



Multi-turn actuators

SAEx 25.1 – SAEx 40.1

SAREx 25.1 – SAREx 30.1

Control unit - electromechanical
with actuator controls

AUMATIC ACExC 01.2 Intrusive

Control

Parallel

Profibus DP

→ Modbus

Foundation Fieldbus



Read operation instructions first.

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

Purpose of the document:

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

Reference documents:

- Manual (Operation and setting) AUMATIC AC 01.2 Modbus
- Manual (Device integration Fieldbus) AUMATIC AC 01.2 Modbus

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:</p> <ul style="list-style-type: none">• Standards and directives such as IEC/EN 60079 "Electrical apparatus for explosive atmospheres" –<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).• Applicable configuration guidelines for fieldbus applications. |
| Safety instructions/warnings | <p>All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.</p> |
| Qualification of staff | <p>Assembly, electrical connection, commissioning, operation, and maintenance must be carried out 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.

M ▶ **Via the menu to parameter**

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

< > **Reference to other sections**

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

2. Identification

2.1. Name plate

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

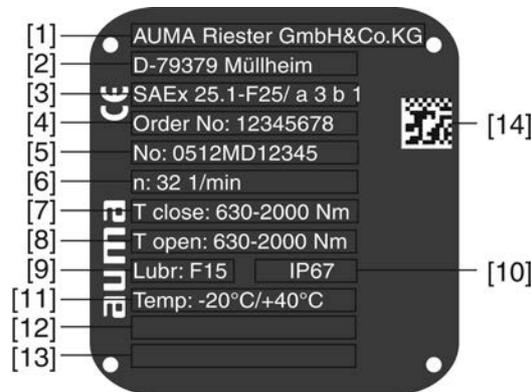
Figure 1: Arrangement of name plates



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

Actuator name plate

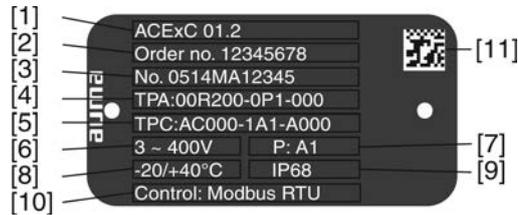
Figure 2: Actuator name plate (example)



- [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**

Actuator controls name plate

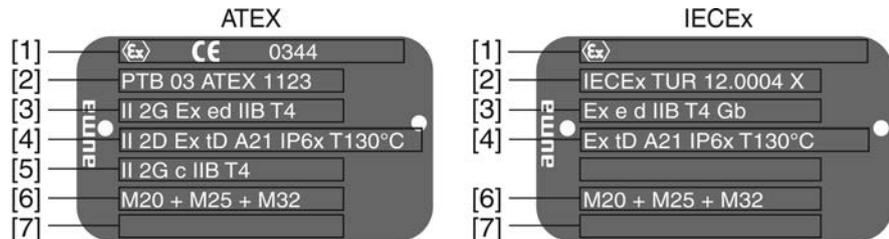
Figure 3: Actuator controls name plate



- [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

Explosion protection approval plate

Figure 4: Approval plates in explosion-proof version (examples)

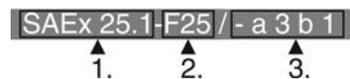


- [1] Ex symbol, CE mark, number of test authority
- [2] Ex certificate (number)
- Classification:**
- [3] Electrical gas explosion protection
- [4] Electrical dust explosion protection
- [5] Non-electrical explosion protection
- [6] Threads for line bushings at electrical connection
- [7] Not used

Descriptions

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 25.1, 30.1, 35.1, 40.1 = multi-turn actuators for open-close duty

SAREx 25.1, 30.1 = multi-turn actuators for modulating duty

ACExC 01.2 = actuator controls AUMATIC

Ex marking

Table 1: Marking for explosion protection (with example)

| | | | | | | |
|--|---|---|---|---|---|--|
| / | - | a | 3 | b | 1 | |
| 1st position: Not used | | | | | | |
| | - | | | | | |
| 2nd position: Motor type | | | | | | |
| | | a | ADX or VDX: 3-phase AC motor | | | |
| | | b | AEX, ACX, VEX and VCX: 1-phase AC motor | | | |
| 3rd position: Protection type of electrical connection | | | | | | |
| | | | 3 | Terminal compartment Ex e increased safety: Types: KP, KPH or KES | | |
| | | | 4 | Terminal compartment Ex d flameproof enclosure: Type: KES-Exd | | |
| 4th position: Protection type of position transmitter | | | | | | |
| | | | a | Without intrinsically safe electric circuit | | |
| | | | b | Electric circuit Ex i Intrinsic safety: Type: RWG 5020.2Ex | | |
| 5th position: Protection type 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 |

Actuator terminal plan 9th position after **TPA**: Position transmitter version

0 = Without position transmitter

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

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

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

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

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 or serial number.

Figure 6: Link to the App store:



Control

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

| Input signal | Description |
|----------------|--------------------------------------|
| Profibus DP-V1 | Control via Profibus DP-V1 interface |
| Profibus DP-V2 | Control via Profibus DP-V2 interface |
| Modbus RTU | Control via Modbus RTU interface |

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

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

Local controls/AUMA CDT Operation, setting, and display can be performed directly at the controls or alternatively from REMOTE via a fieldbus interface.

When set to local control, it is possible to

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

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

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Hovering load!

Risk of death or serious injury.

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

Figure 7: Lifting the actuator using an eyebolt



3.2. Storage

NOTICE

Danger of corrosion due to inappropriate storage!

- Store in a well-ventilated, dry room.
- Protect against floor dampness by storage on a shelf or on a wooden pallet.
- Cover to protect against dust and dirt.
- Apply suitable corrosion protection agent to uncoated surfaces.

NOTICE

Damage on display caused by temperatures below permissible level!

- The AUMATIC actuator controls must NOT be stored below $-30\text{ }^{\circ}\text{C}$.

Long-term storage

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

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

3.3. Packaging

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

4. Assembly

4.1. Mounting position

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

4.2. Handwheel fitting

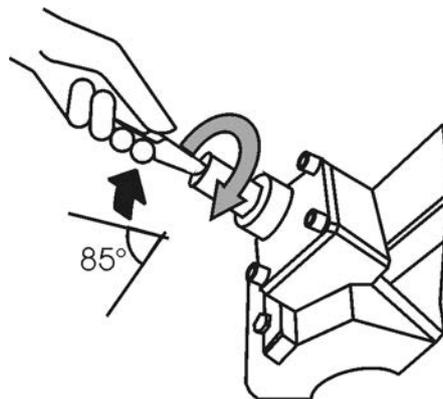
Information For transport purposes, handwheels from a diameter of 400 mm are supplied separately.

NOTICE

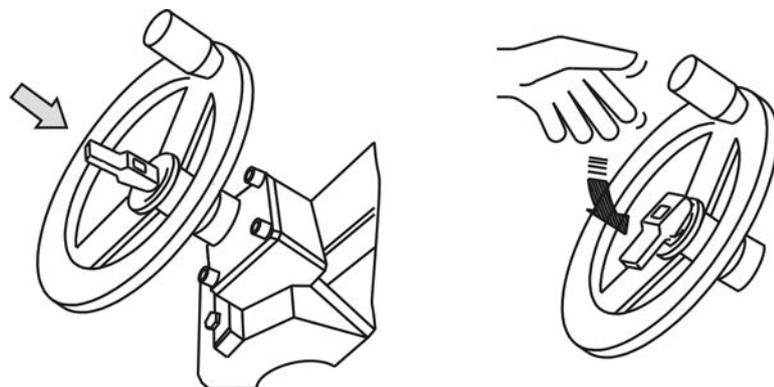
Damage at the change-over mechanism due to incorrect assembly!

- Only pivot change-over lever manually.
- Do NOT use extensions as lever for operation.
- First engage manual operation correctly, then mount handwheel.

1. Manually lift the red change-over lever while slightly turning the shaft back and forth until manual operation engages.
 - ➔ The manual operation is correctly engaged if the change-over lever can be lifted by approx. 85°.



2. Attach handwheel over the red change-over lever then on to the shaft.



3. Release change-over lever (should snap back into initial position by spring action, if necessary, push it back manually).
4. Secure handwheel using the circlip supplied.

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

NOTICE

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

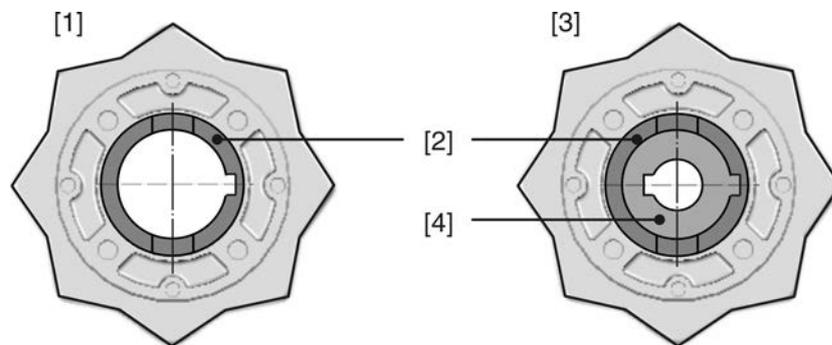
- Touch up damage to paint finish after work on the device.
- After mounting, connect the device immediately to electrical mains to ensure that heater minimises condensation.

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 drives



- [1] Output drive types B1/B2 and B
- [2] Hollow shaft with keyway
- [3] Output drive types B3/B4 and E
- [4] Output drive sleeve/output drive plug sleeve with bore and keyway

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

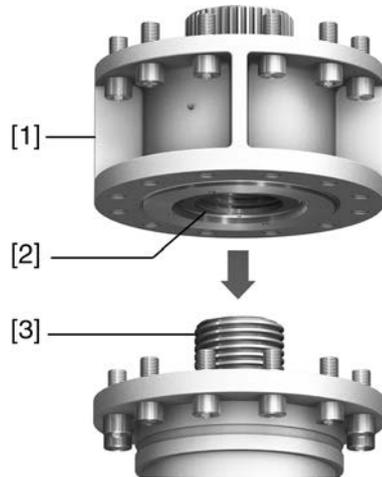
| Screws | Tightening torque T_A [Nm] |
|---------|------------------------------|
| Threads | Strength class 8.8 |
| M16 | 214 |
| M20 | 431 |
| M30 | 1,489 |
| M36 | 2,594 |

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.

Figure 9: Design of output drive type A

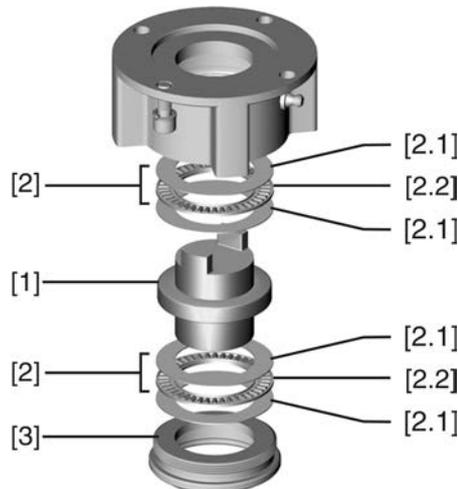


- [1] Output drive type A
- [2] Stem nut with splines
- [3] Stem

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 10: Design of output drive type A



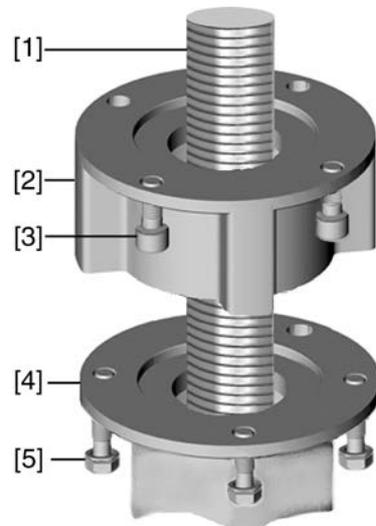
- [1] Stem nut
- [2] Bearing
- [2.1] Bearing race
- [2.2] Bearing rim
- [3] Spigot ring

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].
Information: From sizes A 35.2 – 48.2: Record the order of the bearing races [2.1].
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].
Information: From sizes A 35.2 – 48.2: Respect correct order of bearing races [2.1].
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 11: 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 |
| M16 | 214 |
| M20 | 431 |
| M30 | 1,489 |
| M36 | 2,594 |

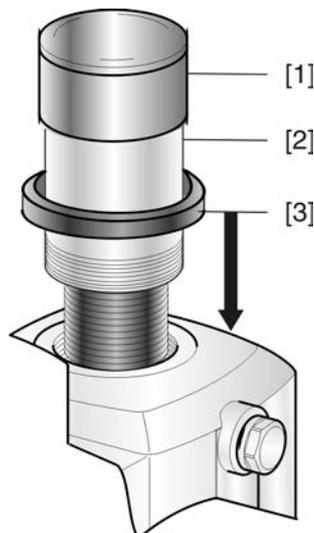
- Turn multi-turn actuator with handwheel in direction OPEN until valve flange and output drive A are firmly placed together.
- Tighten fastening screws [5] between valve and output drive type A crosswise applying a torque according to table.

4.4. Accessories for assembly

4.4.1. Stem protection tube for rising valve stem

— Option —

Figure 12: Assembly of the stem protection tube



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

- Seal thread with hemp, Teflon tape, or thread sealing material.
- Screw stem protection tube [2] into thread and tighten it firmly.
- Push down the sealing ring [3] onto the housing.
- 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 13: Mounting positions A and B

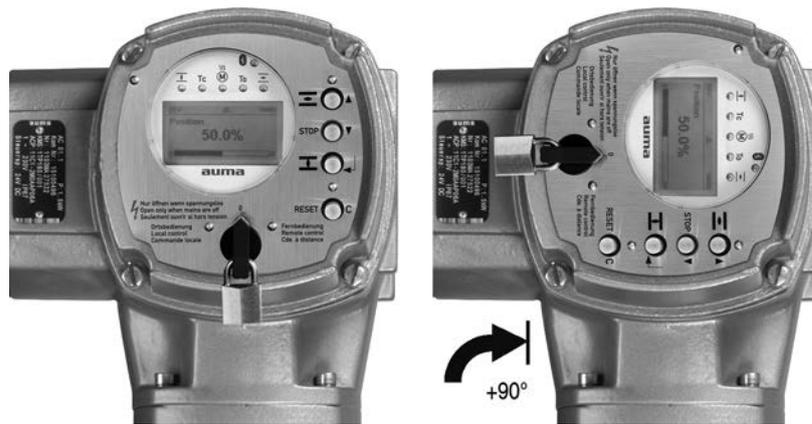
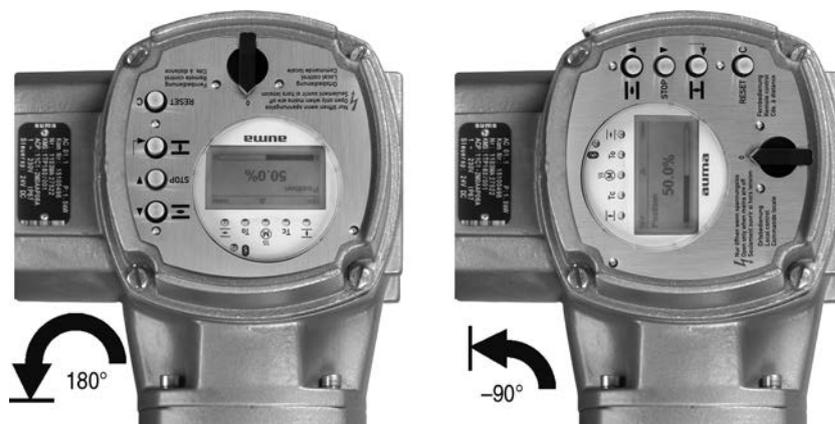


Figure 14: Mounting positions C and D



4.5.1. Mounting positions: modify

WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

NOTICE

Electrostatic discharge ESD!

Risk of damage to electronic components.

- Earth both operators and devices.

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

NOTICE

Cable damage due to twisting or pinching!

Risk of functional failures.

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

4. Fasten screws evenly crosswise.

5. Electrical connection

5.1. Basic information



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>).

Permissible networks (supply networks)

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

Protection on site

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

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

Table 6: Current consumption controls

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

Table 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) |
| Reversing contactor A4 (in the control box) | up to 30 kW | 125A (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.

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

Power supply for the controls (electronics)

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

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.

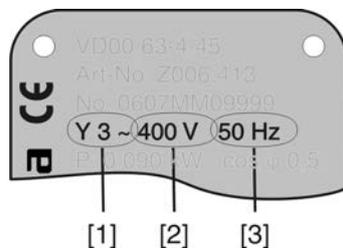
Motor cables are interference sources.

- 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 15: 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.

Bus cables

Only cables complying with the recommendations of EIA 485 specifications should be used for Modbus wiring.

Cable recommendation:

- Impedance: 135 to 165 Ohm, at a measurement frequency between 3 and 20 MHz
- Cable capacity: < 30 pF per metre
- Wire diameter > 0.64 mm
- Wire cross section: 0.34 mm², corresponds to AWG 22
- Loop resistance: < 110 Ohm per km
- Screening: CU shielding braid or shielding braid and shielding foil

Prior to installation, please note:

- Connect maximum 32 devices to one segment.
- If more devices are to be connected:
 - Connect several segments using repeaters.
- Respect a distance of minimum 20 cm between the bus cable and other cables.

- If possible, bus cables should be laid in a separate, conductive, and earthed cable tray.
- Make sure to avoid potential differences between the individual devices on the bus (perform an equipotential earth bonding).

5.2. Connection with control box

For actuators with a high motor current, the electrical connection is made via control box.

The control box is mounted separately on a wall.

Figure 16: Controls with control box



Observe prior to connection

- Cables and required number of wires are indicated in the wiring diagram.
- The cable for motor connection has to be shielded.
- For the power supply cable, fuses have to be provided for short-circuit protection by the customer. The fuses have to be adapted to the cross section of the cable, the thermal overload relay in the control box, the switch contacts and the motor data (refer to motor name plate).

Information Observe <Controls on wall bracket> chapter.

5.3. Motor connection



Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

The power for the motor is connected to separate terminals. For this, the cover at the motor connection compartment [2] has to be removed.

Figure 17: Connection arrangement



- [1] Terminal connection (KR) for control connections
- [2] Motor connection compartment
- [3] Cable entry for motor connection

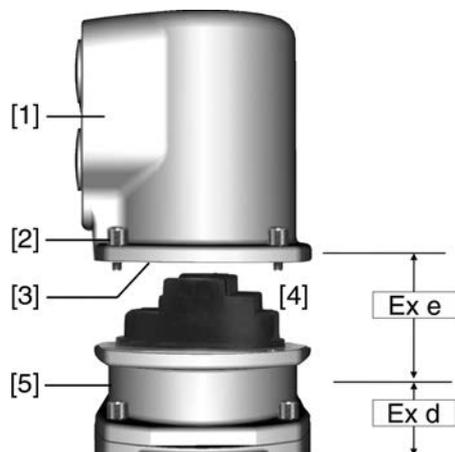
Table 8: Cross sections and tightening torques for motor terminals

| Type | Output speed | Cross sections | Tightening torques |
|-------------------------|--------------|--------------------------|--------------------|
| SAEx 25.1 SAREx 25.1 | 4 – 22 | 0.5 – 16 mm ² | 2.0 Nm |
| | 32 – 90 | 2.5 – 35 mm ² | 3.5 Nm |
| SAEx 30.1 SAREx 30.1 | 4 – 22 | 4 – 16 mm ² | 1.2 – 2.4 Nm |
| | 32 – 45 | 10 – 35 mm ² | 4.0 – 5.0 Nm |
| | 63 – 90 | 16 – 70 mm ² | 6.0 – 12 Nm |
| SAEx 35.1 | 4 – 5.6 | 4 – 16 mm ² | 1.2 – 2.4 Nm |
| | 8 – 22 | 10 – 35 mm ² | 4.0 – 5.0 Nm |
| | 32 – 45 | 16 – 70 mm ² | 6.0 – 12 Nm |
| SAEx 40.1 | 4 – 11 | 10 – 35 mm ² | 4.0 – 5.0 Nm |
| | 16 – 32 | 16 – 70 mm ² | 6.0 – 12 Nm |

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

5.4.1. Terminal compartment: open

Figure 18: Ex plug/socket connector KPH



- [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.

5.4.2. Cable connection

Table 9: 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

NOTICE

Danger of corrosion: Damage due to condensation!

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

1. Remove cable sheathing in a length of 120 – 140 mm.
2. Strip wires.
 - Controls max. 8 mm, motor 12 mm
3. For flexible cables: Use end sleeves according to DIN 46228.
4. Connect cables according to order-related wiring diagram.

Information: Two wires for each connection permitted.

→ When using motor cables with a cross section of 1.5 mm²: Use small clamp washers for connection to terminals U1, V1, W1 and PE (the small clamp washers are provided in the electrical connection cover).



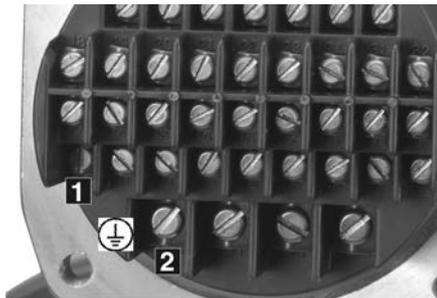
In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

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 19: PE connection

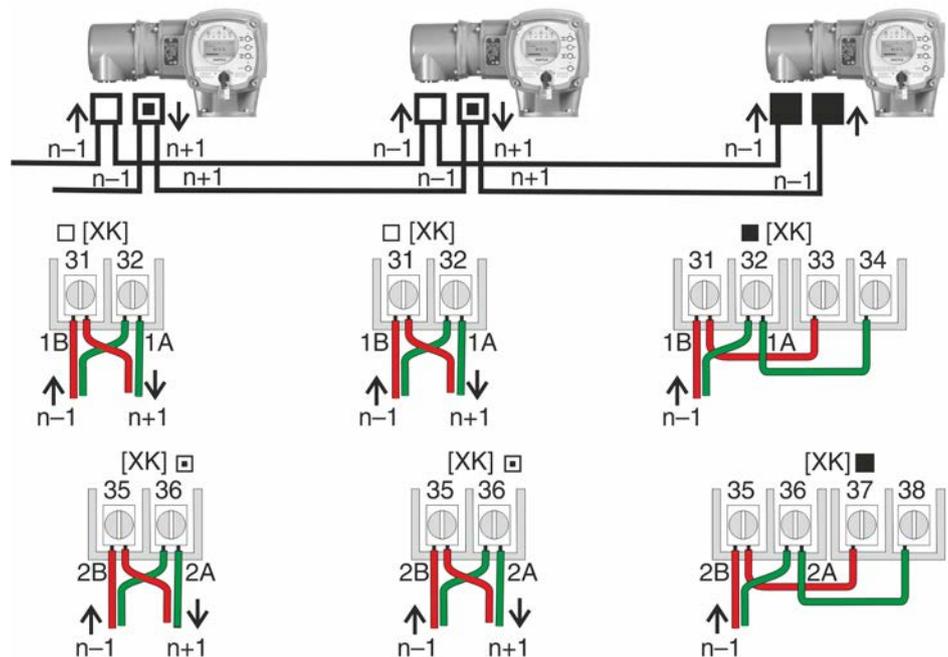


- [1] PE connection, control cable
- [2] PE connection, motor cable

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

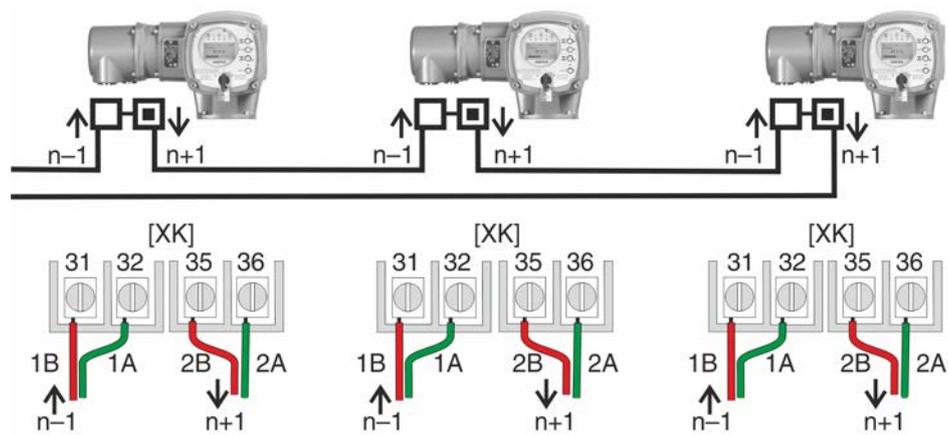
5.4.3. Bus cables: connect

Figure 20: Terminal assignment for line topology (1-channel or 2-channel for AUMA redundancy I or II)



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

Figure 21: Terminal assignment for loop topology (2-channel)



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

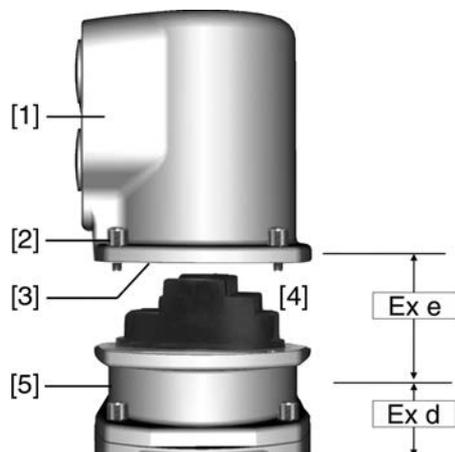
- Information**
- For loop topology, automatic termination is performed as soon as the AUMATIC is connected to the power supply.
 - In case of a power outage of the AUMATIC, the two RS-485 loop segments will be automatically connected so that the actuators following these segments remain available.
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

Connecting bus cables:

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

5.4.4. Terminal compartment: close

Figure 22: Ex plug/socket connector KPH



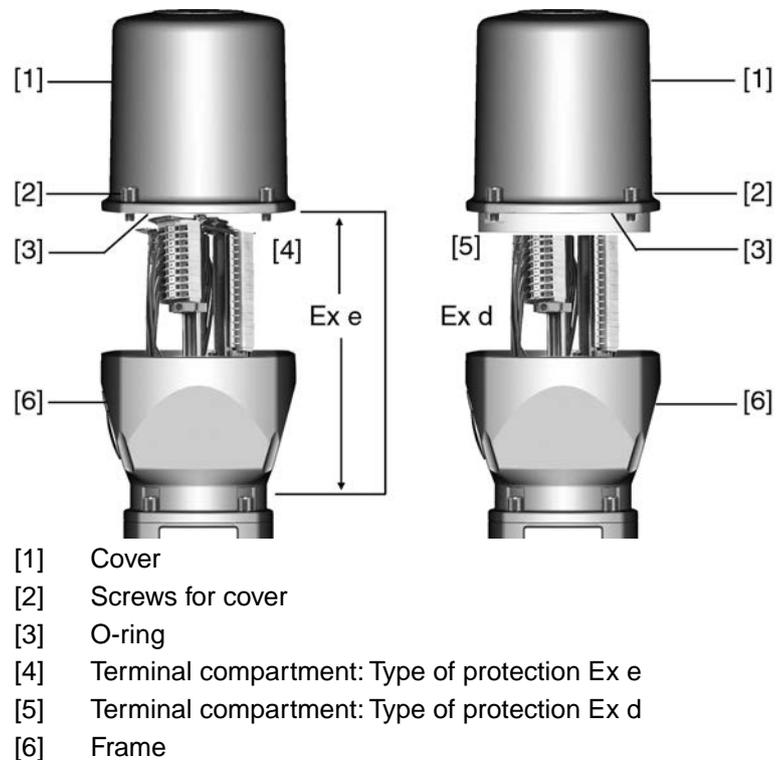
- [1] Cover
- [2] Screws for cover
- [3] O-ring
- [4] Terminal compartment
- [5] Terminal board

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

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

5.5.1. Terminal compartment: open

Figure 23: Ex plug/socket connector: left KES, right KES flameproof



Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove cover [1].
 - ➔ Terminal compartments [4] and [5] are designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure). Hereby, the flameproof interior compartment of the actuator (Ex d) remains closed.
2. Insert cable glands with Ex e approval and suitable for connection cables.
 - ➔ The enclosure protection IP... stated on the name plate is only ensured if suitable cable glands are used. Example: Name plate shows enclosure protection IP68.



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

5.5.2. Cable connection

Table 10: 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

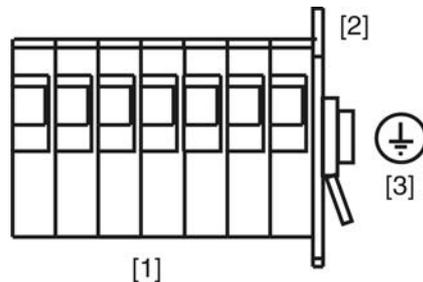
In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

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 24: PE connection

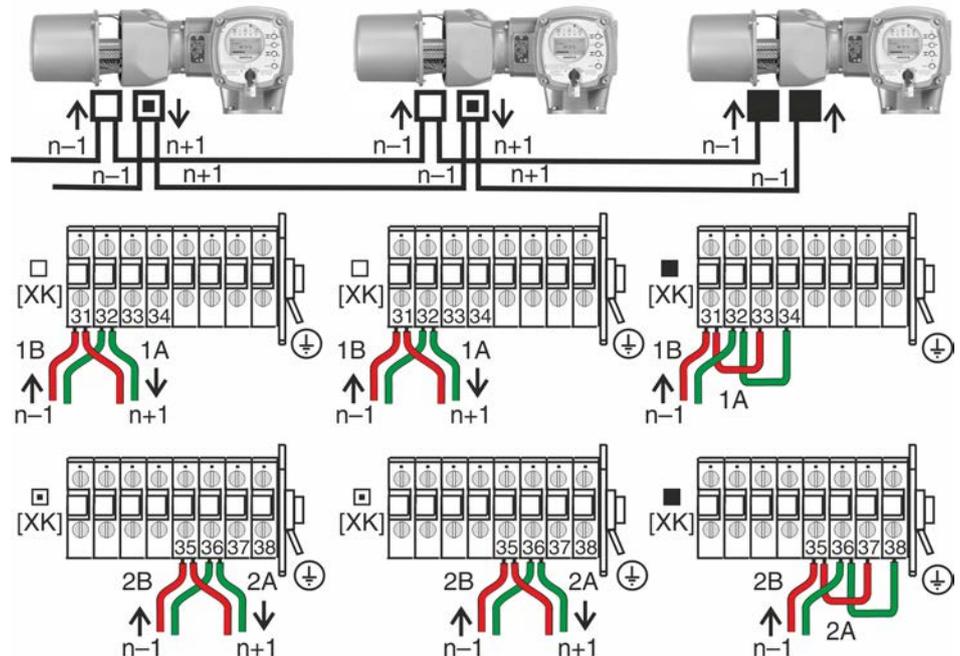


- [1] Terminal blocks
- [2] Terminal housing
- [3] PE connection, symbol: ⊕

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

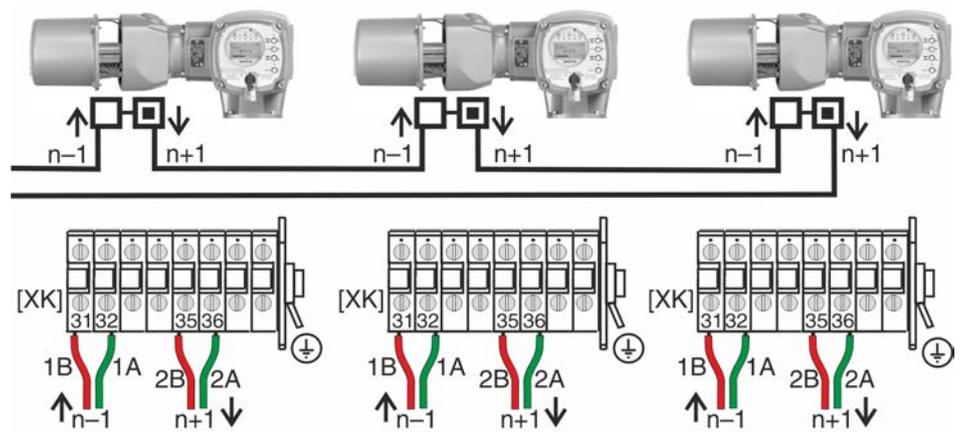
5.5.3. Bus cables: connect

Figure 25: Terminal assignment for line topology (1-channel or 2-channel for AUMA redundancy I or II)



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

Figure 26: Terminal assignment for loop topology (2-channel)



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

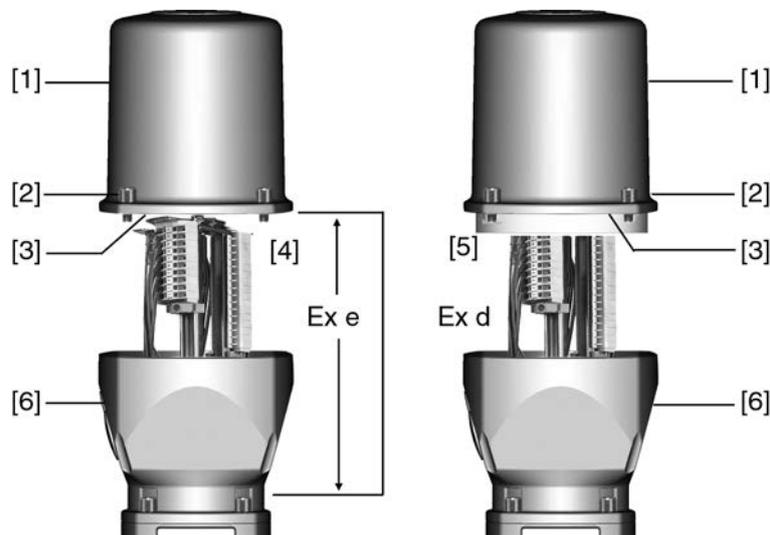
- Information**
- For loop topology, automatic termination is performed as soon as the AUMATIC is connected to the power supply.
 - In case of a power outage of the AUMATIC, the two RS-485 loop segments will be automatically connected so that the actuators following these segments remain available.
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

Connecting bus cables:

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

5.5.4. Terminal compartment: close

Figure 27: 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.

5.6. Accessories for electrical connection

5.6.1. Controls mounted on wall bracket

— Option —

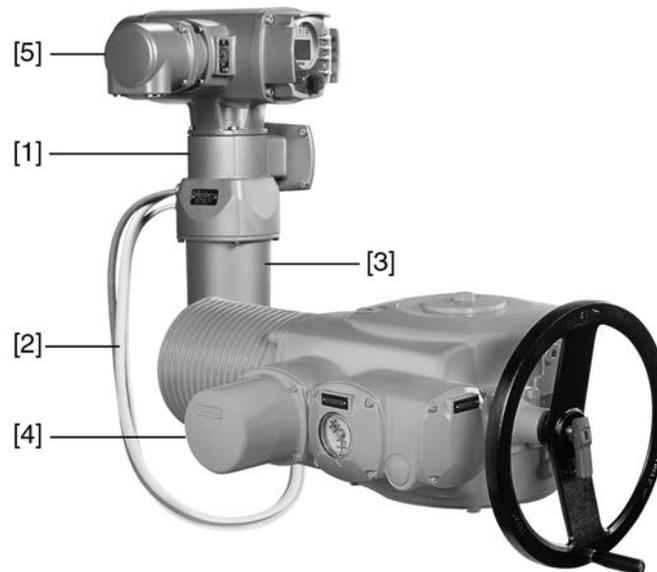
The wall bracket allows separate mounting of controls and actuator.

Application

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

Design

Figure 28: Design principle with wall bracket



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

Observe prior to connection

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

5.6.2. 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 29: Parking frame and Ex plug/socket connector with screw-type terminals (KP/KPH)

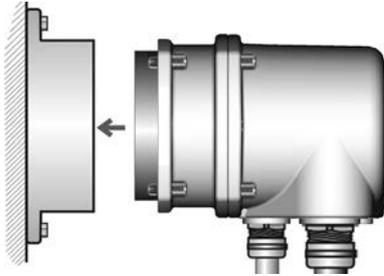
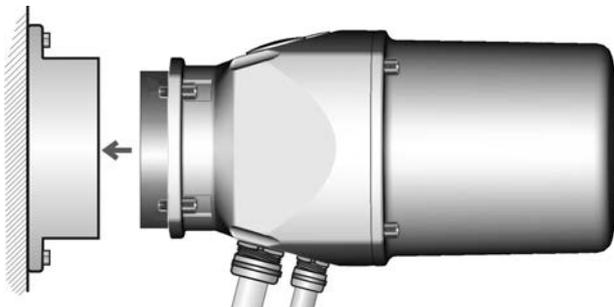


Figure 30: Parking frame and Ex plug/socket connector with terminal blocks (KES)

**5.6.3. 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).

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

Figure 31: Earth connection

**Cross sections of earth connection:**

- 2 x 6 mm² to 16 mm² (solid and stranded conductors) or
- 2 x 4 mm² to 10 mm² (fine stranded conductors)

6. Operation

NOTICE

Valve damage due to incorrect basic setting!

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

6.1. Manual operation

For purposes of setting and commissioning, in case of motor 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

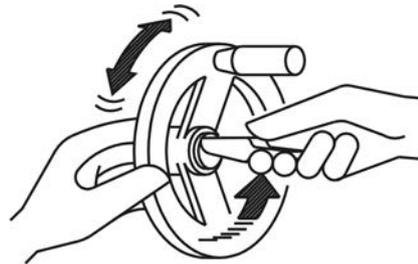
Information When using brake motors, note that the motor is disengaged during manual operation. For this reason, the brake motor cannot sustain any load during manual operation. The load must be sustained via the handwheel.

NOTICE

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

- Engage manual operation only during motor standstill.
- Only pivot change-over lever manually.
- Do NOT use extensions as lever for operation.

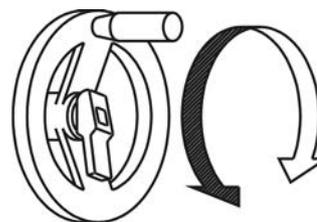
1. Pivot change-over lever manually to approx. 85° while slightly turning the handwheel back and forth until manual operation engages.



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



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



6.1.2. Manual operation: disengage

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

6.2. Motor operation

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

6.2.1. Local actuator operation

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

Figure 32: Local controls



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

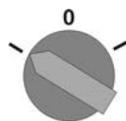


Hot surfaces, e.g. possibly caused by high ambient temperatures or strong direct sunlight!

Danger of burns

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

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



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

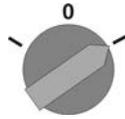
- Run actuator in direction OPEN: Press push button [1]
- Stop actuator: Press push button STOP [2].
- Run actuator in direction CLOSE: Press push button [3]

Information

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

6.2.2. Actuator operation from remote

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



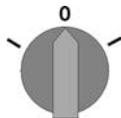
➔ Now, the actuator can be remote-controlled via fieldbus.

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

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

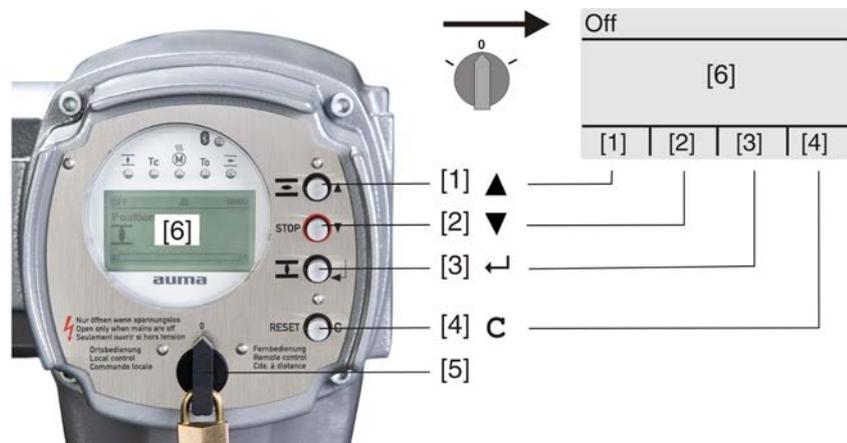
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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



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

Figure 33:



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

Table 11: Important push button functions for menu navigation

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

| Push buttons | Navigation support on display | Functions |
|--------------|-------------------------------|----------------------------|
| [4] C | Setup | Enter Main menu |
| | Esc | Cancel process |
| | | Return to previous display |

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

6.3.1. Menu layout and navigation

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

Figure 34: Groups



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

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

Figure 35: Marking with ID

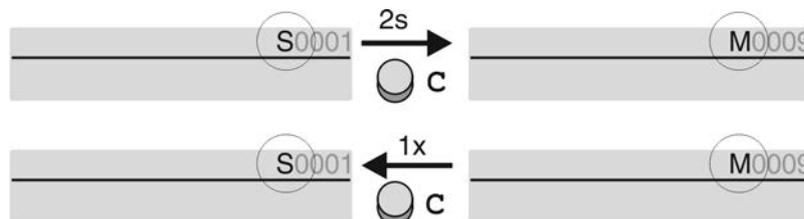


- S ID starts with S = status menu
- M ID starts with M = main menu

Group selection It is possible to select between status menu **S** and main menu **M**:

For this, set selector switch to **0** (OFF), hold down push button **C** for approx. 2 seconds until a screen containing the ID **M...** appears.

Figure 36: Select menu groups

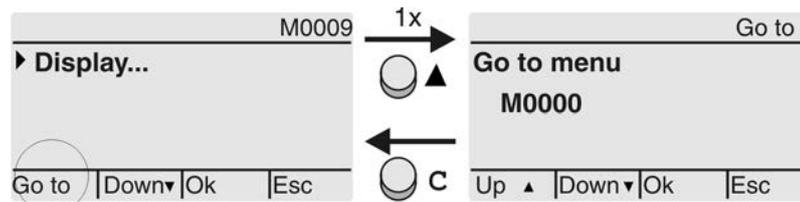


You return to the status menu if:

- the push buttons on the local controls have not been operated within 10 minutes
- or by briefly pressing **C**

Direct display via ID When entering the ID within the main menu, screens can be displayed directly (without clicking through).

Figure 37: Direct display (example)



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

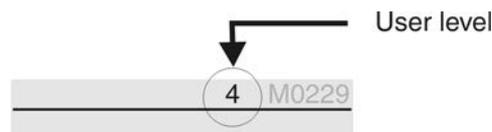
1. Press push button **▲ Go to**.
Display indicates: **Go to menu M0000**
2. Use push buttons **▲▼ Up ▲ Down ▼** to select figures 0 to 9.
3. Press push button **◀ Ok** to confirm first digit.
4. Repeat steps 2 and 3 for all further digits.
5. To cancel the process: Press **C Esc**.

6.4. User level, password

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

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

Figure 38: User level display (example)



Password A password must be entered to allow parameter modification. The display indicates: **Password 0*****

A specific password is assigned to each user level and permits different actions.

Table 12: User levels and authorisations

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

6.4.1. Password entry

1. Select desired menu and hold down push button **◀** for approx. 3 seconds.
➔ Display indicates the set user level, e.g **Observer (1)**
2. Press **▲ Up ▲** to select a higher user level and press **◀ Ok** to confirm.
➔ Display shows: **Password 0*****
3. Use push buttons **▲▼ Up ▲ Down ▼** to select figures 0 to 9.
4. Confirm first digit of password via push button **◀ Ok**.
5. Repeat steps 1 and 2 for all further digits.
➔ Having confirmed the last digit with **◀ Ok**, access to all parameters within one user level is possible if the password entry is correct.

6.4.2. Password change

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

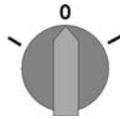
Example: The user is signed in as **Specialist (4)**. This authorises him or her to modify the passwords between user levels (1) to (4).

- M ▷ **Device configuration M0053**
- Service functions M0222**
- Change passwords M0229**

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

Select main menu

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



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

➔ Display goes to main menu and indicates: ▶ **Display...**

Change passwords

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



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

6.5. Language in the display

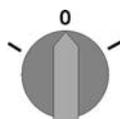
The AUMATIC display is multilingual.

6.5.1. Language change

- M ▷ **Display... M0009**
- Language M0049**

Select main menu

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



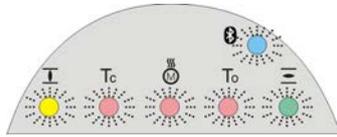
- Change language**
2. Press push button **C Setup** and hold it down for approx. 3 seconds.
➔ Display goes to main menu and indicates: ▶ **Display...**
 3. Press **↵ Ok**.
➔ Display indicates: ▶ **Language**
 4. Press **↵ Ok**.
➔ Display indicates the selected language, e.g.: ▶ **Deutsch**
 5. The bottom row of the display indicates:
 - **Save** → continue with step 10
 - **Edit** → continue with step 6
 6. Press **↵ Edit**.
➔ Display indicates: ▶ **Observer (1)**
 7. Select user level via **▲▼ Up ▲ Down ▼** resulting in the following significations:
 - black triangle: ▶ = current setting
 - white triangle: ▷ = selection (not saved yet)
 8. Press **↵ Ok**.
➔ Display indicates: **Password 0*****
 9. Enter password (→ enter password).
➔ Display indicates: ▶ **Language** and **Save** (bottom row)
- Language selection**
10. Select new language via **▲▼ Up ▲ Down ▼** resulting in the following significations:
 - black triangle: ▶ = current setting
 - white triangle: ▷ = selection (not saved yet)
 11. Confirm selection via **↵ Save**.
➔ The display changes to the new language. The new language selection is saved.

7. Indications

7.1. Indications during commissioning

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

Figure 39: LED test

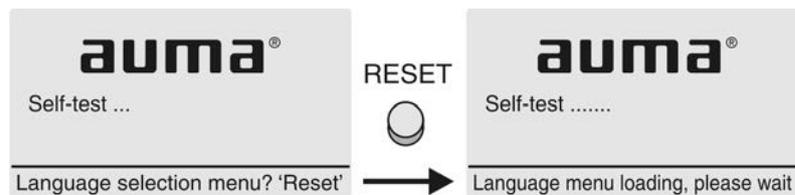


Language selection During the self-test, the language selection can be activated so that the selected language is immediately indicated in the display. For this, set selector switch [5] to position 0 (OFF).

Activate language selection:

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

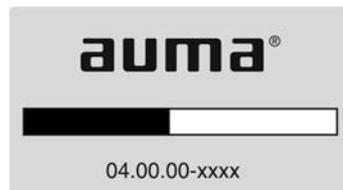
Figure 40: Self-test



The language selection menu follows the startup menu.

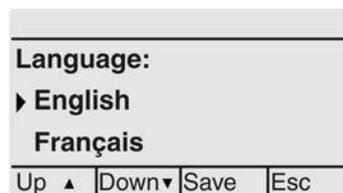
Startup menu The current firmware version is displayed during the startup procedure:

Figure 41: Startup menu with firmware version: 04.00.00–xxxx



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

Figure 42: Language selection

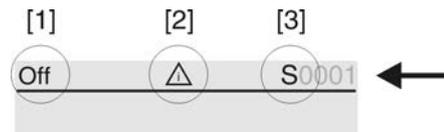


If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

7.2. Indications in the display

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

Figure 43: Information in the status bar (top)

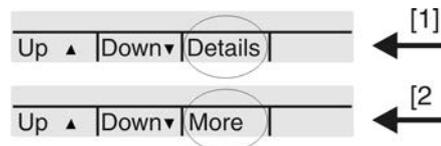


- [1] Operation mode
- [2] Error symbol (only for faults and warnings)
- [3] ID number: S = Status page

Navigation support

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

Figure 44: Navigation support (bottom)



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

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

7.2.1. Feedback indications from actuator and valve

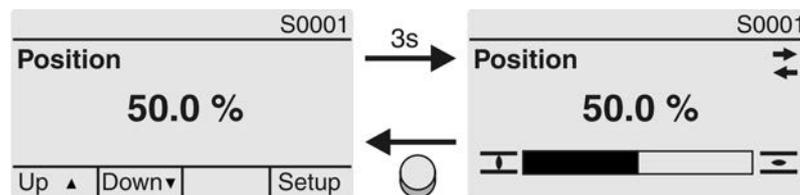
Display indications depend on the actuator version.

Valve position (S0001)

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

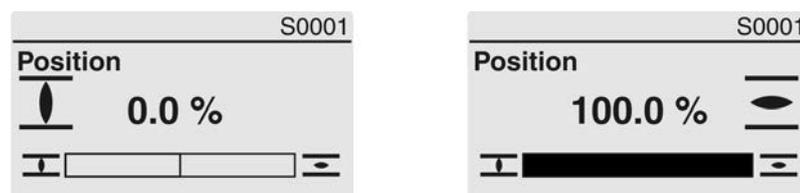
- S0001 on the display indicates the valve position in % of the travel.
- The bargraph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 45: Valve position and direction of operation



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

Figure 46: End position CLOSED/OPEN reached



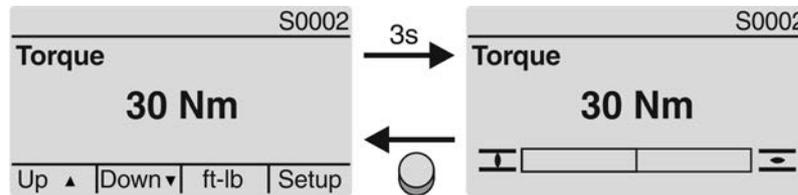
- 0% Actuator is in end position CLOSED
- 100% Actuator is in end position OPEN

Torque (S0002)

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

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

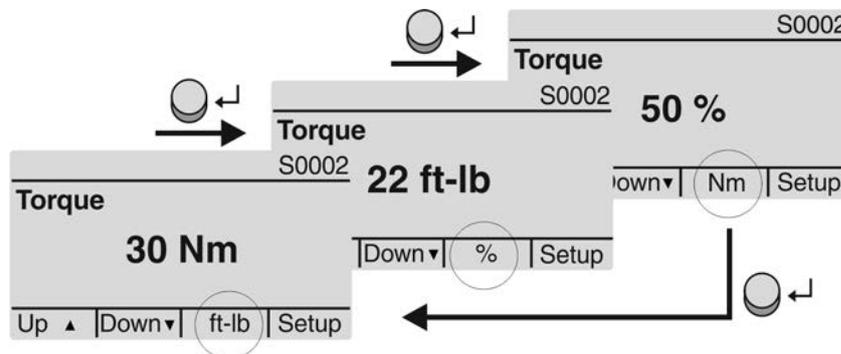
Figure 47: Torque



Select unit

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

Figure 48: Units of torque



Display in percent

100 % indication equals the max. torque indicated on the name plate of the actuator.
 Example: SA 07.6 with 20 – 60 Nm.

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

Operation commands (S0003)

The display S0003 indicates:

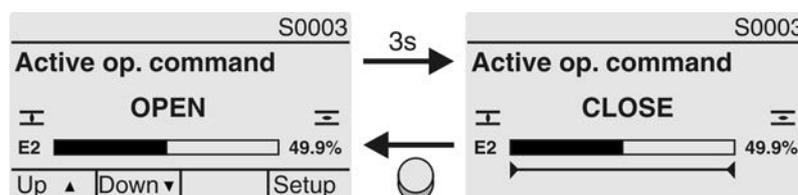
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bargraph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points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

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

OPEN - CLOSE control

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

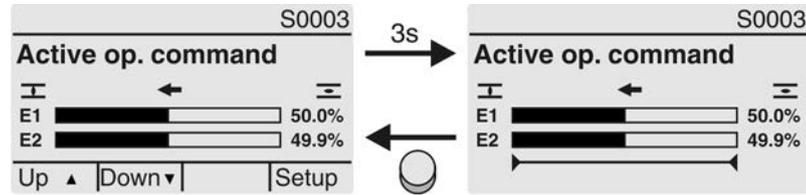
Figure 49: Display for OPEN - CLOSE control



E2 Actual position value

Setpoint control If the positioner is enabled and activated, the bargraph indication for E1 (position setpoint) is displayed.
 The direction of the operation command is displayed by an arrow above the bargraph indication. The figure below shows the operation command in direction CLOSE.

Figure 50: Display for setpoint control (positioner)



E1 Position setpoint
 E2 Actual position value

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

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

Operation profile M0294

Timer CLOSE M0156

Timer OPEN M0206

Figure 51: Examples: on the left pivot points (intermediate positions); on the right stepping mode



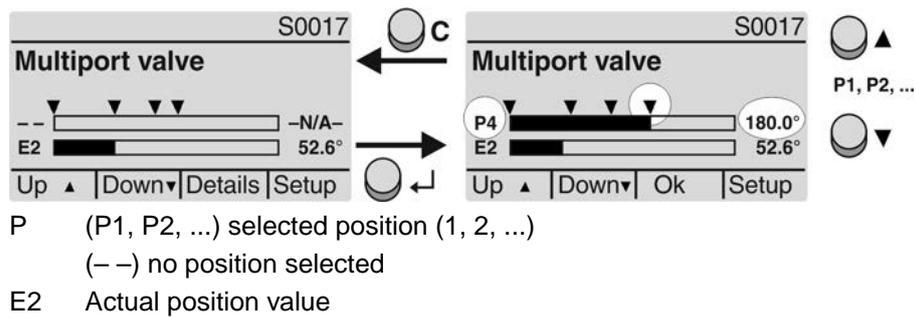
Table 13: Symbols along the pivot point axis

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

Multipoint valve positions (S0017)

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

Figure 52: Status indication for multiport valve (example P4 = 180°)



7.2.2. Status indications according to AUMA classification

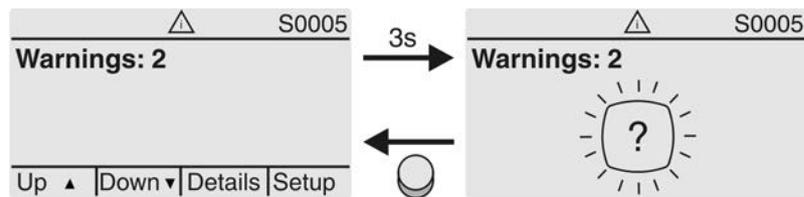
These indications are available, if the parameter **Diagnostic classific. M0539** is set to **AUMA**.

Warnings (S0005)

If a warning has occurred, the display shows **S0005**:

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

Figure 53: Warnings



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

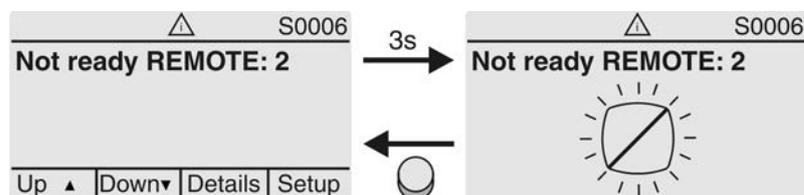
Not ready REMOTE (S0006)

The **S0006** display shows indications of the Not ready REMOTE group.

If such an indication has occurred, the display shows **S0006**:

- the number of indications occurred
- a blinking crossbar after approx. 3 seconds

Figure 54: Not ready REMOTE indications



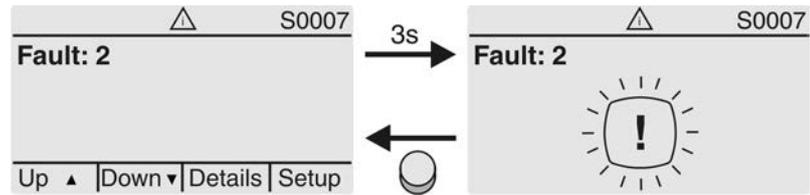
For further information, please also refer to <Corrective action>.

Fault (S0007)

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

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

Figure 55: Fault



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

7.2.3. Status indications according to NAMUR recommendation

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

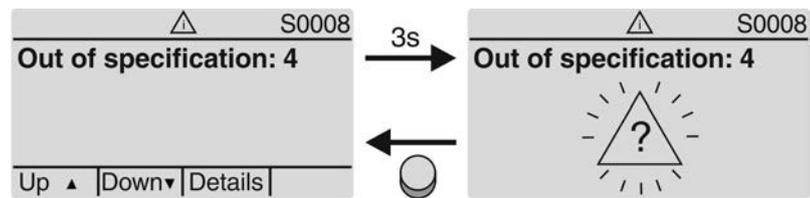
Out of Specification (S0008)

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

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

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

Figure 56: Out of specification



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

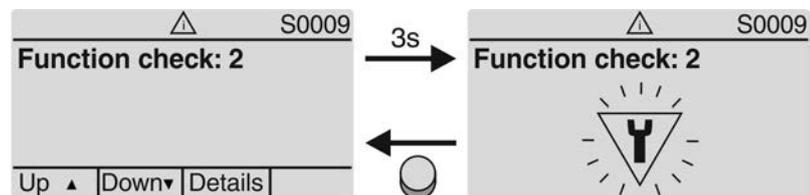
Function check (S0009)

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

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

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

Figure 57: Function check



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

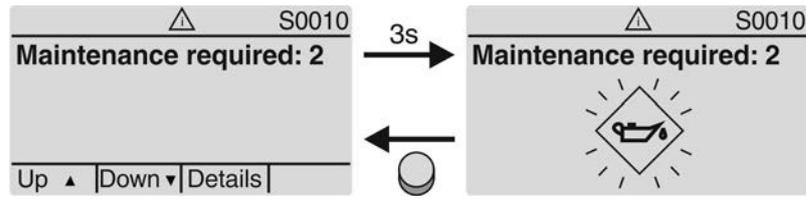
Maintenance required (S0010)

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

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

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

Figure 58: Maintenance required



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

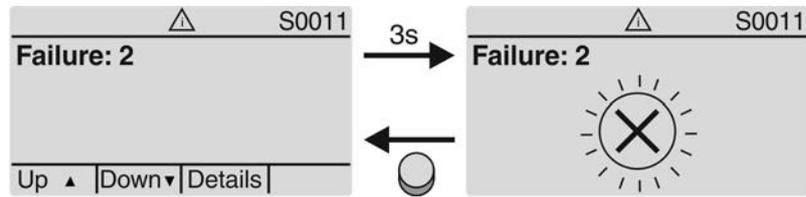
Failure (S0011)

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

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

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

Figure 59: Failure



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

7.3. 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 60: Mechanical position indicator



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

7.4. Indication lights

Figure 61: Arrangement and signification of indication lights



- [1] Marking with symbols (standard)
- [2] Marking with figures 1 – 6 (option)
- 1 End position CLOSED reached (blinking: for operation in direction CLOSE)
- 2 Tc Torque fault CLOSE
- 3 Motor protection tripped
- 4 To Torque fault OPEN
- 5 End position OPEN reached (blinking: for operation in direction OPEN)
- 6 Bluetooth connection

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

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

Default values (Europe):

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

Further setting values:

Refer to Manual (Operation and setting).

8. Signals

8.1. Status signals via output contacts (digital outputs)

— (Option) —

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

Characteristics Output contacts are used to send status signals (e.g. reaching the end positions, selector switch position, faults...) as binary signals to the control room.
 Status signals only have two states: active or inactive. Active means that the conditions for the signal are fulfilled.

8.1.1. Assignment of outputs

The output contacts (outputs DOUT 1 – 6) can be assigned to various signals.

Required user level: Specialist (4) or higher.

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

Default values:

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

8.1.2. Coding the outputs

The output signals DOUT 1 – 6 can be set either to high active or low active.

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

Required user level: Specialist (4) or higher.

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

Default values for DOUT 1 – 6: High active

8.2. Analogue signals

— (Option) —

Analogue feedback signals are only available if the following conditions are met:

- the AUMATIC is equipped with additional input signals.
- The actuator is equipped with a position transmitter (potentiometer, RWG or EWG).

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

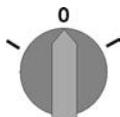
Designation in the wiring diagram:

ANOUT1 (position)

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

9. Commissioning (basic settings)

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



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

2. Switch on the power supply.

Information: Please consider the heat-up time for ambient temperatures below $-20\text{ }^{\circ}\text{C}$.

3. Perform basic settings.

9.1. Type of seating: set

NOTICE

Valve damage due to incorrect setting!

- The type of seating must suit the valve.
- Only change the setting with the consent of the valve manufacturer.

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

Default value: Limit

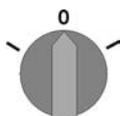
Setting values:

Limit Seating in end positions via limit switching.

Torque Seating in end positions via torque switching.

Select main menu

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



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

Select parameter

3. Select parameter either:
 - click via the menu M ▶ to parameter, or
 - via direct display: press ▲ and enter ID M0086 or M0087
 → Display indicates: End position CLOSED

CLOSE or OPEN

4. Use ▲ ▼ Up ▲ Down ▼ to select:
 - ▶ End position CLOSED
 - ▶ End position OPEN
 → The black triangle ▶ indicates the current selection.
5. Press ← Ok.
 - Display indicates the current setting: Limit or Torque
 - The bottom row of the display indicates either:
 - Edit → continue with step 6
 - Save → continue with step 10

- Log on user**
6. Press **← Edit**.
 - ➔ Display indicates: **▶ Specialist (4)**
 7. Use **▲▼ Up ▲ Down ▼** to select user:
Information: Required user level: **Specialist (4)** or higher
 - ➔ The symbols have the following meaning:
 - black triangle: **▶** = current setting
 - white triangle: **▷** = selection (not saved yet)
 8. Press **← Ok**.
 - ➔ Display indicates: **Password 0*****
 9. Enter password (→ enter password).
 - ➔ The screen indicates the pre-set type of seating (**▶ Limit** or **▶ Torque**) by means of a black triangle **▶**.
- Change settings**
10. Select new setting **▲▼ Up ▲ Down ▼** resulting in the following significations:
 - ➔ The symbols have the following meaning:
 - black triangle: **▶** = current setting
 - white triangle: **▷** = selection (not saved yet)
 11. Confirm selection via **← Save**.
 - ➔ The setting for the type of seating is complete.
 12. Back to step 4 (CLOSED or OPEN): Press **← Esc** .

9.2. Bus address (slave address), baud rate, parity and monitoring time: set

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

Default values:

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

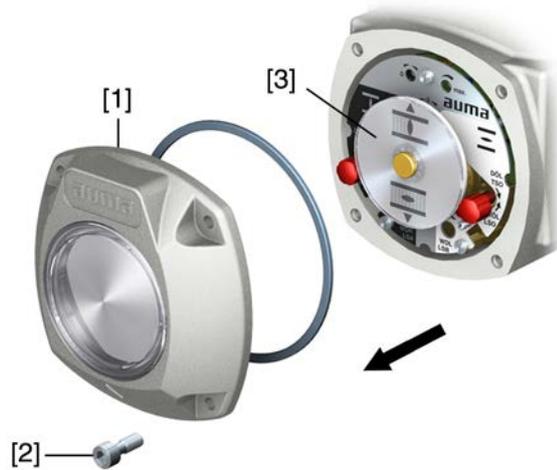
Information Parameter **MD2 slave address** is only available if AUMA redundancy I (option) is available.

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

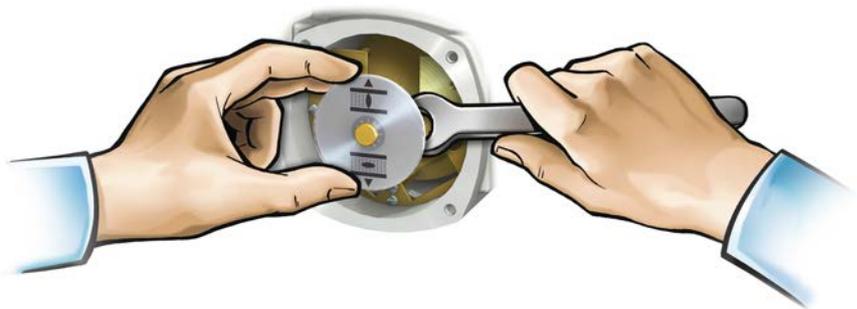
9.3. Switch compartment: open

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

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



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



9.4. Torque switching: set

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

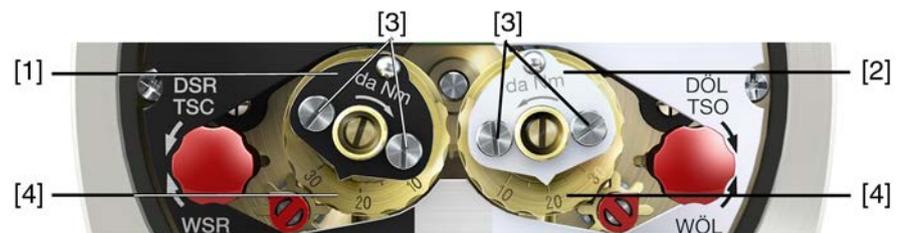
Information The torque switches may also trip during manual operation.

NOTICE

Valve damage due to excessive tripping torque limit setting!

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

Figure 62: 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.

9.5. Limit switching: set

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

Figure 63: Setting elements for limit switching



Black section:

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

White section:

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

9.5.1. End position CLOSED (black section): set

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

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

9.5.2. End position OPEN (white section): set

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

3. Turn handwheel by approximately half a turn (overrun) in the opposite direction.
4. **Press down** and turn setting spindle [4] with screw driver in direction of the arrow and observe the pointer [5]: While a ratchet click is felt and heard, the pointer [5] moves 90° every time.
5. If the pointer [5] is 90° from mark [6]: Continue turning slowly.
6. If the pointer [5] moves to mark [6]: Stop turning and release setting spindle.
- ➔ The end position OPEN setting is complete.
7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.6. Intermediate positions: set

— Option —

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

Figure 64: 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.

9.6.1. Running direction CLOSE (black section): set

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

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

9.6.2. Running direction OPEN (white section): set

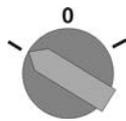
1. Move valve in direction OPEN to desired intermediate position.
2. If you override the tripping point inadvertently: Move valve in opposite direction and approach intermediate position again in direction OPEN (always approach the intermediate position in the same direction as in later electrical operation).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

9.7. Test run

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

9.7.1. Direction of rotation: check

1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. 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:

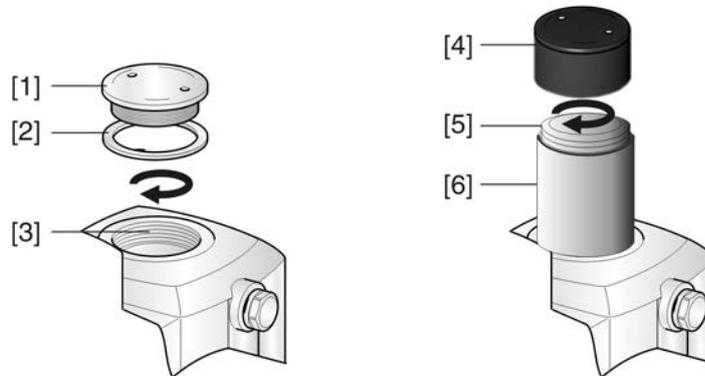
→ Observe direction of rotation.

➔ 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**.

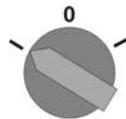
Figure 65: Hollow shaft/stem



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

9.7.2. Limit switching: check

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



2. Operate actuator using push buttons OPEN, STOP, CLOSE.
 - ➔ The limit switching is set correctly if (default indication):
 - the yellow indication light/LED1 is illuminated in end position CLOSED
 - the green indication light/LED5 is illuminated in end position OPEN
 - the indication lights go out after travelling into opposite direction.
 - ➔ The limit switching is set incorrectly if:
 - the actuator comes to a standstill before reaching the end position
 - one of the red indication lights/LEDs is illuminated (torque fault)
 - the status indication **S0007** in the display signals a fault.
3. If the end position setting is incorrect: Reset limit switching.
4. If the end position setting is correct and no options (e.g. potentiometer, position transmitter) are available: Close switch compartment.

9.7.3. Reference operation position feedback: perform

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

→ Operate actuator electrically (via the push buttons OPEN and CLOSE of the local controls) once to end position OPEN and once to end position CLOSED. If no reference operation is performed after changing the limit switching, the feedback signal via the bus is not correct. The bus signals the missing reference operation as a warning.

9.8. Potentiometer

— Option —

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

Setting elements

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

Setting is made via potentiometer [1].

Figure 66: 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: set

— Option —

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

Information

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



Intrinsically safe electric circuit, risk of explosion!

Risk of death or serious injury.

- Observe the applicable installation regulations regarding explosion protection when connecting.
- Do NOT lead cables via the connections of AUMA actuator controls.

Table 14: Technical data RWG 5020

| 2-wire system | | |
|----------------------------------|-------|----------------------------------|
| EC type examination certificate | | PTB 03 ATEX 2176 |
| Explosion protection | | II2G Ex ib IIC T4 |
| Terminal plans | KMS | TP_4 / _ _ _ _ TP_5 / _ _ _ _ |
| Output current | I_A | 4 – 20 mA |
| Power supply | U_V | 10 - 28.5 V DC |
| Max. current consumption | I | 20 mA |
| Max. load | R_B | $(U_V - 10 V) / 20 mA$ |
| Signal and power supply circuits | U_i | 28.8 V |
| | I_i | 200 mA |
| | P_i | 0.9 W |
| | C_i | Negligibly small |
| | L_i | Negligibly small |

Figure 67: View of control unit



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

1. Connect voltage to electronic position transmitter.
2. Move valve to end position CLOSED.
3. Connect measuring device for 4 – 20 mA to measuring points [4] (lower side of RWG board).
4. Turn potentiometer [1] clockwise to the stop.
5. Turn potentiometer [1] slightly in opposite direction.
6. Turn potentiometer [2] clockwise until output current starts to increase.
7. Turn back potentiometer [2] until a value of approx. 4.1 mA is reached.
- ➔ This ensures that the signal remains above the dead and live zero point.
8. Move valve to end position OPEN.
9. Set potentiometer [3] to end value 20 mA.
10. Approach end position CLOSED anew and check minimum value (4.1 mA). If necessary, correct the setting.

Information If the maximum value cannot be reached, the selection of the reduction gearing must be checked. (The max. possible turns/stroke are indicated on the order-related technical data sheet for the actuator.)

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

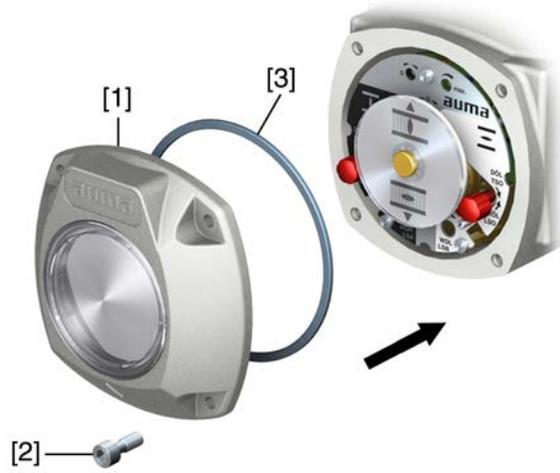
NOTICE

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

10. Corrective action

10.1. Faults during commissioning

Table 15: 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.
 3. Turn test button [2] in direction of the TSO arrow: Torque switch OPEN trips.
- If the actuator is equipped with a DUO limit switching (option), the intermediate position switches (LSA and LSB) will be operated at the same time as the torque switches.
1. Turn test button [1] in direction of the LSC arrow: Limit switch CLOSED trips.
 2. Turn test button [2] in direction of the LSO arrow: Limit switch OPEN trips.

10.2. Fault indications and warning indications

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

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

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

Table 16: Faults and warnings via status indications in the display

| Indication on display | Description/cause | For indicated value > 0: |
|----------------------------|--|--|
| Warnings S0005 | Collective signal 02: Indicates the number of active warnings. | Press push button ⏪ Details . For details, refer to <Warnings and Out of specification> table. |
| Not ready REMOTE S0006 | Collective signal 04: Indicates the number of active signals. | Press push button ⏪ Details . For details, refer to <Not ready REMOTE and Function check> table. |
| Fault S0007 | Collective signal 03: Indicates the number of active faults. The actuator cannot be operated. | Press push button ⏪ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table. |
| Out of specification S0008 | Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions. | Press push button ⏪ Details . For details refer to <Warnings and Out of specification> table. |
| Function check S0009 | Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid. | Press push button ⏪ Details . For details, refer to <Not ready REMOTE and Function check> table. |
| Maintenance required S0010 | Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance. | Press push button ⏪ Details to display a list of detailed indications. |
| Failure S0011 | Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid | Press push button ⏪ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table. |

Table 17: Warnings and Out of specification

| Indication on display | Description/cause | Remedy |
|-----------------------|--|--|
| Config. warning | Collective signal 06: Possible cause: Configuration setting is incorrect. The device can still be operated with restrictions. | Press push button ⏪ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Internal warning | Collective signal 15: Device warnings The device can still be operated with restrictions. | Press push button ⏪ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| 24 V DC external | The external 24 V DC voltage supply of the controls has exceeded the power supply limits. | Check 24 V DC voltage supply. |
| Wrn on time running | Warning on time max. running time/h exceeded | <ul style="list-style-type: none"> • Check modulating behaviour of actuator. • Check parameter Perm. running time/h M0356, re-set if required. |
| Wrn on time starts | Warning on time max. number of motor starts (starts) exceeded | <ul style="list-style-type: none"> • Check modulating behaviour of actuator. • Check parameter Permissible starts/h M0357, re-set if required. |
| Failure behav. active | The failure behaviour is active since all required setpoints and actual values are incorrect. | Verify signals: <ul style="list-style-type: none"> • Setpoint E1 • Actual value E2 • Actual process value E4 • Check connection to master. |
| Wrn input AIN 1 | Warning: Loss of signal analogue input 1 | Check wiring. |
| Wrn input AIN 2 | Warning: Loss of signal analogue input 2 | Check wiring. |

| Indication on display | Description/cause | Remedy |
|-----------------------|--|---|
| Wrn setpoint position | Warning: Loss of signal of actuator setpoint position Possible causes: Input signal for setpoint = 0 (signal loss) | Check setpoint signal. |
| Op. time warning | The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED. | The warning indications are automatically cleared once a new operation command is executed. <ul style="list-style-type: none"> Check valve. Check parameter Perm.op. time, manual M0570. |
| Wrn controls temp. | Temperature within controls housing too high | Measure/reduce ambient temperature. |
| Wrn motor temp. | Temperature within motor winding too high | Check actuator sizing, correct accordingly. |
| Wrn gearbox temp. | Temperature within actuator gear housing too high | Check actuator sizing, correct accordingly. |
| RTC not set | Real time clock has not yet been set. | Set time. |
| RTC button cell | Voltage of the RTC button cell is too low. | Replace button cell. |
| PVST fault | Partial Valve Stroke Test (PVST) could not be successfully completed. | Check actuator (PVST settings). |
| PVST abort | Partial Valve Stroke Test (PVST) was aborted or could not be started. | Perform RESET or restart PVST. |
| Wrn no reaction | No actuator reaction to operation commands within the set reaction time. | <ul style="list-style-type: none"> Check movement at actuator. Check parameter Reaction time M0634. |
| Wrn FOC | Optical receiving signal (channel 1) incorrect (no or insufficient Rx receive level) or RS-485 format error (incorrect bit(s)) | Check/repair FO cables. |
| Wrn FO cable budget | Warning: FO cable system reserve reached (critical or permissible Rx receive level) | Check/repair FO cables. |
| Wrn FOC connection | Warning FO cable connection is not available. | Fit FO cable connection. |
| Torque wrn OPEN | Limit value for torque warning in direction OPEN exceeded. | Check parameter Wrn torque OPEN M0768 , re-set if required. |
| Torque wrn CLOSE | Limit value for torque warning in direction CLOSE exceeded. | Check parameter Wrn torque CLOSE M0769 , re-set if required. |

Table 18: Faults and Failure

| Indication on display | Description/cause | Remedy |
|-----------------------|--|---|
| Configuration error | Collective signal 11: Configuration error has occurred. | Press push button Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Config. error REMOTE | Collective signal 22: Configuration error has occurred. | Press push button Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Internal error | Collective signal 14: Internal error has occurred. | AUMA service Press push button Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Torque fault CLOSE | Torque fault in direction CLOSE | Perform one of the following measures: <ul style="list-style-type: none"> Issue operation command in direction OPEN. Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET. Execute reset command via fieldbus. |

| Indication on display | Description/cause | Remedy |
|-----------------------|---|--|
| Torque fault OPEN | Torque fault in direction OPEN | Perform one of the following measures: <ul style="list-style-type: none"> • Issue operation command in direction CLOSE. • Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET. • Execute reset command via fieldbus. |
| Phase fault | <ul style="list-style-type: none"> • When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing. | Test/connect phases. |
| Incorrect phase seq | The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system. | Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases. |
| Mains quality | Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring. | <ul style="list-style-type: none"> • Check mains voltage. • Check parameter Tripping time M0172, extend time frame if required. |
| Thermal fault | Motor protection tripped | <ul style="list-style-type: none"> • Cool down, wait. • If the fault indication display persists after cooling down: <ul style="list-style-type: none"> - Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET. - Execute reset command via fieldbus. • Check fuses. |
| Fault no reaction | No actuator reaction to operation commands within the set reaction time. | Check movement at actuator. |

Table 19: Not ready REMOTE and Function check (collective signal 04)

| Indication on display | Description/cause | Remedy |
|-----------------------|--|---|
| Wrong oper. cmd | Collective signal 13: Possible causes: <ul style="list-style-type: none"> • Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SETPOINT operation simultaneously) • A setpoint is present and the positioner is not active • For fieldbus: Setpoint exceeds 100.0 % | <ul style="list-style-type: none"> • Check operation commands (send one operation command only). • Set parameter Positioner to Function active. • Check setpoint. Press push button Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Sel. sw. not REMOTE | Selector switch is not in position REMOTE. | Set selector switch to position REMOTE. |
| Service active | Operation via service interface (Bluetooth) and service software AUMA CDT. | Exit service software. |
| Disabled | Actuator is in operation mode Disabled. | Check setting and status of function <Local controls enable>. |
| EMCY stop active | The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected. | <ul style="list-style-type: none"> • Enable EMERGENCY stop switch. • Reset EMERGENCY stop state by means of Reset command. |
| EMCY behav. active | Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input. | <ul style="list-style-type: none"> • Detect cause for EMERGENCY signal. • Verify failure source. • Apply +24 V DC at EMERGENCY input. |

| Indication on display | Description/cause | Remedy |
|-----------------------|--|---|
| I/O interface | The actuator is controlled via the I/O interface (parallel). | Check I/O interface. |
| Handwheel active | Manual operation is activated. | Start motor operation. |
| FailState fieldbus | Fieldbus connection available, however no process data transmission by the master. | Verify master configuration |
| Local STOP | A local STOP is active. Push button STOP of local controls is operated. | Release push button STOP. |
| Interlock | An interlock is active. | Check interlock signal. |
| Interlock by-pass | By-pass function is interlocked. | Check states of main and by-pass valve. |
| PVST active | Partial Valve Stroke Test (PVST) is active. | Wait until PVST function is complete. |

10.3. Fuses

10.3.1. Fuses within the actuator controls

Fuses used

F1/F2 Primary fuses on power supply unit

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

F3 Internal 24 V DC supply

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

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

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

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

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

Replace fuses F1/F2

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

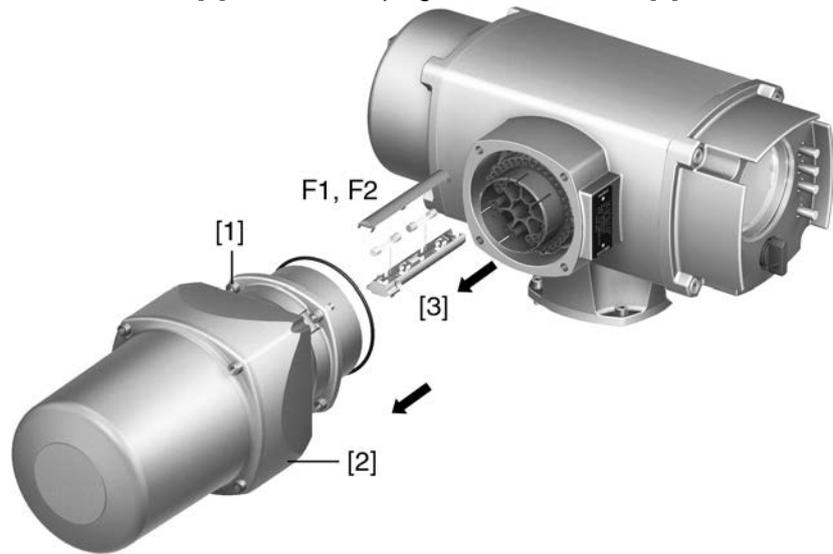


Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

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



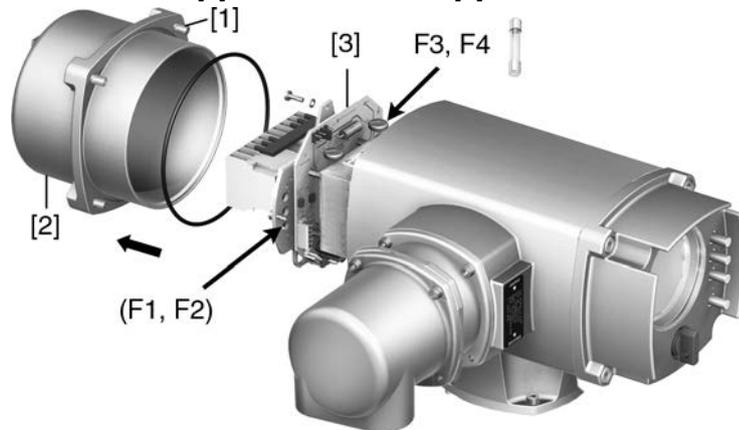
2. Pull fuse holder [3] out of pin carrier, open fuse cover and replace old fuses by new ones.

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

Information

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

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



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

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

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

NOTICE

Cable damage due to pinching!

Risk of functional failures.

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

10.3.2. Fuses within the control box



Hazardous voltage!

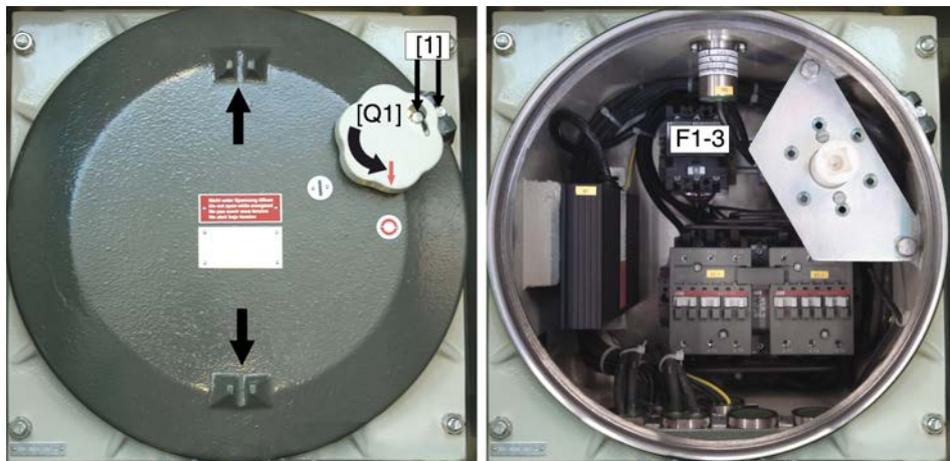
Risk of electric shock.

→ Disconnect device from the mains before opening.

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

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

Figure 68: Control box



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

10.3.3. Motor protection (thermal monitoring)

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

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

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

The motor has to cool down before the operation can be resumed. Depending on the parameter setting, the fault signal is either automatically reset or the fault signal has to be acknowledged.

The acknowledgement is made:

- via the push button **Reset** in selector switch position LOCAL.
- or with the reset command via fieldbus.

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

11. 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).

11.1. Preventive measures for servicing and safe operation

The following measures are required to ensure safe device operation:

6 months after commissioning and then every year

- Carry out visual inspection:
Cable entries, cable glands, blanking plugs, etc. have to be checked for correct tightness and sealing.
Respect torques according to manufacturer's details.
- Check fastening screws between actuator and gearbox/valve for tightness. If required, fasten screws while applying the tightening torques as indicated in chapter <Assembly>.
- When rarely operated: Perform test run.
- For 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 69: Output drive type A



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

Table 20: Grease quantities for bearing of output drive type A

| Output drive | A 25.2 | A 30.2 | A 35.2 | A 40.2 |
|----------------------------|--------|--------|--------|--------|
| Quantity [g] ¹⁾ | 10 | 14 | 20 | 25 |

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.

11.2. Disconnection from the mains

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

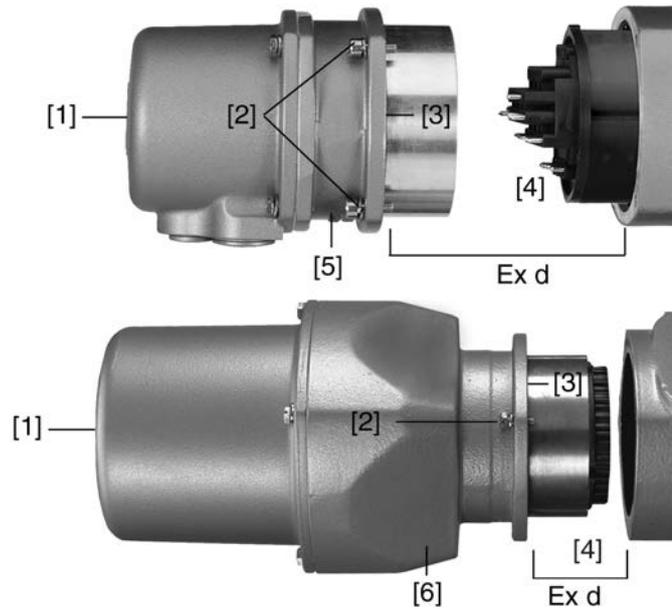


Flameproof enclosure, danger of explosion!

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 70: top: KP/KPH, bottom: KES



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

Removing the plug:

1. Loosen the screws [2].
2. Remove plug/socket connector.
- ➔ Hereby, cover [1] and terminal board [5] or frame [6] remain together.
3. Seal open plug/socket connection, e.g. using AUMA protection cover and parking frame.

Fitting the plug:

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

11.3. Maintenance

Maintenance intervals

After 3 years at the latest for Ex certified products.

Lubrication

- In the factory, the gear housing is filled with grease.
- Grease change is performed during maintenance
 - Generally after 4 to 6 years for modulating duty.
 - Generally after 6 to 8 years if operated frequently (open-close duty).
 - Generally after 10 to 12 years if operated rarely (open-close duty).

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.

11.4. Disposal and recycling

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

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

The following generally applies:

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

12. Technical data

Information The following technical data includes standard and optional features. For detailed information on the customer-specific version, refer to the order-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).

12.1. Features and functions of actuator

| | |
|---------------------------------|---|
| Explosion protection | Standard: <ul style="list-style-type: none"> • II2G Ex ed IIB T4 or T3 • II2D Ex tD A21 IP6x T130 °C or T190 °C • II2G c IIB T4 or T3 For actual version, refer to actuator name plate. |
| EC type examination certificate | PTB 03 ATEX 1123 |
| Protection types | <ul style="list-style-type: none"> • Ex d flameproof enclosure: <ul style="list-style-type: none"> - Motor compartment - Controls housing • Ex e increased safety: <ul style="list-style-type: none"> - Terminal compartment - Switch compartment • Ex i Intrinsic safety: <ul style="list-style-type: none"> - Electronic position transmitter RWG 5020Ex • c constructional safety: <ul style="list-style-type: none"> - Gear housing |
| Type of duty ¹⁾ | Standard: <ul style="list-style-type: none"> • SAEx: Short-time duty S2 - 15 min • SAREx: Intermittent duty S4 - 25 % Options: <ul style="list-style-type: none"> • SAEx: Short-time duty S2 - 30 min • SAREx: Intermittent duty S4 - 50 % |
| Torque range | Refer to actuator name plate |
| Output speed | Refer to actuator name plate |
| Motor | Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC 60034 |
| Insulation class | Standard: F, tropicalized Option: H, tropicalized |
| Motor protection | Standard: PTC thermistors (according to DIN 44082) Option: Thermostats (NC) |
| Self-locking | <ul style="list-style-type: none"> • Self-locking: <ul style="list-style-type: none"> - SAEx/SAREx 25.1 – 30.1: Output speeds up to 90 rpm (50 Hz), 108 rpm (60 Hz) - SAEx 35.1 – SAEx 40.1: Output speeds up to 22 rpm (50 Hz), 26 rpm (60 Hz) • NOT self-locking: <ul style="list-style-type: none"> - SAEx 35.1 – SAEx 40.1: Output speeds from 32 rpm (50 Hz), 38 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. |
| Limit switching | Counter gear mechanism for end positions CLOSED and OPEN Turns per stroke: 1 to 500 (standard) or 1 to 5,000 (option) Standard: <ul style="list-style-type: none"> • Single switches (1 NC and 1 NO; not galvanically isolated) for each end position Options: <ul style="list-style-type: none"> • 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; not galvanically isolated) for each direction Option: Tandem switches (2 NC and 2 NO) for each direction, switches galvanically isolated |

Technical data

| | |
|---|---|
| Position feedback signal, analogue (option) | Potentiometer or 0/4 – 20 mA (RWG) (Ex version) |
| Mechanical position indicator (option) | Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED |
| Running indication | Blinker transmitter (standard for SA, option for SAR) |
| Heater in switch compartment | Standard: Resistance type heater, 6 W, 220 – 240 V AC/DC (Ex version) Option: 110 – 120 V AC/DC, 48 V AC/DC, 24 V AC/DC |
| Motor heater (option) | 110 – 120 V AC/DC: 50 W 220 – 240 V AC/DC: 50 W 380 – 400 V AC/DC: 22 W |
| Manual operation | Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable |
| Connection to controls | AUMA plug/socket connector with screw-type connection |
| Valve attachment | Standard: B1 according to EN ISO 5210 Options: A, B2, B3, B4 according to EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drive types: AF, B3D, ED, DD, (IB1 or IB3 only size 25.1) A with stem lubrication |

1) For nominal voltage and 20 °C ambient temperature and an average load with running torque or modulating torque according to separate technical data. The type of duty must not be exceeded.

| Technical data for limit and torque switches | |
|--|---|
| Mechanical lifetime | 2 x 10 ⁶ starts |
| Silver plated contacts: | |
| U min. | 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 µs) 7 A at 30 V (resistive load) 5 A at 30 V (inductive load, L/R = 3 µs) |
| Gold plated contacts | |
| U min. | 5 V |
| U max. | 30 V |
| I min. | 4 mA |
| I max. | 400 mA |

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

12.2. Features and functions

| Features and functions | |
|--|---|
| Power supply Mains frequency | Refer to name plates at controls and motor Permissible variation of mains voltage: $\pm 10\%$ Permissible variation of mains voltage: $\pm 30\%$ (option) Permissible variation of mains frequency: $\pm 5\%$ |
| External supply of the electronics (option) | 24 V DC $+20\%$ / -15% Current consumption: Basic version approx. 250 mA, with options up to 500 mA The external power supply must have a reinforced insulation against the mains voltage in accordance with IEC 61010-1 and may only be supplied by a circuit limited to 150 VA in accordance with IEC 61010-1. |
| Current consumption | Current consumption of the controls depending on mains voltage: For permissible variation of mains voltage of $\pm 10\%$: <ul style="list-style-type: none"> • 100 to 120 V AC = max. 740 mA • 208 to 240 V AC = max. 400 mA • 380 to 500 V AC = max. 250 mA • 515 to 690 V AC = max. 200 mA For permissible variation of mains voltage of $\pm 30\%$: <ul style="list-style-type: none"> • 100 to 120 V AC = max. 1,200 mA • 208 to 240 V AC = max. 750 mA • 380 to 500 V AC = max. 400 mA • 515 to 690 V AC = max. 400 mA |
| Overvoltage category | Category III according to IEC 60364-4-443 |
| Rated power | The 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 class A3 Thyristor unit for mains voltage up to 500 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 on actuator. |
| Control and feedback signals | Via Modbus RTU interface |
| Modbus RTU interface with additional input signals (option) | <ul style="list-style-type: none"> • 2 free analogue inputs (0/4 – 20 mA), 4 free digital inputs <ul style="list-style-type: none"> - Signal transmission is made via Modbus RTU interface • OPEN, STOP, CLOSE, EMERGENCY inputs, I/O interface with 0/4 – 20 mA input for position setpoint <ul style="list-style-type: none"> - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface for selecting the control type (Modbus or additional binary OPEN, STOP, CLOSE input signals) - MODE for selecting between OPEN - CLOSE control and setpoint control (0/4 – 20 mA) |
| Voltage and current values of the optional additional inputs | Standard 24 V DC, current consumption: approx. 10 mA per input |
| | Options: 48 V DC, current consumption: approx. 7 mA per input 60 V DC, current consumption: approx. 9 mA per input 115 V DC, current consumption: approx. 15 mA per input 115 V AC, current consumption: approx. 15 mA per input |
| | All input signals must be supplied with the same potential. |
| Status signals | |

| Features and functions | |
|--|---|
| Modbus RTU interface with additional output signals (option) | <p>Additional output signals (only available in combination with additional input signals)</p> <p>Binary output signals</p> <ul style="list-style-type: none"> • 6 programmable output contacts: <ul style="list-style-type: none"> - 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Standard assignment: End position CLOSED, end position OPEN, selector switch REMOTE, torque fault CLOSE, torque fault OPEN - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) Standard assignment: Collective fault signal (torque fault, phase failure, motor protection tripped) • 6 programmable output contacts: <ul style="list-style-type: none"> - 5 change-over contacts with one common, max. 250 V AC, 1 A (resistive load) - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: <ul style="list-style-type: none"> - 6 potential-free change-over contacts without one common, per contact max. 250 V AC, 5 A (resistive load) <p>All binary output signals must be supplied with the same potential. Analogue output signal for position feedback</p> <ul style="list-style-type: none"> • Galvanically isolated position feedback E2 = 0/4 – 20 mA (load max. 500 Ω) |
| Voltage output | Standard: Auxiliary voltage 24 V DC, max. 100 mA for supply of control inputs, galvanically isolated from internal voltage supply |
| | Option: Auxiliary voltage 115 V AC, max. 30 mA for supply of control inputs, galvanically isolated from internal voltage supply Not possible in combination with PTC tripping device |
| Redundancy (option) | <p>Redundant line topology with universal redundancy behaviour according to AUMA redundancy I or II</p> <p>Redundant loop topology in combination with the SIMA Master Station</p> <ul style="list-style-type: none"> • Max. number of actuators equipped with AUMATIC controls per redundant loop: 247 units • Max. possible cable length between the actuators equipped with controls without external repeater: 1,200 m. • Max. possible total length per redundant loop: approx. 290 km • Automatic commissioning of the redundant loop by means of the SIMA Master Station |
| Local controls | Standard: <ul style="list-style-type: none"> • Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET <ul style="list-style-type: none"> - Local STOP The actuator can be stopped via push button Stop of local controls if the selector switch is in position REMOTE. Not activated when leaving the factory. • 6 indication lights: <ul style="list-style-type: none"> - End position and running indication CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue) • Graphic LC display, illuminated |
| | Options: <ul style="list-style-type: none"> • Special colours for the 5 indication lights: <ul style="list-style-type: none"> - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (white), end position OPEN (red) |
| Bluetooth Communication interface | <p>Bluetooth class II chip, version 2.0 with a range up to 10 m in industrial environments. Supports the SPP Bluetooth profile (Serial Port Profile).</p> <p>Programming software: AUMA CDT, commissioning and diagnostic tool for windows based PCs, PDAs and smart phones</p> |

| Features and functions | | |
|------------------------|-----------|--|
| Application functions | Standard: | <ul style="list-style-type: none"> • Switch-off mode adjustable <ul style="list-style-type: none"> - Limit or torque seating for end positions OPEN and CLOSED • Torque by-pass, adjustable up to 5 seconds (no torque monitoring during start-up time) • Start and end of stepping mode as well as ON and OFF times (1 to 1,800 seconds) can be set individually for directions OPEN and CLOSE. • Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable • Positioner <ul style="list-style-type: none"> - Position setpoint via Modbus RTU interface - Automatic adaptation of dead band (adaptive behaviour selectable) - Change-over between OPEN - CLOSE control and setpoint control via Modbus RTU interface |
| | Option: | <ul style="list-style-type: none"> • PID controller with adaptive positioner, 0/4 – 20 mA inputs for process setpoint and actual process value |
| Safety functions | Standard: | <ul style="list-style-type: none"> • EMERGENCY operation, behaviour programmable <ul style="list-style-type: none"> - Digital input low active - Reaction can be selected: Stop, run to end position CLOSED, run to end position OPEN, run to intermediate position - Torque monitoring can be by-passed during EMERGENCY operation. - Thermal protection can be by-passed during EMERGENCY operation (only in combination with thermoswitch within actuator, not with PTC thermistor). • Release of local controls via fieldbus interface Thus, actuator operation can be enabled or disabled via push buttons on the local controls. • Local STOP <ul style="list-style-type: none"> - The actuator can be stopped via push button Stop of local controls if the selector switch is in position REMOTE. Not activated when leaving the factory. • EMERGENCY Stop push button (latching) interrupts electrical operation, irrespective of the selector switch position • Interlock, enabling the operation commands OPEN or CLOSE via fieldbus interface |
| Monitoring functions | | <ul style="list-style-type: none"> • Valve overload protection (adjustable), results in switching off and generates fault signal • Motor temperature monitoring (thermal monitoring), results in switching off and generates fault indication • Monitoring the heater within actuator, generates warning signal • Monitoring of permissible on-time and number of starts (adjustable), generates warning signal • Operation time monitoring (adjustable), generates warning signal • Phase failure monitoring, results in switching off and generates fault signal • Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current) |
| Diagnostic functions | | <ul style="list-style-type: none"> • Electronic device ID with order and product data • Operating data logging: A resettable counter and a lifetime counter each for: <ul style="list-style-type: none"> - Motor running time, number of starts, torque switch trippings in end position CLOSED, limit switch trippings in end position CLOSED, torque switch trippings in end position OPEN, limit switch trippings in end position OPEN, torque faults CLOSE, torque faults OPEN, motor protection trippings • Time-stamped event report with history for setting, operation and faults: <ul style="list-style-type: none"> - Status signals according to NAMUR recommendation NE 107: "Failure", "Function check", "Out of specification", "Maintenance required" • Torque characteristics (for version with MWG in actuator) <ul style="list-style-type: none"> - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately. Torque characteristics stored can be shown on the display. |

| Features and functions | | |
|---------------------------------|---------------------|--|
| Motor protection evaluation | Standard: | Monitoring the motor temperature in combination with thermostiches within actuator motor |
| | Options: | Additional thermal overload relay in controls combined with thermostiches within actuator |
| | | PTC tripping device in combination with PTC thermistors within actuator motor |
| Overvoltage protection (option) | | Protection of the actuator and control electronics against overvoltages on the fieldbus cables of up to 4 kV |
| Electrical connection | Standard: | AUMA plug/socket connector with screw-type connection |
| | Options: | <ul style="list-style-type: none"> Terminals or crimp connection Gold-plated control contacts (pins and sockets) |
| Threads for cable entries | Standard: | Metric threads |
| | Options: | Pg-threads, NPT-threads, G-threads |
| Wiring diagram | Refer to name plate | |

12.3. Modbus interface

| Settings/programming the Modbus interface | |
|---|---|
| Setting the Modbus interface | Baud rate, parity and Modbus address are set via the display of the AUMATIC |

| Commands and signals of the fieldbus interface | |
|---|--|
| Process representation output (command signals) | OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable LOCAL, Interlock OPEN/CLOSE |
| Process representation input (feedback signals) | <ul style="list-style-type: none"> End position OPEN, CLOSED Actual position value Actual torque value¹⁾ Selector switch in position LOCAL/REMOTE Running indication (directional) Torque switch OPEN, CLOSED Limit switch OPEN, CLOSED Manual operation by handwheel or via local controls 2 analogue and 4 digital customer inputs |
| Process representation input (fault signals) | <ul style="list-style-type: none"> Motor protection tripped Torque switch tripped in mid-travel One phase missing Loss of the analogue customer inputs |
| Behaviour on loss of communication | The behaviour of the actuator is programmable: <ul style="list-style-type: none"> Stop in current position Travel to end position OPEN or CLOSED Travel to any intermediate position Execute last received operation command |

1) Requires magnetic limit and torque transmitter (MWG) in actuator

| General fieldbus interface data | |
|---------------------------------|--|
| Communication protocol | Modbus RTU according to IEC 61158 and IEC 61784 |
| Network topology | <ul style="list-style-type: none"> Line (bus) structure. When using repeaters, tree structures can also be implemented. Coupling and uncoupling of devices during operation without affecting other devices is possible. |
| Transmission medium | Twisted, screened copper cable according to IEC 61158 |
| Fieldbus interface | EIA-485 (RS485) |

| General fieldbus interface data | |
|---------------------------------|--|
| Transmission rate/cable length | <ul style="list-style-type: none"> • Baud rate: 9.6 – 115.2 kbit/s • Maximum cable length (segment length or between two actuators) without repeater: 1,200 m • Possible cable lengths: <ul style="list-style-type: none"> - For line topology with repeater: approx. 10 km (total network cable length) - For loop topology: approx. 290 km (redundant loop) |
| Device types | Modbus slave, e.g. devices with digital and/or analogue inputs/outputs such as actuators, sensors |
| Number of devices | 32 devices in each segment without repeater, with repeaters expandable to 247 |
| Bus access | Polling between master and slaves (query response) |
| Supported fieldbus functions | 01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Force Single Coil 15 (0FHex) Force Multiple Coils 06 Preset Single Register 16 (10Hex) Preset Multiple Registers 07 Read Exception Status 17 (11Hex) Report Slave ID 08 Diagnostics: <ul style="list-style-type: none"> • 00 00 Loopback • 00 10 (0AHex) Clear Counters and Diagnostic Register • 00 11 (0BHex) Return Bus Message Count • 00 12 (0CHex) Return Bus Communication Error Count • 00 13 (0DHex) Return Bus Exception Error Count • 00 14 (0EHex) Return Slave Message Count • 00 15 (0FHex) Return Slave No Response Count • 00 16 (10Hex) Return Slave NAK Count • 00 17 (11Hex) Return Slave Busy Count • 00 18 (12Hex) Return Character Overrun Count |

12.4. Service conditions

| | |
|--|--|
| Mounting position | Any position |
| Use | Indoor and outdoor use permissible |
| Enclosure protection according to EN 60529 | Standard: <ul style="list-style-type: none"> • IP67 with AUMA 3-ph AC motor For actual version, refer to actuator/controls name plate. |
| Corrosion protection | Standard: <ul style="list-style-type: none"> • KN: Suitable for installation in industrial units, in water or power plants with a low pollutant concentration Options: <ul style="list-style-type: none"> • KS: Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in wastewater treatment plants, chemical industry) • KX: Suitable for installation in extremely aggressive atmospheres with high humidity and high pollutant concentration |
| Installation altitude | Standard: ≤ 2,000 m above sea level Option: > 2,000 m above sea level, please contact AUMA |
| Humidity | Up to 100 % relative humidity over the entire permissible temperature range |
| Pollution degree | Within controls: Pollution degree 2 Outside controls (when closed): Pollution degree 4 |
| Finish coating | Standard: Paint based on polyurethane (powder coating) |
| Colour | Standard: AUMA silver-grey (similar to RAL 7037) |
| Ambient temperature | Standard: <ul style="list-style-type: none"> • –40 °C to +40 °C/+60 °C For actual version, refer to actuator/controls name plate. |

| | |
|----------|--|
| Lifetime | Open-close duty (operating cycles (OPEN - CLOSE - OPEN): SA 25.1 – SA 30.1: 10,000 SA 35.1 – SA 40.1: 5,000 Modulating duty: ¹⁾ SAR 25.1 – SAR 30.1: 2.5 million modulating steps |
| Weight | Refer to separate technical data |

1) The lifetime depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operating time, the number of starts per hour chosen should be as low as permissible for the process.

12.5. Accessories

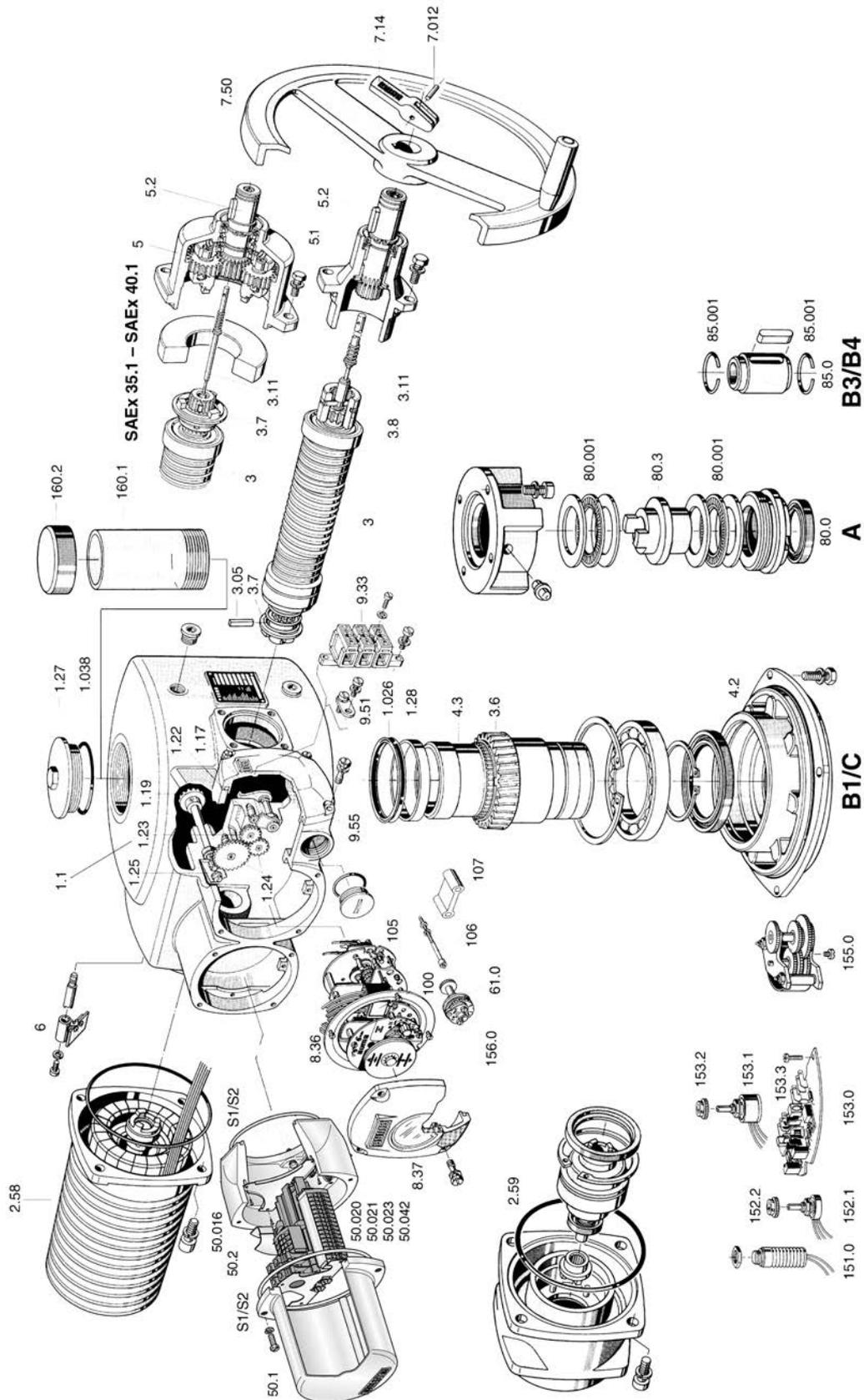
| Accessories | |
|-----------------------------|--|
| Wall bracket | AC 01.2 mounted separately from the actuator, including plug/socket connector. Connecting cable on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service. Cable length between actuator and AC 01.2 max. 100 m. Not suitable for version with potentiometer in the actuator. Instead of the potentiometer, the actuator has to be equipped with an electronic position transmitter. Cable length for non-intrusive version with MWG in the actuator max. 100 m. Requires separate data cable for MWG. |
| Programming software for PC | AUMA CDT |

12.6. Further information

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

13. Spare parts

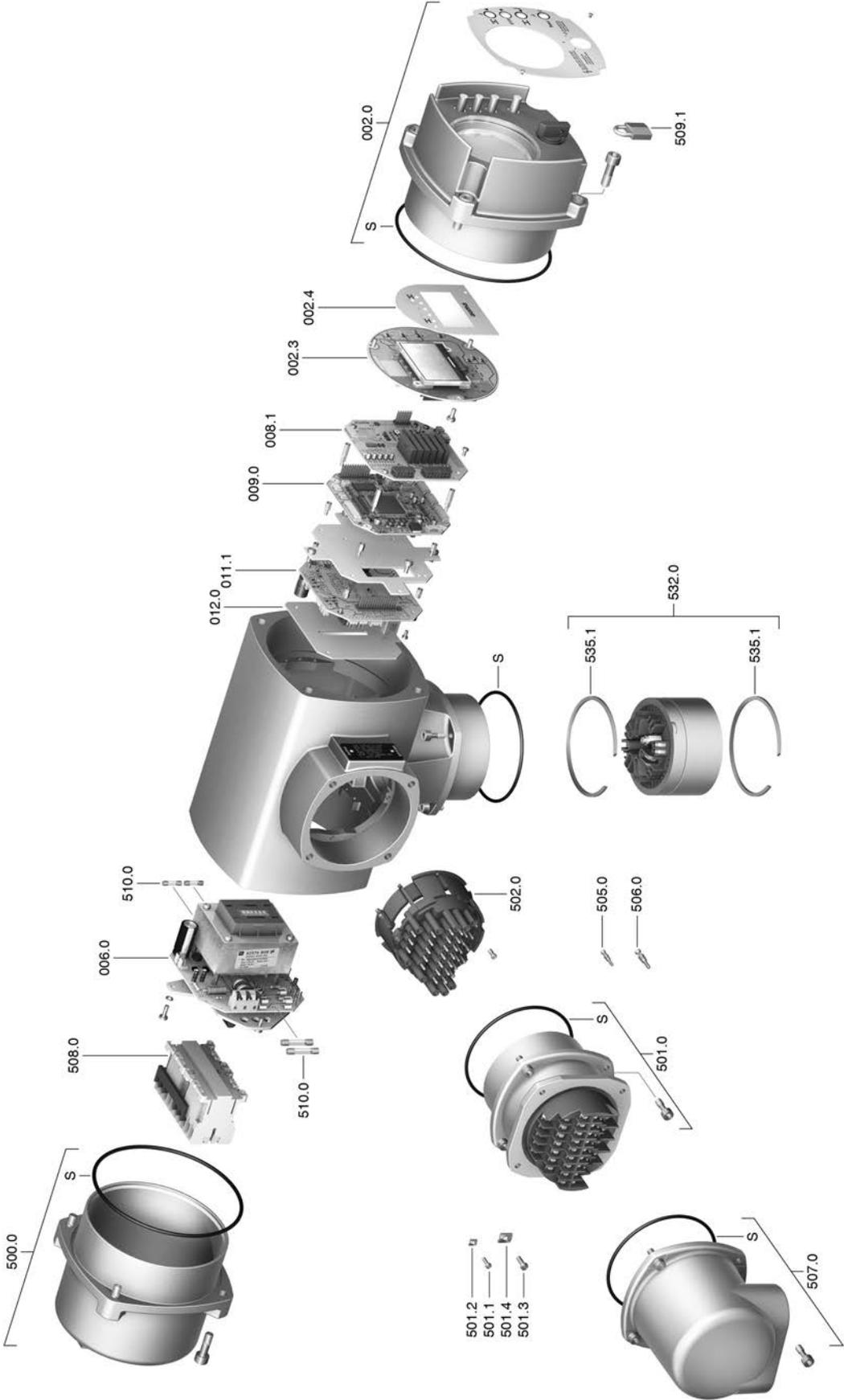
13.1. Multi-turn actuators SAEx 25.1 – SAEx 40.1/SAREx 25.1 – SAREx 30.1



Information: Please state type and commission no. of the device (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Delivered spare parts may slightly vary from the representation.

| No. | Designation | Type | No. | Designation | Type |
|-------|--|--------------|--------|---|--------------|
| 1.026 | V-seal | | 9.55 | Cover for motor connection compartment assy | Sub-assembly |
| 1.038 | O-ring | | 50.1 | Cover assy | Sub-assembly |
| 1.1 | Housing | Sub-assembly | 50.2 | Terminal frame assy (without terminals) (Ex) | Sub-assembly |
| 1.17 | Torque lever | Sub-assembly | 50.016 | End piece (Ex sub-assembly) | |
| 1.19 | Crown wheel | Sub-assembly | 50.020 | Terminal (Ex sub-assembly) | |
| 1.22 | Drive pinion II for torque switching | Sub-assembly | 50.021 | Terminal (Ex sub-assembly) | |
| 1.23 | Output drive wheel for limit switching | Sub-assembly | 50.023 | Terminal cover (Ex sub-assembly) | |
| 1.24 | Intermediate wheel for limit switching | Sub-assembly | 50.042 | Insulation plate (Ex sub-assembly) | |
| 1.25 | Locking plate | | 51.16 | Frame assy (Ex sub-assembly) | Sub-assembly |
| 1.27 | Threaded plug | | 61.0 | Torque switching head | Sub-assembly |
| 1.28 | Bearing bush | | 80.0 | Output drive type A (without stem nut) | Sub-assembly |
| 2.58 | Motor | Sub-assembly | 80.001 | Thrust bearing set | Set |
| 2.59 | Planetary gearing for motor drive | Sub-assembly | 80.3 | Stem nut (without thread) | |
| 3 | Drive shaft assy | Sub-assembly | 85.0 | Output drive type B3/ B4 | Sub-assembly |
| 3.05 | Dowel pin | | 85.001 | Snap ring | |
| 3.11 | Pull rope | Sub-assembly | 100 | Switch for limit/ torque switching (including pins at wires) | Sub-assembly |
| 3.6 | Worm wheel | Sub-assembly | 105 | Blinker transmitter including pins at wires (without impulse disc and insulation plate) | Sub-assembly |
| 3.7 | Motor coupling | | 106.0 | Stud bolt for switches | Sub-assembly |
| 3.8 | Manual drive coupling | Sub-assembly | 107 | Spacer | |
| 4.2 | Bearing flange | Sub-assembly | 151.0 | Heater | Sub-assembly |
| 4.3 | Hollow shaft | Sub-assembly | 152.1 | Potentiometer without slip clutch | Sub-assembly |
| 5 | Planetary gearing for manual drive | Sub-assembly | 152.2 | Slip clutch for potentiometer | Sub-assembly |
| 5.1 | Retaining flange | | 153.0 | RWG | Sub-assembly |
| 5.2 | Handwheel shaft | Sub-assembly | 153.1 | Potentiometer for RWG without slip clutch | Sub-assembly |
| 6 | Swing lever | Sub-assembly | 153.2 | Slip clutch for potentiometer/RWG | Sub-assembly |
| 7.012 | Notched pin | | 153.3 | Electronic board RWG | Sub-assembly |
| 7.14 | Change-over lever assy | | 155.0 | Reduction gearing | Sub-assembly |
| 7.50 | Handwheel with ball handle | Sub-assembly | 156.0 | Mechanical position indicator | Sub-assembly |
| 8.36 | Control unit without torque switching heads and switches | Sub-assembly | 160.1 | Stem protection tube (without cap) | |
| 8.37 | Cover for switch compartment | Sub-assembly | 160.2 | Cap for stem protection tube | |
| 9.33 | Terminals for motor connection | Sub-assembly | S1 | Seal kit (small) | Set |
| 9.51 | Protective earth connection | Sub-assembly | S2 | Seal kit (large) | Set |

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



Information: Please state 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 |
| 002.3 | Local controls board | Sub-assembly |
| 002.4 | Face plate for display | Sub-assembly |
| 006.0 | Power supply unit | Sub-assembly |
| 008.1 | I/O board | Sub-assembly |
| 008.1 | Fieldbus board | Sub-assembly |
| 009.0 | Logic board | Sub-assembly |
| 011.1 | Relay board | Sub-assembly |
| 012.1 | Option board | Sub-assembly |
| 500.0 | Cover | Sub-assembly |
| 501.0 | 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 | |
| 510.0 | Fuse kit | Sub-assembly |
| 532.0 | Cable conduit (actuator connection) | Sub-assembly |
| 535.1 | Retaining ring | |
| S | Seal kit | Set |

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 |
| 002.3 | Local controls board | Sub-assembly |
| 002.4 | Face plate for display | Sub-assembly |
| 006.0 | Power supply unit | Sub-assembly |
| 008.1 | I/O board | Sub-assembly |
| 008.1 | Fieldbus board | Sub-assembly |
| 009.0 | Logic board | Sub-assembly |
| 011.1 | Relay board | Sub-assembly |
| 012.1 | Option board | Sub-assembly |
| 500.0 | Cover | Sub-assembly |
| 502.0 | Pin carrier (without pins) | Sub-assembly |
| 505.0 | Pin for controls | Sub-assembly |
| 506.0 | Pin for motor | Sub-assembly |
| 508.0 | Switchgear | Sub-assembly |
| 509.1 | Padlock | |
| 510.0 | Fuse kit | Sub-assembly |
| 528.0 | Terminal frame (without terminals) | Sub-assembly |
| 529.0 | End clamp | |
| 532.0 | Cable conduit (actuator connection) | Sub-assembly |
| 533.0 | Terminals for motor/controls | |
| 535.1 | Retaining ring | |
| 573.0 | Ex plug/socket connector with terminal blocks (KES) | Sub-assembly |
| S | Seal kit | Set |

14. Certificates

14.1. 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 multi-turn actuators of the type ranges **SAEx 25.1 – SAEx 40.1, SAREx 25.1 – SAREx 30.1**
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 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 12100-1: 2003 | ISO 5210: 1996 |
| EN 12100-2: 2003 | EN 60204-1: 2006 |

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

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

As partly completed machinery, the multi-turn 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: 2006 | EN 60079-11: 2007 | EN 1127-1: 2007 |
| EN 60079-1: 2007 | EN 13463-1: 2009 | |
| EN 60079-7: 2007 | EN 13463-5: 2003 | |

The EC type examination certificate PTB 03 ATEX 1123 issued by the Physikalisch Technische Bundesanstalt is available for the multi-turn actuators mentioned above.

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

EN 61000-6-4: 2007
EN 61000-6-2: 2005

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

| | |
|------------------|------------------|
| EN 60204-1: 2006 | EN 60034-1: 2004 |
| EN 50178: 1997 | EN 61010-1: 2001 |

Year of affixing of the CE marking: 2010

Muellheim, 2010-11-01

H. Newerla, General Management

14.2. ATEX certificate

Physikalisch-Technische Bundesanstalt
 Braunschweig und Berlin



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
 (Translation)

- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**
 (3) EC-type-examination Certificate Number:



PTB 03 ATEX 1123

- (4) Equipment: Multi-turn actuator, types SA.Ex 25.1-... to SA.Ex40.1-...
 (5) Manufacturer: AUMA RIESTER GmbH & Co. KG
 (6) Address: 79379 Müllheim, Germany
 (7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
 (8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 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 the confidential report PTB Ex 04-13199.
 (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
 EN 50014: 1997 + A1 + A2 EN 50018: 2000 EN 50019: 2000
 EN 50020: 1994 EN 50281-1-1:1998
 (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 in accordance 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/D EEx ed [ib] IIB T4 or T3 IP 67 T 130 °C or 190 °C

Zertifizierungsstelle Explosionsschutz
 By order:

Braunschweig, September 29, 2004

Dr.-Ing. U. Klausmeyer
 Regierungsdirektor



sheet 1/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig



Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 1123

| | | |
|--------------------------------------|--------------------|---------------------|
| Rated insulation voltage | up to | Control circuit |
| Rated current | 750 V | 250 V |
| Rated cross section | 75 A | 10 A |
| | max. | 2.5 mm ² |
| Admissible ambient temperature range | 25 mm ² | |
| | max. | |
| | - 50 °C to + 60 °C | |

The admissible ambient temperature range may be restricted by the components selected or the data sheet for the electrical design.

The composition of the protection symbol will be based on the types of protection of the components actually used.

(16) Test report PTB Ex 04-13199

(17) Special conditions for safe use
 None

Notes for operation and manufacturing

Any components attached or installed (e.g. limit switches, potentiometers, electronic control gear, display units) shall be of a technical standard that complies with the specifications on the cover sheet, they shall be suited for the operating conditions, and be covered by a separate examination certificate. The notes specified in the component certificate shall be complied with.

The monitoring devices shall satisfy the requirements of Directive 94/9 EC and EN 1127-1.

This EC Type Examination Certificate as well as any future supplements thereto shall at the same time be regarded as supplements for the Certificates of Conformity PTB No. Ex-92.C.1039 and Ex-94.C.1007. These are no supplements as defined by Directive 76/117/EEC, but only show that the old examination certificate has been replaced.

(18) Essential health and safety requirements
 Met by compliance with the aforementioned standards.



Braunschweig, September 29, 2004

sheet 3/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE

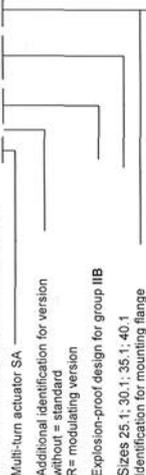
(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 1123**

(15) **Description of equipment**

The multi-turn actuator, types SA.Ex 25.1-... to SA.Ex40.1-..., comprises the following elements:

- Housing accommodating the gearing and the mechanical actuators (these do not form part of this examination certificate).
- Flanged pot-type motor designed to Flameproof Enclosure type of protection. The shaft rotates in anti-friction bearings. Together with the end shield provided at the drive end, the shaft forms the flameproof shaft joint. Electric power supply is by means of separately certified cable entries.
- Motors separately certified by means of an adapter flange as an option (designed to Flameproof Enclosure "d" or increased Safety "e" type of protection).
- Switching and signalling compartment, designed to increased Safety type of protection, cast integral with the enclosure and optionally provided with an inspection window. The compartment may be used to accommodate switchgear and signalling units, electronic measuring and control gear as well as display units designed to Intrinsic Safety "i" type of protection, as well as terminals for intrinsically safe and non-intrinsically safe circuits. The internal elements are covered by a separate type approval.

Type name of the multi-turn actuators SA.Ex 25.1-F10



Technical data

For the S2, S4 or S5 duty types, the electrical motor data, incl. specifications for compliance with the temperature class, are defined in the attached data sheet attached for the EC type-examination certificate.

| Size of actuator | Size of motor | Output |
|------------------|----------------|--------------|
| SA.Ex 25.1 | ADX132/ADX 90 | 1.1 to 15 kW |
| SA.Ex 30.1 | ADX160/ADX 112 | 2.2 to 30 kW |
| SA.Ex 35.1 | ADX160/ADX 132 | 7.5 to 30 kW |
| SA.Ex 40.1 | ADX160 | 7.5 to 30 kW |

or comparable motors with a separate examination certificate.

sheet 2/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin
DATA SHEET 01 TO EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 1123

Manufacturer: AUMA RIESTER GmbH & Co. KG, 79379 Müllheim, Germany

for the actuator motors

| | |
|---------------|---------------|
| Size of motor | Output |
| ADX 90 | 1.1 to 4 kW |
| ADX 112 | 2.2 to 7.8 kW |
| ADX 132 | 4 to 15 kW |
| ADX 160 | 7.5 to 30 kW |

of the multi-turn actuators, types SA.Ex.25.1-... to SA.Ex.40.1-...

Electrical ratings

This certificate is valid for the following designs, provided the actuator motors, marked II 2 G/D EEx ed (Ib) IIB T4 or T3 (IP 67 T 130 °C or T 190 °C, differ only negligibly from the sample tested as regards their electrical and thermal loads:

| | | |
|---------------------|--|------|
| Rated voltage: | 100 to 690 | V AC |
| Rated current: | 7 A to 75 | A |
| Rated power: | 1.1 to 30 | kW |
| Power factor cos φ: | 0.40 to 0.95 | |
| Rated frequency: | 50 or 60 | Hz |
| Rated speed: | 700 to 3360 | rpm |
| Duty types: | S2, S4 or S5 in compliance with EN 60034-1 | |
| Temperature class: | T4 or T3 | |

For the defined output and the corresponding voltage ratings, additional ratings, and the maximum temperatures, reference is made to test report VB No. 010-08.001291-00.

In addition to the above-mentioned voltage ratings, intermediate values are also permissible, provided the temperature class specifications are complied with. The corresponding currents are to be converted at a ratio which is the reciprocal of the voltages. The mains voltage may vary by up to ±10 % from the rated values.

The actuator motors may operate on electric low-voltage networks with nominal voltages and voltage tolerances in compliance with IEC 38, or other networks or power supply systems with nominal voltage tolerances of ±10 % as a maximum. Motor overload protection must be provided. This may be done in the form of:

- Current limitation (e.g. by means of thermostats and overcurrent protection device) for duty type S2. The rated current must be set, and the motor must be stopped under operating conditions at 1.2 times the current rating at the latest.
- Temperature limitation by means of integrated PTC thermistors in the stator, for duty types S4 and S5. The PTC thermistors shall be connected to a tripping device that complies with the requirements in ATEX 100a, Annex II, section 1.5.5, and EN 1127-1.



Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin
DATA SHEET 01 TO EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 1123

For compliance with the temperature class, the actuator motor will be stopped once the limit temperatures have been reached. This is done by connecting an approved tripping device to the intended measuring points. The tripping temperatures specified in the data sheet must be complied with by all means.

The electrical data specified in test report VB No. 010-08.001291-00 relate to duty type S2 15 min. and are used as reference values for the other duty types.

Report PTB Ex 04-13199

Special conditions
None

Zertifizierungsstelle Explosionsschutz

By:
Dr.-Ing. U. Klausmeyer
Regierungsdirektor

Braunschweig, September 29, 2004



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

1st SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 1123
(Translation)

Equipment: Multi-turn actuator, types SA.Ex.25.1-... to SA.Ex.40.1-...

Marking: II 2 G EEx de [Ib] IIB T4 and T3

II 2 D Ex ID A21 IP 67 T 130 °C and T 190 °C

Manufacturer: AUMA Riester GmbH & Co. KG

Address: Aumastraße 1
79379 Müllheim, Germany

Description of supplements and modifications

The multi-turn actuator, types SA.Ex.25.1-... to SA.Ex.40.1-..., may alternatively be powder coated to protect it against corrosion.

Applied standards

EN 50014:1997 + A1 + A2
EN 50020:2007

EN 50018:2000
EN 50281-1-1:1998

EN 50019:2000

Test report: PTB Ex.07-16259

Zertifizierungsstelle Explosionsschutz

By order:

Braunschweig, October 10, 2007



Dr.-Ing. Volker Thiele
Oberregler-Physik

Sheet 1/1

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig, Germany

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A

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Y005.735/003/en/1.15