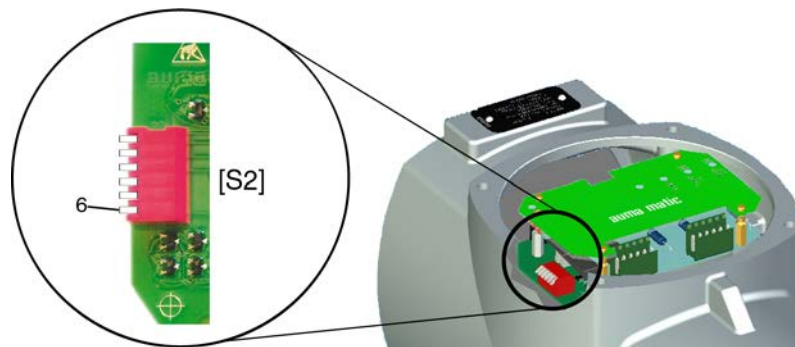
- ➔ Switch 5 in lower position (position ON): Running indication is deactivated.
- ➔ Switch 5 in upper position (position OFF): Running indication is activated.

10.5. Torque fault in collective fault signal: activate/deactivate

The torque fault signal is activated/deactivated via a DIP switch on the logic board.

→ Activate/deactivate signal via DIP switch [S2].

Figure 39: DIP switch on logic board



[S2] 6-way DIP, switch 6

- Switch 6 in lower position (position ON): The signal "Torque fault in collective fault signal" is activated.
- Switch 6 in upper position (position OFF): The signal "Torque fault in collective fault signal" is deactivated.

10.6. Positioner

— (Option) —

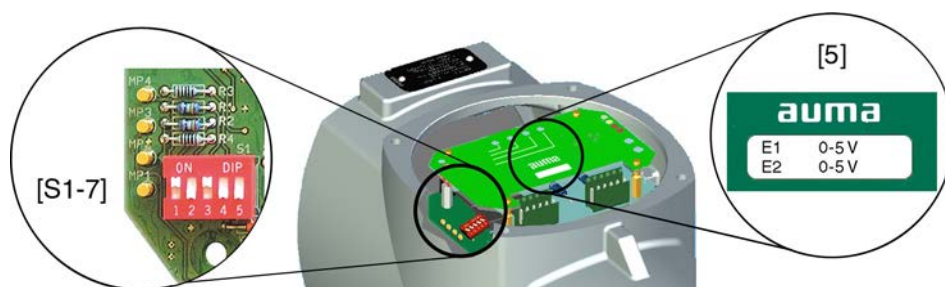
→ Prior to positioner setting, set limit and torque switching as well as potentiometer or electronic position transmitter.

10.6.1. Input ranges (signal type) for setpoint and actual value

The input range (signal type) for setpoint E1 and actual value E2 is set in the factory and marked with a label on the cover plate of the positioner.

The type of signal can be modified at a later date exclusively for versions with setpoint E1 ≠ 0/4 – 20 mA and split-range version. For these versions, the positioner board is equipped with an additional contact.

Figure 40: Version with additional switch on the positioner board



[5] Label indicating the set input ranges

[S1-7] 5-contact DIP switch for setting

DIP1 Actual value E2 (current or voltage signal)

DIP3 Setpoint E1 (current or voltage signal)

DIP5 Setpoint E1 (double signal range e.g. for split range)

Table 14: Input range setting for setpoint E1

Setpoint E1	[S1-7]
	DIP 3 and 5
0/4 – 20 mA	ON




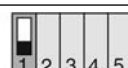
Setpoint E1	[S1-7]
	DIP 3 and 5
0 – 5 V	ON 
0 – 10 V	ON 

Table 15: Input range setting for actual value E2

Actual value E2	[S1-7]
	DIP 1
0/4 – 20 mA ¹⁾	ON 
0 – 5 V ²⁾	ON 

- 1) for internal feedback of electronic position transmitter RWG
- 2) for internal feedback of precision potentiometer 5 kΩ

Information When changing the setting, a new label [5] indicating the set signal type must be provided. Furthermore, the wiring diagram indicated on the name plate of the actuator controls also changes.

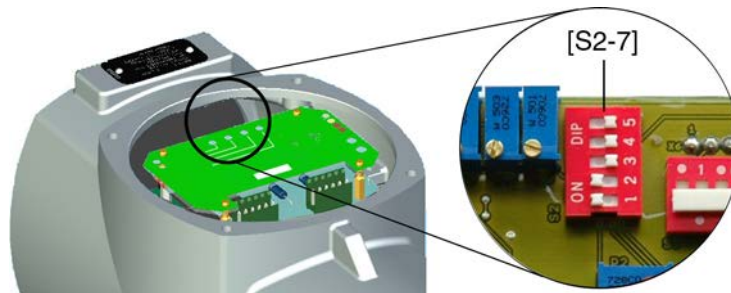
10.6.2. Behaviour on loss of signal (actuator reaction)

In case of a loss of signal of setpoint E1 or actual value E2, the reaction of the actuator can be programmed via switch [S2-7]. The complete selection range, however, is only available for signals 4 – 20 mA.

The following reactions are possible:

- Fail as is:** Actuator stops immediately and remains in this position.
- Fail close:** Actuator moves the valve to end position CLOSED.
- Fail open:** Actuator moves the valve to end position OPEN.

Figure 41: DIP switch [S2-7] on positioner board



- DIP1 = ON, actual value E2 is monitored
- DIP2 = ON, setpoint E1 is monitored

Table 16: Recommended settings











Behaviour on loss of signal of E1 and/or E2	Signal type		[S2-7]
	Setpoint E1	Actual value E2	DIP 1 2 3 4
Fail as is	4 – 20 mA	4 – 20 mA	ON 
Fail close			ON 
Fail open			ON 

Table 17: Further possible settings

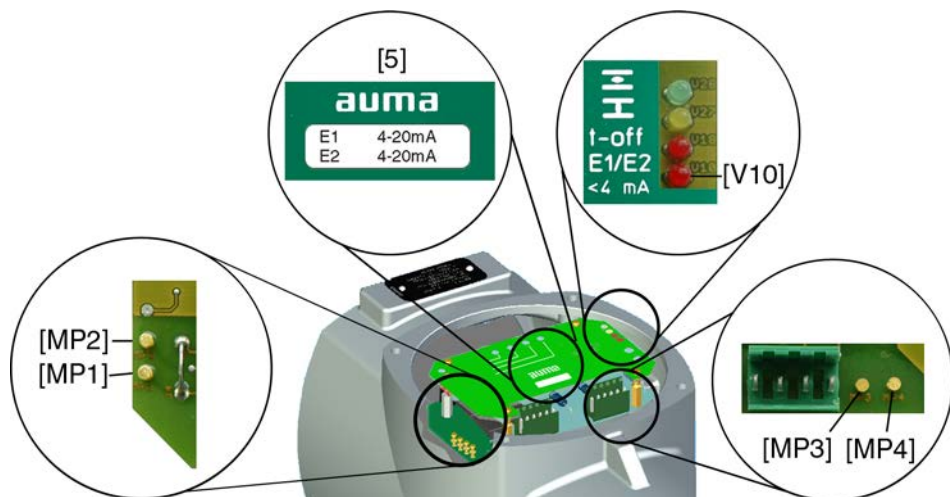
Behaviour on loss of signal of		Signal type ¹⁾		[S2-7]
E1	E2	Setpoint E1	Actual value E2	DIP 1 2 3 4
Fail as is	Fail open	4 – 20 mA	0 – 5 V	ON 
Fail close	Fail open	4 – 20 mA	0 – 5 V	ON 
		0 – 20 mA	4 – 20 mA	ON 
		0 – 20 mA 0 – 5 V 0 – 10 V	0 – 20 mA 0 – 5 V	ON 
	Fail close	0 – 20 mA 0 – 5 V	4 – 20 mA	ON 
	Fail as is	0 – 20 mA 0 – 10 V	4 – 20 mA	ON 
Fail open		4 – 20 mA	0 – 20 mA 0 – 5 V	ON 

1) in case of a signal loss, a misinterpretation might be made for 0 – 20 mA, 0 – 5 V or 0 – 10 V, due to the fact that E1 or E2 could take the value 0 mA even without loss of signal (end position CLOSED = 0 mA or 0 V).

10.6.3. Adjustment in end positions

The setting described below applies to the standard positioner version, i.e. maximum setpoint E1 (20 mA) triggers a travel to end position OPEN, minimum setpoint (0/4 mA) triggers a travel to end position CLOSED.

Figure 42: Electronic positioner board

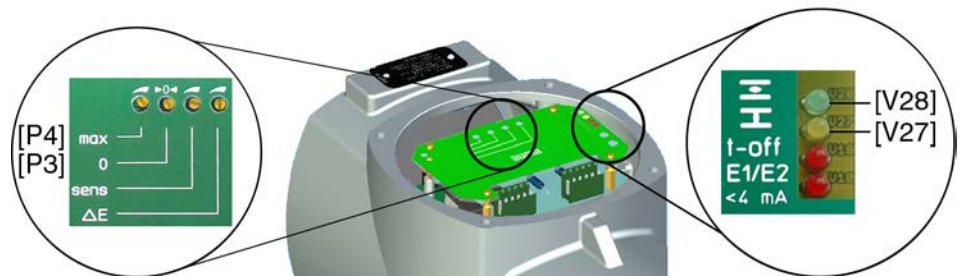


- [MP1] Measuring point (-) for actual value E2
- [MP2] Measuring point (+) for actual value E2
- [MP3] Measuring point (+) for setpoint E1
- [MP4] Measuring point (-) for setpoint E1
- [5] Label with signal indication
- [V10] Red LED: E1/E2 <4 mA

- End position CLOSED**
1. Set selector switch to position **Local control** (LOCAL).
 2. Move valve to end position CLOSED.

3. Connect lower setpoint to customer connection XK (terminals 2/3). The lower setpoint (0 V, 0 mA or 4 mA) is indicated on the label [5].
4. If the red LED [V10] **E1/E2 <4 mA** is illuminated:
 - 4.1 Verify polarity of setpoint E1.
 - 4.2 Check whether external load is connected to customer connection XK (terminals 23/24) (observe max. load R_B), or
 - 4.3 Connect terminals 23/24 across customer connection XK (terminals 23/24).
5. Measure setpoint E1: Connect measuring device for 0 – 5 V to measuring points **[MP3/MP4]**.
 - ➔ For a setpoint E1 of 0 V or 0 mA, the voltmeter shows 0 V.
 - ➔ For a setpoint E1 of 4 mA, the voltmeter shows 1 V.
6. If measured value is not correct: Correct setpoint E1.
7. Measure actual value E2: Connect measuring device for 0 – 5 V to measuring points **[MP1/MP2]**.
 - ➔ For an actual value E2 of 0 mA, the voltmeter shows 0 V.
 - ➔ For an actual value E2 of 4 mA, the voltmeter shows 1 V.
8. If measured value is not correct: Re-set potentiometer or electronic position transmitter and perform adjustment once again, starting from step 1.
9. Adjust positioner using potentiometer **0** [P3].
 - 9.1 If both LEDs are OFF or the green LED [V28] is illuminated: Turn potentiometer **0** [P3] slightly clockwise until the yellow LED [V27] is illuminated.
 - 9.2 If the yellow LED [V27] is illuminated: Turn potentiometer **0** [P3] counter-clockwise until the yellow LED [V27] goes out. Then turn potentiometer **0** [P3] slightly clockwise until the yellow LED [V27] is illuminated again.

Figure 43: Electronic positioner board



- [P3] Potentiometer 0
- [P4] Potentiometer max
- [V27] Yellow LED: End position CLOSED reached
- [V28] Green LED: End position OPEN reached

- ➔ The setting is correct if the yellow LED [V27] is switched on when reaching end position CLOSED.

End position OPEN

10. Move valve to end position OPEN.
11. Measure actual value E2 (measuring points **[MP1/MP2]**):
 - ➔ For an actual value E2 of 20 mA, the voltmeter shows 5 V.
12. If measured value is not correct: Re-set potentiometer or electronic position transmitter and perform adjustment once again, starting from step 1.
13. Set maximum setpoint E1 (5 V or 20 mA, refer to label [5]).
14. Measure setpoint E1 (measuring points **[MP3/MP4]**):
 - ➔ For a setpoint E1 of 5 V or 20 mA, the voltmeter shows 5 V.
15. If measured value is not correct: Verify setpoint E1.

16. Adjust positioner using potentiometer **max** [P4].
 - 16.1 If both LEDs are OFF or the yellow LED [V27] is illuminated: Turn potentiometer **max** [P4] slightly counterclockwise until the green LED [V28] is illuminated.
 - 16.2 If the green LED [V28] is illuminated: Turn potentiometer **max** [P4] clockwise until the green LED [V28] goes out. Then turn potentiometer **0** [P3] slightly counterclockwise until the green LED [V28] is illuminated again.
 - ➔ The setting is correct if the green LED [V28] is switched on when reaching end position OPEN.

10.6.4. Sensitivity setting

NOTICE

Unnecessary wear at valve and actuator caused by an excessive number of starts (sensitivity)!

- Set maximum dead band acceptable for the process.
- Observe maximum number of actuator starts (refer to technical data sheet for modulating actuators).

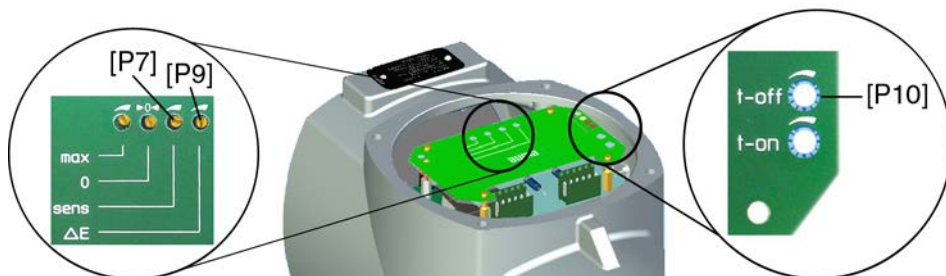
Dead band The dead band determines the sensitivity between switch-on point and switch-off point. The smaller the dead band, the higher the sensitivity of the positioner.

Default value: 2.5 %

Setting range: 0.5 % to 2.5 % (of the maximum setpoint E1)

Dead time The dead time prevents the operation to a new setpoint within a pre-determined time (0.5 to 10 seconds). The number of starts can be reduced by setting the dead time to a sufficiently high value.

Figure 44: Sensitivity setting



[P7] Potentiometer **sens** (fine tuning)

[P9] Potentiometer **Δ E** (dead band)

[P10] Potentiometer **t-off** (dead time)

- Dead band setting**
1. Set selector switch to position **Remote control** (REMOTE).
 2. Connect setpoint E1 to customer connection XK (terminals 2/3).
 3. Set dead band using potentiometer **Δ E** [P9]:
 - Reduce dead band (increase sensitivity): Turn potentiometer counterclockwise.
 - Increase dead band (reduce sensitivity): Turn potentiometer clockwise.
- Fine tuning**
- Information:** Fine tuning is only useful for output speeds <16 rpm. For 1-phase AC motors, fine tuning is not possible.
4. Reduce dead band further by up to 0.25 % (increase sensitivity): Turn potentiometer **sens** [P7] counterclockwise.

- Dead time setting**
5. Set dead time using potentiometer **t-off** [P10]:
 - Reduce dead time: Turn potentiometer **t-off** [P10] counterclockwise.
 - Increase dead time: Turn potentiometer **t-off** [P10] clockwise.

10.7. EMERGENCY command (EMERGENCY - OPEN/EMERGENCY - CLOSE)

— (Option) —

The EMERGENCY input (refer to wiring diagram) has to be connected to the control voltage using an NC contact (closed circuit principle). In the event of an EMERGENCY command (removal of the signal = NC contact is operated), the actuator runs to the preset end position:

- EMERGENCY - CLOSE input: Actuator runs to end position CLOSED.
- EMERGENCY - OPEN input: Actuator runs to end position OPEN.

The EMERGENCY command is effective in all three selector switch positions (LOCAL, OFF, REMOTE).



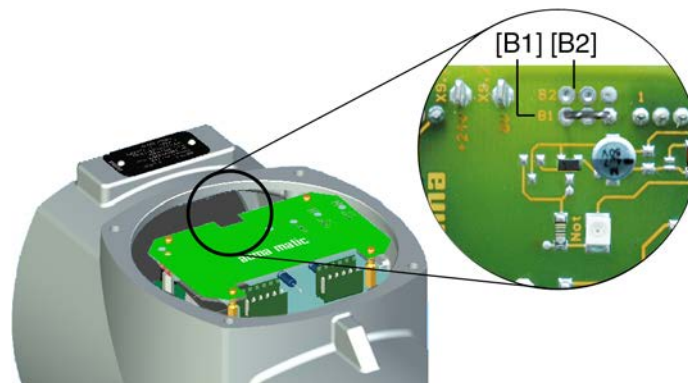
The actuator can immediately start when switched on!

Risk of personal injuries or damage to the valve.

- Ensure that EMERGENCY signal is present when switching on.
- If the actuator starts to run unexpectedly: Immediately press push button **Stop**.

Disable EMERGENCY command

Figure 45: Interface board for available option EMERGENCY - OPEN/EMERGENCY - CLOSE



[B1] Link available: EMERGENCY - CLOSE

[B2] Link available: EMERGENCY - OPEN

1. Remove face plate.
2. Disconnect links [B1] or [B2].

10.8. Controls: close

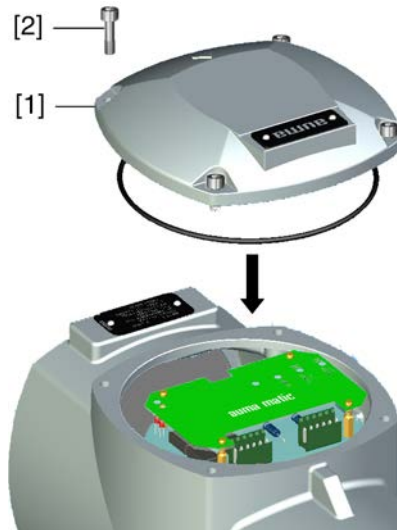
NOTICE

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.

11. Corrective action

11.1. Faults during commissioning

Table 18: 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).
Position transmitter RWG Measurement range 4 – 20 mA or maximum value 20 mA cannot be set.	Reduction gearing is not suitable for turns/stroke of the actuator.	Exchange reduction gearing.
Limit and/or torque switches do not trip.	Switch is defective or switch setting is incorrect.	Check setting, if required, reset end positions. → 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. The red indication light (fault) on the local controls is illuminated.
2. Press push button OPEN to reset the fault (indication light) by operating the device in the opposite direction.
3. Turn test button [2] in direction of the TSO arrow: Torque switch OPEN trips.
4. Press push button CLOSE to reset the fault (indication light) by operating the device in the opposite direction.

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

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

11.2. Fuses

11.2.1. Fuses within the actuator controls

After removal of local controls, the fuses can be accessed.

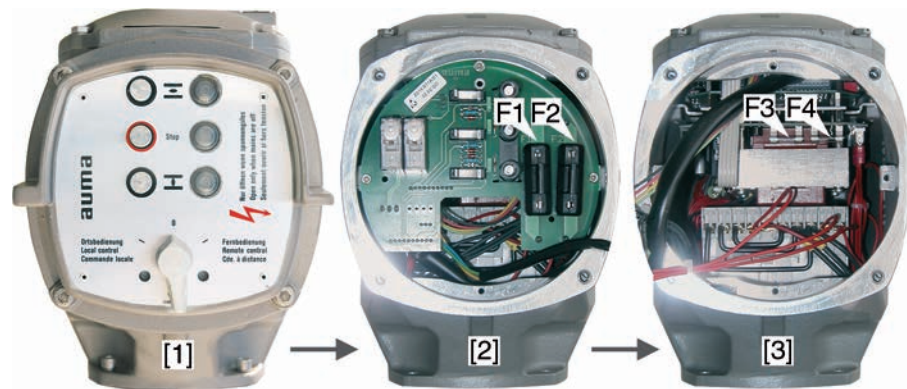


Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

Figure 46: Access to fuses



- [1] Local controls
- [2] Signal and control board
- [3] Power supply unit

F1/F2 Primary fuses on power supply unit

G fuses	F1/F2	AUMA Art. no.:
Size	6.3 x 32 mm	
Power supply ≤ 500 V	1 A T; 500 V	K002.277
Power supply > 500 V	2 A FF; 690 V	K002.665

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	500 mA T; 250 V	K001.183
Voltage output (power supply unit) = 115 V	500 mA T; 250 V	K001.183

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

- Heater, switch compartment, reversing contactors control
- PTC tripping device (24 V AC only)
- 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	1.0 A T; 250 V 1.6 A T; 250 V	K004.831 K003.131
Voltage output (power supply unit) = 115 V	0.4 A T; 250 V	K003.021

Information Only replace fuses with fuses of the same type and value.

→ After replacing the fuses, screw local controls back on again.

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.

11.2.2. 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 stopped and the "collective fault" indication light (option) on the local controls is illuminated.

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

Version with thermoswitch (standard)

The actuator can be controlled again once the motor has cooled down ("collective fault" indication light goes out).

Version with thermoswitch and additional thermal overload relay within the controls (option)

The operation may only be resumed once the fault signal ("collective fault" indication light) has been reset. The fault signal is reset via the overload relay integrated in the actuator controls. Therefore the controls have to be opened at the cover and the relay held down. The relay is located on the contactors.

Version with PTC thermistor (option)

The operation may only be resumed once the fault signal ("collective fault" indication light) has been reset. The fault signal is reset via selector switch position **Reset** of the local controls.

Figure 47: Selector switch on local controls



12. Servicing and maintenance



Damage caused by inappropriate maintenance!

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

AUMA Service & Support

AUMA 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).

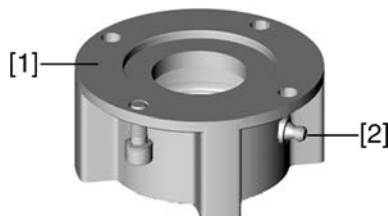
12.1. Preventive measures for servicing and safe operation

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 devices with output drive A: Press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with a grease gun.
- Lubrication of the valve stem must be done separately.

Figure 48: Output drive type A



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

Table 19: Grease quantities for bearing of output drive type A

Output drive	A 07.2	A 10.2	A 14.2	A 16.2
Quantity [g] ¹⁾	1.5	2	3	5

1) For grease at density $\rho = 0.9 \text{ kg/dm}^3$

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.

12.2. 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.

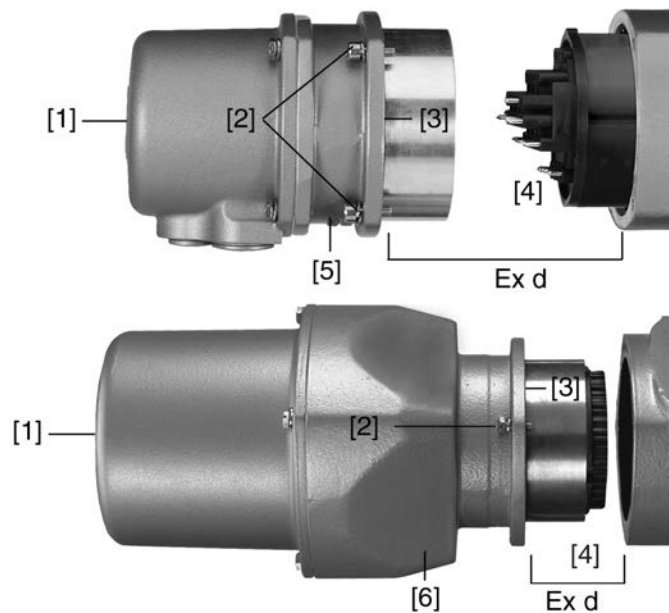


Flameproof enclosure, danger of explosion!

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 49: 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.

12.3. 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).

Notes regarding the maintenance

- We recommend exchanging the seals when changing the grease.
- No additional lubrication of the gear housing is required during operation.
- Check actuator visually. Ensure that no outside damage or changes are visible.
- The electric connection cables must be without damage and wired correctly.
- Do a thorough touch-up of possible damage to paint finish 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 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.

12.4. Disposal and recycling

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

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

The following generally applies:

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

13. Technical data

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

13.1. Technical data Multi-turn actuators

Features and functions							
Explosion protection	<table border="1"> <tr> <td>Standard:</td> <td> Standard version (ATEX): <ul style="list-style-type: none"> II 2G Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb II 2D Ex tb IIIC T130°C (T190°C) Db IP68 II 2G c IIC T4 Standard version (IECEX): <ul style="list-style-type: none"> Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb Ex tb IIIC T130°C (190°C) Db IP68 </td> </tr> <tr> <td colspan="2">For actual version, refer to actuator name plate</td> </tr> </table>	Standard:	Standard version (ATEX): <ul style="list-style-type: none"> II 2G Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb II 2D Ex tb IIIC T130°C (T190°C) Db IP68 II 2G c IIC T4 Standard version (IECEX): <ul style="list-style-type: none"> Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb Ex tb IIIC T130°C (190°C) Db IP68 	For actual version, refer to actuator name plate			
Standard:	Standard version (ATEX): <ul style="list-style-type: none"> II 2G Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb II 2D Ex tb IIIC T130°C (T190°C) Db IP68 II 2G c IIC T4 Standard version (IECEX): <ul style="list-style-type: none"> Ex de IIC (IIB, IIB+H₂) T4 (T3) Gb Ex tb IIIC T130°C (190°C) Db IP68 						
For actual version, refer to actuator name plate							
EC type examination certificate	DEKRA 11 ATEX 0008 X DEKRA 12 ATEX 0143 X IECEX DEK 12.0022 X						
Type of duty	<table border="1"> <tr> <td>Standard:</td> <td> Short-time duty S2 - 15 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 25 % (multi-turn actuators for modulating duty) </td> </tr> <tr> <td>Option:</td> <td> Short-time duty S2 - 30 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 50 % (multi-turn actuators for modulating duty) </td> </tr> <tr> <td colspan="2">For nominal voltage and 40 °C ambient temperature and at average load with 35 % of the max. torque</td> </tr> </table>	Standard:	Short-time duty S2 - 15 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 25 % (multi-turn actuators for modulating duty)	Option:	Short-time duty S2 - 30 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 50 % (multi-turn actuators for modulating duty)	For nominal voltage and 40 °C ambient temperature and at average load with 35 % of the max. torque	
Standard:	Short-time duty S2 - 15 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 25 % (multi-turn actuators for modulating duty)						
Option:	Short-time duty S2 - 30 min (multi-turn actuators for open-close duty) Intermittent duty S4 - 50 % (multi-turn actuators for modulating duty)						
For nominal voltage and 40 °C ambient temperature and at average load with 35 % of the max. torque							
Motors	<table border="1"> <tr> <td>Standard:</td> <td>3-ph AC asynchronous motor, type IM B9 according to IEC 60034</td> </tr> <tr> <td>Option:</td> <td> 1-phase AC motor, type IM B9 according to IEC 60034 DC shunt motor, type IM B14 according to IEC 60034 DC compound motor, type IM B14 according to IEC 60034 </td> </tr> </table>	Standard:	3-ph AC asynchronous motor, type IM B9 according to IEC 60034	Option:	1-phase AC motor, type IM B9 according to IEC 60034 DC shunt motor, type IM B14 according to IEC 60034 DC compound motor, type IM B14 according to IEC 60034		
Standard:	3-ph AC asynchronous motor, type IM B9 according to IEC 60034						
Option:	1-phase AC motor, type IM B9 according to IEC 60034 DC shunt motor, type IM B14 according to IEC 60034 DC compound motor, type IM B14 according to IEC 60034						
Mains voltage, mains frequency	Refer to motor name plate Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 % (for 3-phase and 1-phase AC current)						
Overvoltage category	Category III according to IEC 60364-4-443						
Insulation class	<table border="1"> <tr> <td>Standard:</td> <td>F, tropicalized</td> </tr> <tr> <td>Option:</td> <td>H, tropicalized</td> </tr> </table>	Standard:	F, tropicalized	Option:	H, tropicalized		
Standard:	F, tropicalized						
Option:	H, tropicalized						
Motor protection	<table border="1"> <tr> <td>Standard:</td> <td>3-phase and 1-phase AC current motors: PTC thyristors (according to DIN 44082) DC motors: Without</td> </tr> <tr> <td>Option:</td> <td>Thermoswitches (NC) in the actuator and in the thermal overload relay of controls</td> </tr> </table>	Standard:	3-phase and 1-phase AC current motors: PTC thyristors (according to DIN 44082) DC motors: Without	Option:	Thermoswitches (NC) in the actuator and in the thermal overload relay of controls		
Standard:	3-phase and 1-phase AC current motors: PTC thyristors (according to DIN 44082) DC motors: Without						
Option:	Thermoswitches (NC) in the actuator and in the thermal overload relay of controls						
Self-locking	Self-locking: Output speeds up to 90 rpm (50 Hz), 108 rpm (60 Hz) NOT Self-locking: Output speeds up to 125 rpm (50 Hz), 150 rpm (60 Hz) Multi-turn actuators are self-locking, if the valve position cannot be changed from standstill while torque acts upon the output drive.						
Motor heater (option)	<table border="1"> <tr> <td>Voltages:</td> <td>110 – 120 V AC, 220 – 240 V AC or 400 V AC (externally supplied)</td> </tr> <tr> <td colspan="2">Power depending on the size 12.5 – 25 W</td> </tr> </table>	Voltages:	110 – 120 V AC, 220 – 240 V AC or 400 V AC (externally supplied)	Power depending on the size 12.5 – 25 W			
Voltages:	110 – 120 V AC, 220 – 240 V AC or 400 V AC (externally supplied)						
Power depending on the size 12.5 – 25 W							
Manual operation	<table border="1"> <tr> <td colspan="2">Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.</td> </tr> <tr> <td>Option:</td> <td> Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm </td> </tr> </table>	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.		Option:	Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm		
Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.							
Option:	Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm						
Indication for manual operation (option)	Indication whether manual operation is active/not active via single switch (1 change-over contact)						

Features and functions		
Valve attachment	Standard:	B1 according to EN ISO 5210
	Option:	A, B2, B3, B4 according to EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338
	Special output drive types: AF, AK, AG, B3D, ED, DD, IB1, IB3 A prepared for permanent lubrication of stem	

Electromechanical control unit		
Limit switching	Counter gear mechanism for end positions OPEN and CLOSED Turns per stroke: 2 to 500 (standard) or 2 to 5,000 (option)	
	Standard:	Single switches (1 NC and 1 NO) for each end position, not galvanically isolated
	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 switches (1 NC and 1 NO) for each direction, 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 (EWG/RWG)	
Mechanical position indicator (option)	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED	
Running indication	Blinker transmitter (option for modulating actuators)	
Heater in switch compartment	Standard:	Self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC
	Options:	24 – 48 V AC/DC or 380 – 400 V AC
	A resistance type heater of 5 W, 24 V AC is installed in the actuator in combination with AM or AC actuator controls.	

Technical data for limit and torque switches	
Mechanical lifetime	2×10^6 starts
Silver plated contacts:	
U min.	24 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, $L/R = 3 \mu s$) 7 A at 30 V (resistive load) 5 A at 30 V (inductive load, $L/R = 3 \mu s$)
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, $\cos \phi \approx 0.8$)
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)

Service conditions	
Use	Indoor and outdoor use permissible
Mounting position	Any position
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level, on request
Ambient temperature	Standard: -40 °C to +40 °C/+60 °C
	Options: -50 °C to +40 °C/+60 °C (1-phase AC motors) -60 °C to +40 °C/+60 °C (3-phase AC motors)
	For exact version, refer to actuator name plate.
Enclosure protection according to EN 60529	Standard: IP68 For special motors differing enclosure protection: refer to name plate.
	Option: DS Terminal compartment additionally sealed against interior (double sealed)
	According to AUMA definition, enclosure protection IP68 meets the following requirements: <ul style="list-style-type: none"> • Depth of water: Maximum 8 m head of water • Duration of continuous immersion in water: Maximum 96 hours • Up to 10 operations during continuous immersion Modulating duty is not possible during continuous immersion.
	For actual version, refer to actuator name plate.
Pollution degree	Pollution degree 4 (when closed) according to EN 50178
Vibration resistance according to IEC 60068-2-6	2 g, from 10 to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid for multi-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls). Not valid in combination with gearboxes.
Corrosion protection	Standard: KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option: KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
	KX-G: Same as KX, however aluminium-free version (outer parts)
Finish coating	Powder coating Two-component iron-mica combination
Colour	Standard: AUMA silver-grey (similar to RAL 7037)
	Option: Other colours are possible on request.
Lifetime	AUMA multi-turn actuators meet or even exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.

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

13.2. Technical data Actuator controls

Features and functions	
Explosion protection	Standard: Standard version (ATEX): <ul style="list-style-type: none"> • II2G Ex de IIC T4 or T3 • II2D Ex tb IIIC T130 °C or T190 °C Db IP6x Standard version (IECEX): <ul style="list-style-type: none"> • Ex de IIC T4 or T3 • Ex tb IIIC T130 °C or T190 °C Db IP6x
	For actual version, refer to actuator name plate
EC type examination certificate	In combination with SAEx: DEKRA 11ATEX0008 X
Mains voltage, mains frequency	Refer to name plates at controls and motor Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 % Current consumption of controls depending on mains voltage: 100 to 120 V AC = max. 575 mA 208 to 240 V AC = max. 275 mA 380 to 690 V AC = max. 160 mA
External supply of the electronics (option)	24 V DC +20 % / -15 % Current consumption: Basic version approx. 200 mA, with options up to 500 mA
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	Standard: Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2
	Options: Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2 with additional contacts, 1 NC + 1 NO each
	Thyristor unit for mains voltage up to 600 V AC (recommended for modulating actuators) for AUMA power classes B1, B2 and B3
	Reversing contactors are designed for a lifetime of 2 million starts. For applications requiring a high number of starts, we recommend using thyristor units. For the assignment of AUMA power classes, please refer to Electrical data pertaining to the actuator
Control	Standard: Control inputs 24 V DC, OPEN, STOP, CLOSE (via opto-isolator, one common), current consumption: approx. 10 mA per input Respect min. pulse duration for modulating actuators
	Option: Control inputs 115 V AC, OPEN, STOP, CLOSE, EMERGENCY (via opto-isolator, one common), current consumption: approx. 15 mA per input
Status signals	Standard: 5 output contacts with gold-plated contacts: <ul style="list-style-type: none"> • 4 potential-free NO contacts with one common, max. 250 V AC, 0.5 A (resistive load) <ul style="list-style-type: none"> - Default configuration: End position CLOSED, end position OPEN, selector switch REMOTE, selector switch LOCAL • 1 potential-free change-over contact, max. 250 V AC, 0.5 A (resistive load) <ul style="list-style-type: none"> - Default configuration: Collective fault signal (torque fault, phase failure, motor protection tripped)
	Options: <ul style="list-style-type: none"> • Signals in connection with positioner: <ul style="list-style-type: none"> - End position OPEN, end position CLOSED (requires tandem switches within actuator), selector switch REMOTE, selector switch REMOTE, selector switch LOCAL via level 2 of selector switch • 1 potential-free change-over contact, max. 250 V AC, 0.5 A (resistive load) <ul style="list-style-type: none"> - Default configuration: Collective fault signal (torque fault, phase failure, motor protection tripped)
Voltage output	Standard: Auxiliary voltage 24 V DC ±5 %, max. 50 mA for supply of control inputs, galvanically isolated from internal voltage supply.
	Option: Auxiliary voltage 115 V AC, max. 30 mA for supply of control inputs, galvanically isolated from internal voltage supply

Features and functions		
Local controls	Standard:	Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) Push buttons OPEN, STOP, CLOSE 3 indication lights: End position CLOSED (yellow), collective fault signal (red), end position OPEN (green)
	Options:	Special colours for the 3 indication lights Protection cover, lockable
Functions	Standard:	Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED
		Overload protection against excessive torques across the whole travel
		Excessive torque (torque fault) can be excluded from collective fault signal.
		Phase failure monitoring with automatic phase correction
		Push-to-run operation or self-retaining in REMOTE
		Push-to-run operation or self-retaining in LOCAL
Motor protection evaluation	Standard:	Monitoring of the motor temperature with PTC tripping device in combination with PTC thermistors in the actuator motor
	Options:	Additional thermal overload relay in controls combined with thermostats within actuator Thermal overload relay in combination with thermostats in the actuator motor
Electrical connection	Standard:	Ex plug/socket connector with screw-type terminals (KP)
	Options:	Ex plug/socket connector with terminal blocks (KES), increased safety Ex e Ex plug/socket connector with terminal blocks (KES), flameproof enclosure Ex d
Threads for cable entries	Standard:	Metric threads
	Options:	Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate	

Further options for version with EWG/RWG in actuator	
Position feedback signal (option)	Analogue output E2 = 0/4 – 20 mA (load max. 500 Ω)

Service conditions		
Use	Indoor and outdoor use permissible	
Mounting position	Any position	
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level on request	
Ambient temperature	Standard:	–40 °C to +40 °C/+60 °C
	Options:	–60 °C to +40 °C/+60 °C, extreme low temperature version Low temperature versions incl. heating system for connection to external power supply 230 V AC or 115 V AC.
	For exact 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 Terminal compartment additionally sealed against interior (double sealed)
	According to AUMA definition, enclosure protection IP68 meets the following requirements:	
	<ul style="list-style-type: none"> • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours 	
For exact version, refer to actuator controls name plate.		
Pollution degree	Pollution degree 4 (when closed)	
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. Not valid in combination with gearboxes.	

Service conditions		
Corrosion protection	Standard:	KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
		KX-G: Same as KX, however aluminium-free version (outer parts)
Finish coating	Powder coating Two-component iron-mica combination	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Other colours available on request

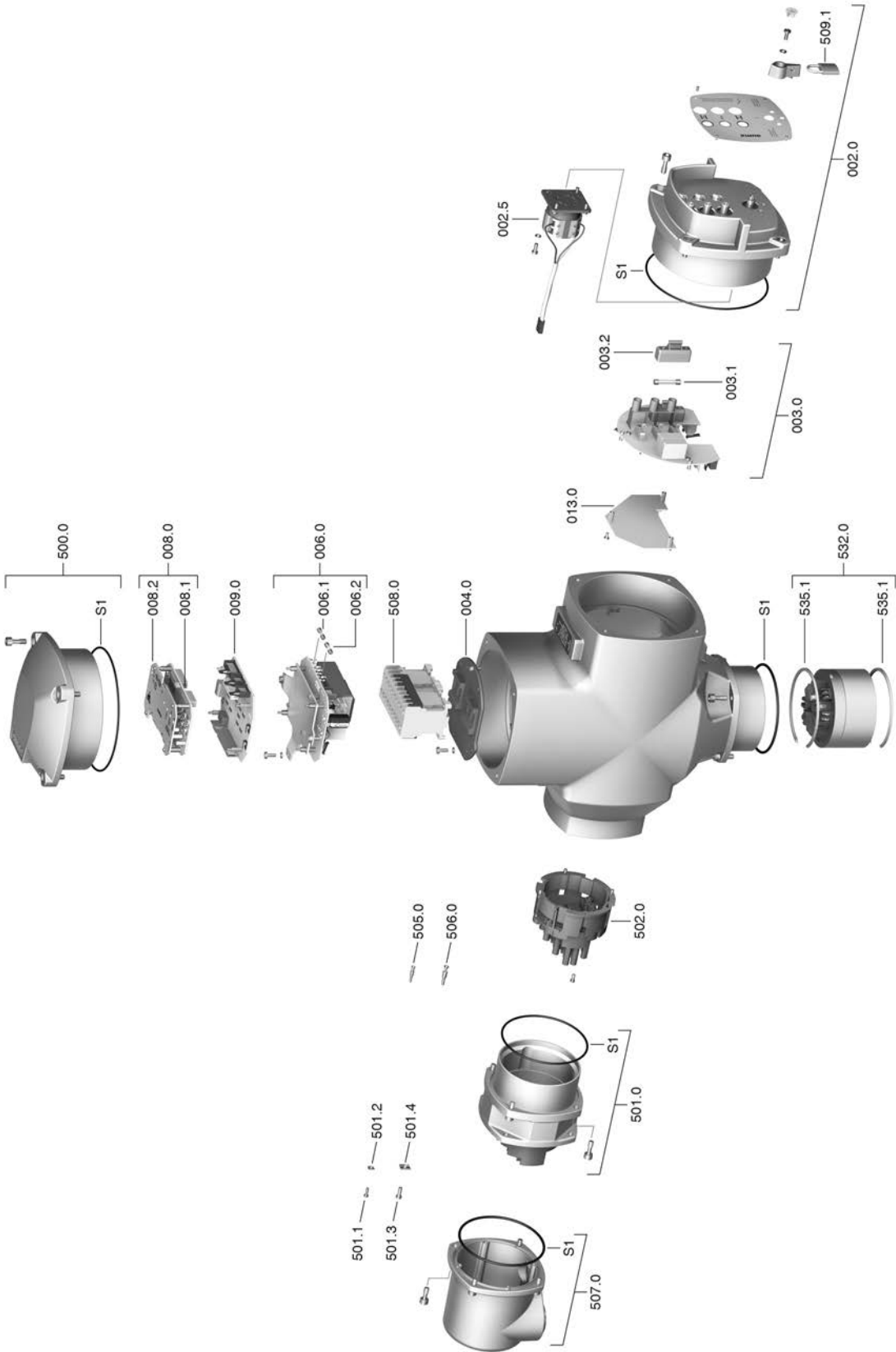
Wall bracket	AM mounted separately from the actuator, including plug/socket connector. Connecting cable on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service. Cable length between actuator and AM max. 100 m. Not suitable for version with potentiometer in the actuator. Instead of the potentiometer, the actuator has to be provided with EWG.
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Further information	
Weight	Approx. 12 kg (including Ex-plug/socket connector and terminal board)
EU Directives	ATEX Directive: (94/9/EC) Electromagnetic Compatibility (EMC): (2004/108/EC) Low Voltage Directive: (2006/95/EC) Machinery Directive: (2006/42/EC)

Information: Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Delivered spare parts may slightly vary from the representation in these instructions.

Ref. no.	Designation	Type	Ref. no.	Designation	Type
002.0	Bearing flange	Sub-assembly	535.1	Snap ring	
003.0	Hollow shaft	Sub-assembly	539.0	Screw plug	Sub-assembly
005.0	Drive shaft	Sub-assembly	542.0	Handwheel with ball handle	Sub-assembly
005.1	Motor coupling		549.0	Output drive type B1/B3/B4/E	Sub-assembly
005.3	Manual drive coupling		549.1	Output drive sleeve B1/B3/B4/C	
009.0	Planetary gearing for manual drive	Sub-assembly	553.0	Mechanical position indicator	Sub-assembly
017.0	Torque lever	Sub-assembly	554.0	Socket carrier for motor plug/socket connector with cable harness	Sub-assembly
018.0	Gear segment		556.0	Potentiometer for position transmitter	Sub-assembly
019.0	Crown wheel		556.1	Potentiometer without slip clutch	Sub-assembly
022.0	Drive pinion II for torque switching	Sub-assembly	557.0	Heater	Sub-assembly
023.0	Output drive wheel for limit switching	Sub-assembly	558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
024.0	Drive wheel for limit switching	Sub-assembly	559.0-1	Control unit with torque switching heads and switches	Sub-assembly
025.0	Locking plate	Sub-assembly	559.0-2	Control unit with magnetic limit and torque transmitter (MWG) for Non-intrusive version in combination with AUMATIC integral controls	Sub-assembly
058.0	Wire for protective earth	Sub-assembly	560.0-1	Switch stack for direction OPEN	Sub-assembly
070.0	Motor (VD motor incl. ref. no. 079.0)	Sub-assembly	560.0-2	Switch stack for direction CLOSE	Sub-assembly
079.0	Planetary gearing for motor drive (SA/SAR 07.2 – SA/SAR 16.2 for VD motor)	Sub-assembly	560.1	Switch for limit/torque	Sub-assembly
155.0	Reduction gearing	Sub-assembly	560.2	Switch case	
500.0	Cover	Sub-assembly	566.0	Position transmitter EWG/RWG	Sub-assembly
501.0	Ex plug/socket connector with screw-type terminals (KP, KPH)	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	Sub-assembly
501.1	Screw – Control terminal		566.2	Position transmitter board for RWG	Sub-assembly
501.2	Washer – Control terminal		566.3	Wires for RWG	Sub-assembly
501.3	Screw – Power terminal		567.1	Slip clutch for potentiometer	Sub-assembly
501.4	Washer – Power terminal		568.1	Stem protection tube (without cap)	
502.1	Pin carrier (without pins)	Sub-assembly	568.2	Cap for stem protection tube	
505.0	Pin for controls	Sub-assembly	568.3	V-seal	
506.0	Pin for motor	Sub-assembly	575.1	Stem nut type A	
507.0	Cover for electrical connection	Sub-assembly	583.0	Motor coupling on motor shaft	Sub-assembly
511.0	Threaded plug	Sub-assembly	583.1	Pin for motor coupling	
514.0	Output drive type A (without stem nut)	Sub-assembly	584.0	Retaining spring for motor coupling	Sub-assembly
514.1	Axial needle roller bearing	Sub-assembly	7003	Radial seal for output drive type A with ISO	
516.0	Output drive type D	Sub-assembly	S1	Seal kit, small	Set
			S2	Seal kit, large	Set

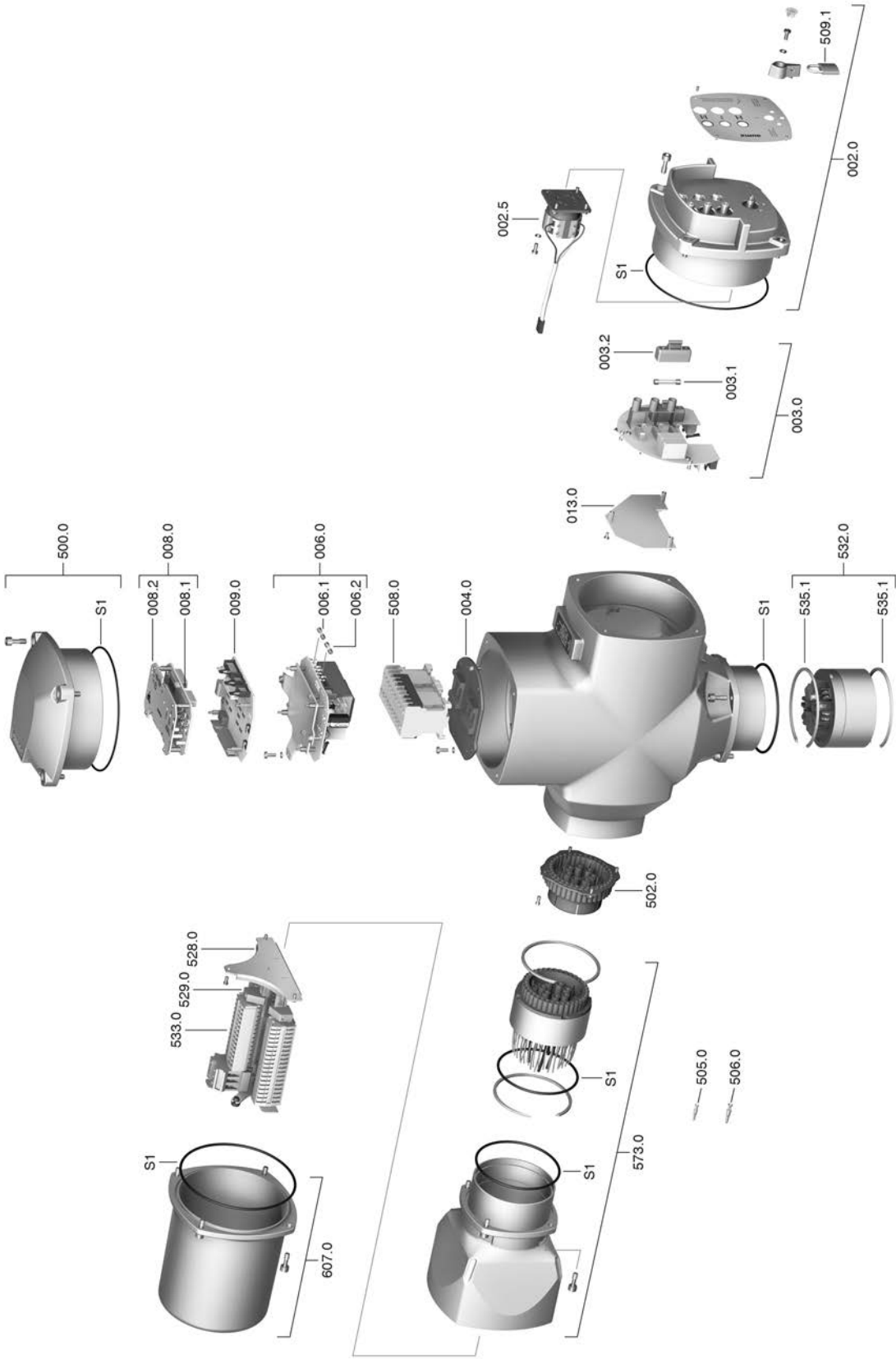
14.2. Actuator controls AUMA MATIC AMExC 01.1 via Ex plug/socket connector with screw-type terminals (KP, KPH)



Information: Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Delivered spare parts may slightly vary from the representation in these instructions.

Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.5	Selector switch	Sub-assembly
003.0	Signal and control board	Sub-assembly
003.1	Primary fuse F1/F2	Sub-assembly
003.2	Fuse cover	Sub-assembly
004.0	Carrier for contactors	Sub-assembly
006.0	Power supply	Sub-assembly
006.1	Secondary fuse F3	
006.2	Secondary fuse F4	
008.0	Interface board	Sub-assembly
008.1	Interface board	
008.2	Cover plate for interface board	
009.0	Logic board	Sub-assembly
013.0	Adapter board	Sub-assembly
500.0	Cover	Sub-assembly
501.0	Ex plug/socket connector with screw-type terminals (KP, KPH)	Sub-assembly
501.1	Screw for control terminal	
501.2	Washer for control terminal	
501.3	Screw for power terminal	
501.4	Washer for power terminal	
502.0	Pin carrier without pins	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Cover for electrical connection	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
532.0	Line bushing (actuator connection)	Sub-assembly
535.1	Retaining ring	
S	Seal kit	Set

14.3. Actuator controls AUMA MATIC AMExC 01.1 via Ex plug/socket connector with terminal blocks (KES)



Information: Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Delivered spare parts may slightly vary from the representation in these instructions.

Ref. no.	Designation	Type
002.0	Local controls	Sub-assembly
002.5	Selector switch	Sub-assembly
003.0	Signal and control board	Sub-assembly
003.1	Primary fuse F1/F2	
003.2	Fuse cover	
004.0	Carrier for contactors	Sub-assembly
006.0	Power supply	Sub-assembly
006.1	Secondary fuse F3	
006.2	Secondary fuse F4	
008.0	Interface board	Sub-assembly
008.1	Interface board	Sub-assembly
008.2	Cover plate for interface board	
009.0	Logic board	Sub-assembly
013.0	Adapter 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	
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End clamp	
532.0	Line bushing (actuator connection)	Sub-assembly
533.0	Terminals for motor/controls	
535.1	Retaining ring	
573.0	Ex plug/socket connector with terminal blocks (KES)	Sub-assembly
607.0	Cover	Sub-assembly
S	Seal kit	Set

15. Certificates

15.1. Declaration of Incorporation and EC Declaration of Conformity

AUMA Riester GmbH & Co. KG Tel +49 7631 809-0
Aumastr. 1 Fax +49 7631 809-1250
79379 Müllheim, Germany Riester@auma.com
www.auma.com



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 Müllheim

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

Müllheim, 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

15.2. ATEX certificate



CERTIFICATE

(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 11ATEX0008 X** Issue Number: **4**

(4) **Equipment:** Multi-Turn actuator, Types SA.Ex 07.2 to SA.Ex 16.2 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/ExTR11.0044/**.

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

EN 60079-0 : 2012	EN 60079-1 : 2007	EN 60079-7 : 2007	EN 60079-11 : 2012
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 or Ex d ... IIB T4 or T3 Gb
 II 2 (3) G Ex d ... [... Gc] IIC T4 or T3 Gb or Ex d ... [... Gc] IIB T4 or T3 Gb
 II 2 D Ex tb IIIC T130 °C or T190 °C Db IP6x

This certificate is issued on 17 June 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

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(13) **SCHEDULE**
(14) to EC-Type Examination Certificate DEKRA 11ATEX0008 X Issue No. 4

Optional integral controls:

AM Ex C 01 . 1
I II III IV V

Designation	Description	Value	Explanation
I	Controls indicator	AM AMB SEM AC	AUMA MATIC AUMA MATIC Basic AUMA SEMIPACT AUMATIC
II	Area classification	Ex	For use in explosive atmospheres
III	Equipment group	C	Group IIC / Group IIC
IV	Size	01	Indicator for standardized actuator sizes
V	Design series	1 2	Design series 1 Design series 2, ACEXC controls only

Versions without optional integral controls are called AUMA NORM.

Thermal data

Ambient temperature range:

-60 °C to +60 °C or
-20 °C to +60 °C for actuators with a 1 phase motor or
-20 °C to +60 °C for integral controls ACEXC 01.1 with cylindrical joint and special fasteners
M5/IMB.

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

Marking

The marking of the multi-turn actuators types SA Ex 07.2 to SA Ex 16.2 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
	KP, KPH and KES	RWG5020.2Ex	II 2 G Ex d Ib IIC T4 or T3 Gb
	KES-Exd	RWG5020.2Ex	II 2 G Ex d e IIC T4 or T3 Gb
FISCO	KES-Exd	--	II 2(3) G Ex d Ib IIC T4 or T3 Gb
	KP, KPH and KES	RWG5020.2Ex	II 2(3) G Ex d Ib IIC T4 or T3 Gb
	KES-Exd	RWG5020.2Ex	II 2(3) G Ex d e Ib IIC T4 or T3 Gb
FNICO	KP, KPH and KES	--	II 2(3) G Ex d Ib [nL Gc] IIC T4 or T3 Gb
	KES-Exd	RWG5020.2Ex	II 2(3) G Ex d Ib [nL Gc] IIC T4 or T3 Gb
	KP, KPH and KES	RWG5020.2Ex	II 2(3) G Ex d e Ib [nL Gc] IIC T4 or T3 Gb



(13) **SCHEDULE**
(14) to EC-Type Examination Certificate DEKRA 11ATEX0008 X Issue No. 4

(15) **Description**

The Multi-turn actuators, types SA Ex 07.2 to SA Ex 16.2 in version AUMA NORM comprise a motor, a switch compartment and a terminal compartment.
In versions AUMA SEMIPACT, AUMA MATIC and AUMATIC the actuators comprise a motor, a switch compartment, integral controls and a terminal compartment.

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 PTC thermistors (these for 3-phase AC motors and one for 1-phase AC motors) integrated in each winding and a suitable electronics device for switching off in case of over temperature.
3-phase motors are classified for group IIC and 1-phase motors for group IIB.

The switch compartment is in type of protection Ex d and may optionally be provided with position transmitter type RWG5020.2Ex in type of protection Ex tb (EC-Type Examination Certificate PTB 03.ATEX 2176).

Terminal compartment type KES-Ex d is in type of protection Ex d. Terminal compartments type 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 Fieldbus interface in type of protection Ex nL according to FNICO and/or a Fieldbus interface in type of protection Ex ic according to FISCO.
The integral control type AUMATIC ACEXC 01.2 may optionally be provided with a Fieldbus interface in type of protection Ex ic according to FISCO.

The integral controls in type of protection Ex d may optionally be installed to a wall-bracket type WH 01.1. The electrical connections are in type of protection Ex d or in type of protection Ex e.

All Multi-turn actuators are in type of protection Ex tb for use in explosive dust atmospheres.

Type designation

Multi-turn actuator:

SA . Ex 07.2 - F07
I II III IV V

Designation	Description	Value	Explanation
I	General	SA	Multi-turn actuator
II	Duty	none R	Open close duty Modulating duty
III	Area classification	Ex	For use in environments containing flammable gas / vapour / combustible dust substances.
IV	Actuator size	07.2 / 07.6 10.2 14.2 / 14.6 / 16.2	Indicator for standardized actuator sizes
V	Flange size	F**	Indicator for standardized flange sizes



(13) **SCHEDULE**
(14) to EC-Type Examination Certificate DEKRA 11ATEX0008 X Issue No. 4

- 3-phase AC squirrel cage motor
 Motor voltage: 690 V max.
 Motor current: 23 A max.
 Control voltage: 230 V max.
 Control current: 5 A max.
 Frequency: 50/60 Hz
 Isolation class: F or H
 Operation type: S2 - ... min.
 S4 - ... % ED
 S5 - ... % ED
- 1-phase AC asynchronous motor
 Motor voltage: 240 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
 Operation type: S2 - ... min.
 S4 - ... % ED
 S5 - ... % ED

Position Transmitter 4...20 mA, type RWG5020.2EX:
 in type of protection intrinsic safety Ex ib IIC, only for connection to a certified intrinsically safe circuit, with following maximum values
 U_i = 28,5 V, I_i = 200 mA, P_i = 0,9 W, C_i and L_i are negligibly small.

The electronic position transmitter is considered as being earthed in terms of safety.

Fieldbus interfaces of ALUMATIC ACEXC 01.1 and ACEXC 01.2:
 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/DEKEXTR11.0044/**.
- (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 NL/DEKEXTR11.0044/**.



(13) **SCHEDULE**
(14) to EC-Type Examination Certificate DEKRA 11ATEX0008 X Issue No. 4

The marking of the Multi-turn actuators Types SA.Ex.07.2 to SA.Ex.14.6 with 1-ph motors for use in explosive gas atmospheres includes the following:

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

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

Electrical data

3-phase AC motor:

Actuator size	Motor size	Power ¹⁾
SA.Ex.07.2	ADX / VDX 63	0.02 – 0.30 kW
SA.Ex.07.6 ²⁾	ADX / VDX 63	0.03 – 0.50 kW
SA.Ex.10.2	ADX / VDX 71	0.06 – 1.00 kW
SA.Ex.14.2	ADX / VDX 90	0.12 – 1.80 kW
SA.Ex.14.6 ²⁾	ADX / VDX 90	0.20 – 3.30 kW
SA.Ex.16.2	ADX / VDX 112	0.40 – 6.00 kW

1-phase AC motor:

Actuator size	Motor size	Power ¹⁾
SA.Ex.07.2	AEX / ACX / VEX 48	0.02 – 0.30 kW
SA.Ex.07.6 ²⁾	AEX / ACX / VEX 48	0.03 – 0.50 kW
SA.Ex.10.2	VEX 48	0.06 – 0.25 kW
SA.Ex.14.2 ²⁾	ACX / VEX 56	0.04 – 1.00 kW
SA.Ex.14.6	VEX / VEX 56	0.12 – 0.80 kW

1) Nominal power at operating torque (corresponds to approx. 35% of maximum torque).
 2) Size SA.Ex.07.6 is identical in design with SA.Ex.07.2, while SA.Ex.07.6 has a higher drive power. The same is applicable for the actuators SA.Ex.14.2 and SA.Ex.14.6.

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