auma®
Solutions for a world in motion

Multi-turn actuators
SA 07.2-UW – SA 16.2-UW
SAR 07.2-UW – SAR 16.2-UW
for continuous underwater use
with actuator controls
AC 01.2 Non-Intrusive

Control
Parallel
Profibus DP
Profinet
Modbus RTU
→ Modbus TCP/IP
Foundation Fieldbus
HART



Operation instructions

Assembly and commissioning

Read operation instructions first.

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

Target group:

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

Reference documents:

- Manual (Operation and setting) of actuator controls AC 01.2 Modbus TCP/IP
- Manual (Fieldbus device integration) of actuator controls AC 01.2 Modbus TCP/IP

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

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1. Safety instructions

1.1. Prerequisites for the safe handling of the product

Standards/directives

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

They include among others:

- Applicable configuration guidelines for network applications.

Safety instructions/ warnings

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

Qualification of staff

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

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

Commissioning

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

Operation

Prerequisites for safe and smooth operation:

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

Protective measures

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

Maintenance

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

Any device modification requires prior written consent of the manufacturer.

1.2. Range of application

AUMA multi-turn actuators SA 07.2-UW – SA 16.2-UW/SAR 07.2-UW – SAR 16.2-UW are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves, and ball valves.

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
- Potentially explosive areas
- Radiation exposed areas in nuclear power plants

No liability can be assumed for inappropriate or unintended use.

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

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

1.3. Warnings and notes

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

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

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

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

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

Safety alert symbol ⚠ warns of a potential personal injury hazard.

The signal word (here: DANGER) indicates the level of hazard.

1.4. References and symbols

The following references and symbols are used in these instructions:

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

Symbol for CLOSED (valve closed)

Symbol for OPEN (valve open)

M ▷ **Via the menu to parameter**

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

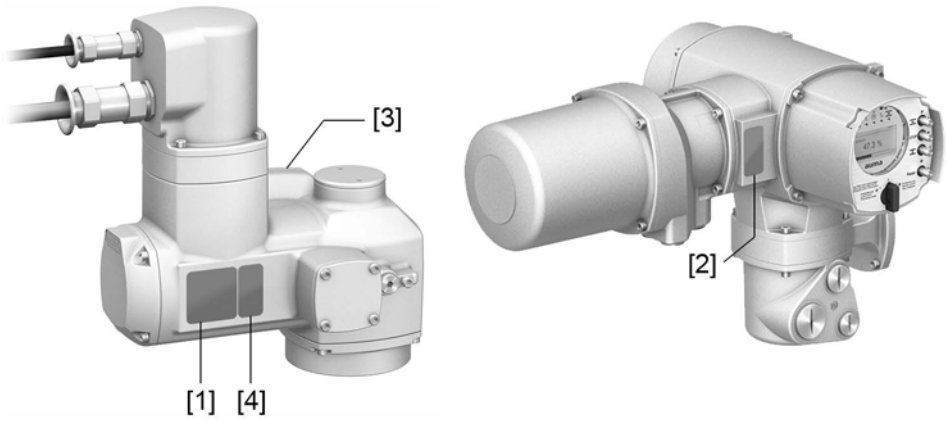
➥ **Result of a process step**

Describes the result of a preceding process step.

2. Identification

2.1. 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)

Actuator name plate

Figure 2: Actuator name plate (example)

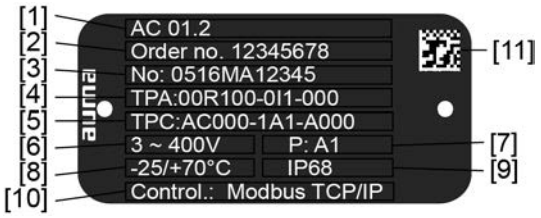


auma (= manufacturer logo); CE (= CE mark)

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

Actuator controls name plate

Figure 3: Actuator controls name plate (example)

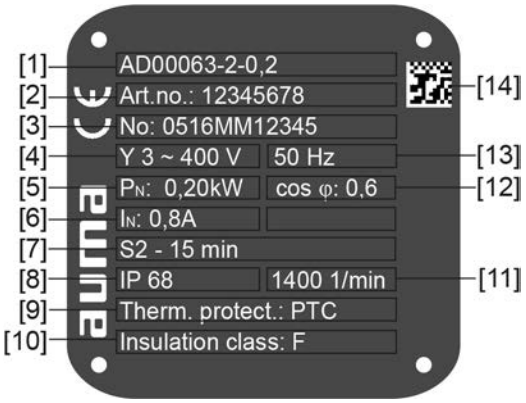


auma (= manufacturer logo)

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

Motor name plate

Figure 4: Motor name plate (example)



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

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

Descriptions referring to name plate indications

Type designation

Figure 5: Type designation (example)



1. Actuator type, size and version
2. Flange size

Type, size and version

These instructions apply to the following devices types and sizes:

- Type: SA = Actuators for open-close duty
  Sizes and generation: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
  Version: UW = for continuous underwater use
- Type: SA**R** = Multi-turn actuators for modulating duty
  Sizes and generation: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
  Version: UW = for continuous underwater use
- Type: AC = AUMATIC actuator controls
  Size and generation: 01.2

Order number

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

Please always state this number for any product inquiries.

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

Actuator serial number

Table 1:

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

Actuator enclosure protection

IP68-C15: The maximum head of water is 15 m.

Actuator terminal plan

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

I = MWG (magnetic limit and torque transmitter)

AUMA power class for switchgear

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

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

Data Matrix code

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

Figure 6: Link to AUMA Assistant App:

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

Control

Table 2:

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

2.2. Short description

Multi-turn actuator

Definition in compliance with EN 15714-2/EN ISO 5210:

A multi-turn actuator is an actuator which transmits torque to a valve for at least one full revolution.

AUMA multi-turn actuator

AUMA multi-turn actuators SA 07.2-UW – SA 16.2-UW/SAR 07.2-UW – SAR 16.2-UW are driven by an electric motor. For setting and emergency operation, a handwheel can be installed as an option.

Switching off in end positions may be either by limit or torque seating.

Actuator controls are required to operate or process the actuator signals.

Actuator controls

The actuator controls AC 01.2 are mounted separately on a wall bracket.

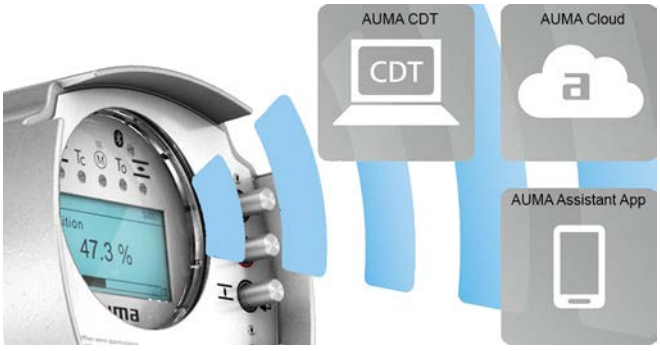
The actuator can be operated via the push buttons on the local controls of the actuator controls or settings can be made in the actuator controls menu. The display shows information on the actuator as well as the menu settings.

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

App and software

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

Figure 7: Communication via Bluetooth



AUMA CDT



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

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

AUMA Cloud



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

AUMA Assistant App



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

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

Figure 8: Link to AUMA Assistant App

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Suspended load!

Death or serious injury.

→ Do NOT stand below suspended load.

→ 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.

→ Respect total weight of combination (actuator, gearbox, valve)

→ Secure load against falling down, sliding or tilting.

→ Perform lift trial at low height to eliminate any potential danger e.g. by tilting.

Figure 9: Example: Lifting the actuator



Table 3:

Weights of multi-turn actuator SA 07.2-UW – SA 16.2-UW/ SAR 07.2-UW – SAR 16.2-UW with 3-phase AC motors		
Type designation Actuator	Motor type[1)]	Weight[2)] approx. [kg]
SA 07.2-UW/ SAR 07.2-UW	VD...	25
	AD...	26
SA 07.6-UW/ SAR 07.6-UW	VD...	25
	AD...	27
SA 10.2-UW/ SAR 10.2-UW	VD...	31
	AD...	33
SA 14.2-UW/ SAR 14.2-UW	VD...	54
	AD...	58
SA 14.6-UW/ SAR 14.6-UW	VD...	56
	AD...	62
SA 16.2-UW/ SAR 16.2-UW	VD...	72
	AD...	93

1) Refer to motor name plate
2) Indicated weight includes AUMA NORM multi-turn actuator with 3-phase AC motor, electrical connection or actuator plug/socket connector incl. cable glands (approx. 2.3 kg) and double sealed intermediate frame (approx. 1.2 kg) as well as output drive type B1. For other output drive types, heed additional weights. Heed weight of cables if plug/socket connector is linked.

3.2. Storage

NOTICE

Risk of corrosion due to inappropriate storage!

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

NOTICE

Risk of damage due to excessively low temperatures!

→ Actuator controls may only be stored permanently down to –30 °C.
→ On request, actuators controls may be transported in specific cases and for short duration at temperatures down to –60 °C.

Long-term storage

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

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

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

The product described in this document can be operated without restriction in any mounting position.

4.2. Mount actuator to valve

NOTICE

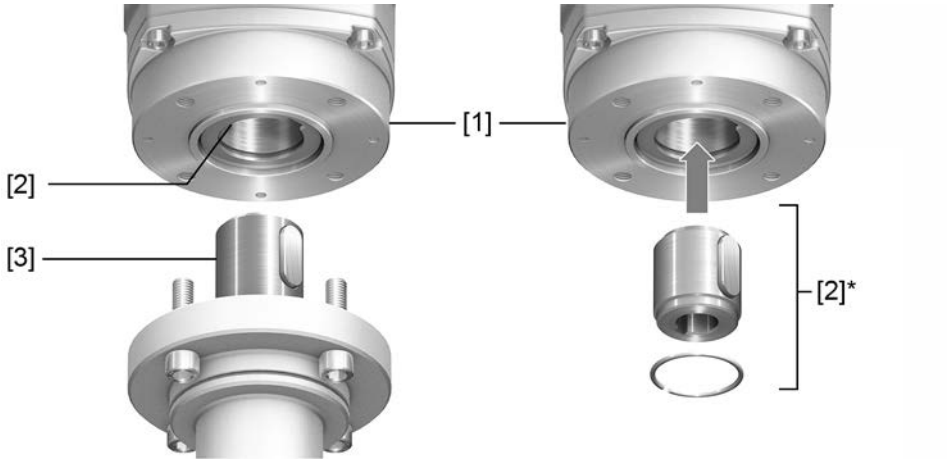
Corrosion due to damage to paint finish and condensation!

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

→ After mounting, connect the device immediately to electrical mains to ensure that heater minimises condensation.

4.2.1. Output drive types B

Figure 10: Mounting principle, example output drive type B



[1] Flange multi-turn actuator (e.g. F07)

[2] For output drive types B/B1/B2 solid shaft with bore and keyway

[2]* For output drive types B3/B4/E, an output drive sleeve is fitted into the bore of the solid shaft

[3] Gearbox/valve shaft with parallel key

Short description

For output drive types B/B1/B2, the connection to the valve or the gearbox is made by directly placing the multi-turn actuator solid shaft (output drive shaft) onto the input shaft of the valve or gearbox.

For output drive types B3/B4/E, the connection is made via output drive sleeve which is inserted into the bore of the solid shaft of the multi-turn actuator and fixed by a retaining ring.

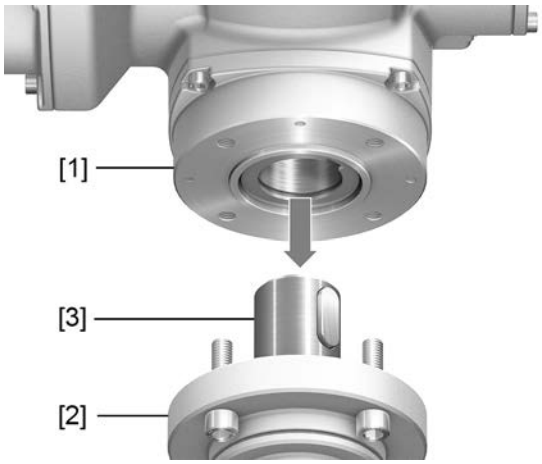
When exchanging the output drive sleeve, later retrofitting to a different output drive type is possible

Information

Spigot at valve flanges should be loose fit.

4.2.1.1. Mount multi-turn actuator with output drive type B

Figure 11: Mounting output drive types B



[1] Multi-turn actuator
[2] Valve/gearbox
[3] Valve/gearbox shaft

How to proceed

1. Check if mounting flanges fit together.
2. Check if output drive of multi-turn actuator [1] matches the output drive of valve/gearbox or valve/gearbox valve shaft [2/3].
3. Apply a small quantity of grease to the valve or gearbox shaft [3].
4. Place multi-turn actuator [1] and 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	
Threads	Tightening torque [Nm]
	Strength class A2-80/A4–80
M8	24
M10	48
M16	200
M20	392

5. Electrical connection

5.1. Basic information

⚠ WARNING

Electric shock due to presence of hazardous voltage!

Risk of death or serious injury!

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

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

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

Wiring diagram/terminal plan

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

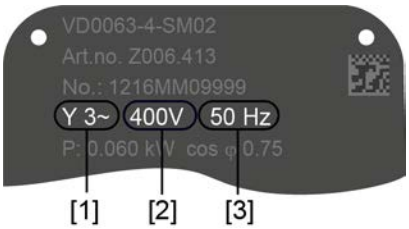
Permissible networks (supply networks)

The actuators are suitable for use in TN and TT networks with directly grounded star point for nominal voltages up to maximum 690 V AC. Use in IT network is permissible for nominal voltages up to maximum 600 V AC. For IT network, a suitable, approved insulation monitor measuring the pulse code is required.

Current type, mains voltage, mains frequency

Type of current, mains voltage and mains frequency must match the data on the actuator controls and motor name plates. Also refer to chapter <Identification>/<Name plate>.

Figure 12: Motor name plate (example)



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

Protection and sizing on site

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

The current values for sizing the protection can be derived from the current consumption of the motor (refer to motor name plate) plus the current consumption of actuator controls.

We recommend adapting the switchgear sizing to the max. current (I_{max}) and selecting and setting the overcurrent protection device in compliance with the indications in the electrical data sheet.

Table 5:

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

Table 6:

Maximum permissible protection		
Switchgear (switchgear with power class)[1)]	Rated power	max. protection
Reversing contactor A1	up to 1.5 kW	16 A (gL/gG)
Reversing contactor A2	up to 7.5 kW	32 A (gL/gG)
Reversing contactor A3	up to 15 kW	63 A (gL/gG)
Thyristor B1	up to 1.5 kW	16 A (g/R) I^2t<1,500A^2s
Thyristor B2	up to 3 kW	32 A (g/R) I^2t<1,500A^2s
Thyristor B3	up to 5.5 kW	63 A (g/R) I^2t<5,000A^2s

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

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

For actuator controls equipped with a heating system and external electronics power supply, the fuses for the heating system have to be provided by the customer (refer to wiring diagram F4 ext.)

Table 7:

Fuse for heating system Designation in wiring diagram = F4 ext.		
External power supply	115 V AC	230 V AC
Fuse	2 A T	1 A T

Potential of customer connections

Refer to Technical data for options of isolated potentials.

Safety standards

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

Connecting cables, cable glands, reducers, blanking plugs

- We recommend using connecting cables and connecting terminals according to rated current (I_N) (refer to motor name plate or electrical data sheet).
- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- To avoid contact corrosion, we recommend the use of sealing agents for cable glands and blanking plugs made of metal.
- Use connecting cable with appropriate minimum rated temperature.
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.
- For the connection of position transmitters, screened cables must be used.

Cable installation in accordance with EMC

Network cables are sensitive 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 network cables increases if the cables are laid close to the earth potential.
- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference.
- Avoid parallel paths with little cable distance of cables being either susceptible to interference or interference sources.

Network cables

This device is equipped with a network port.

Table 8:

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

Prior to installation, please note:

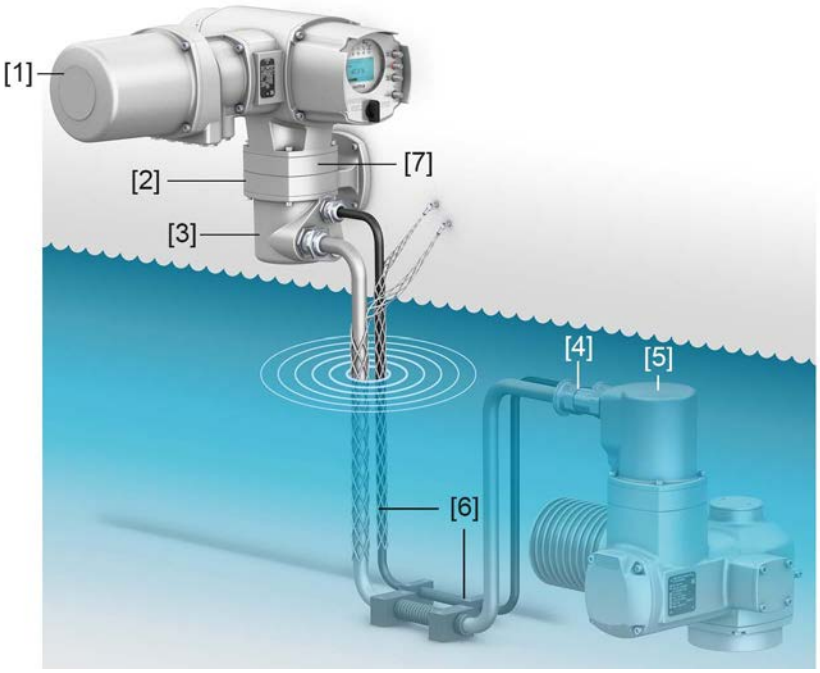
- Install network cables at a distance of minimum 20 cm to other cables.
- If possible, network cables should be laid in a separate, conductive, and earthed cable tray.
- Ensure absence of equipotential earth bonding differences between the individual devices within the network (perform an equipotential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

Table 9: Transmission rate/cable length for star topology or point-to-point wiring

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

5.2. Cable installation between actuator controls (wall bracket) and actuator

Figure 13: Example for cable installation of actuator controls – wall bracket



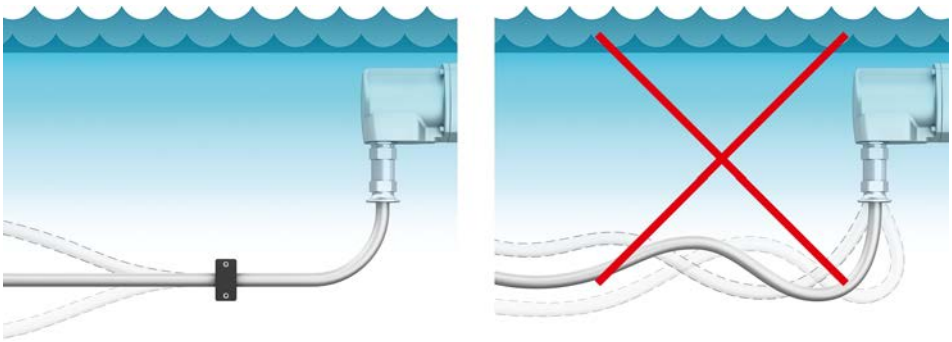
[1] Electrical connection (SJ) of actuator controls
[2] Wall bracket
[3] Plug/socket connector for wall bracket
[4] Connecting cables
[5] Plug/socket connector for actuator
[6] Fixing the connecting cables (example)
[7] DS intermediate frame (option)

Wall bracket

- Actuator controls are always mounted separately from the actuator on a wall bracket, outside the flooded area.
- The permissible cable length between actuator controls on wall bracket and the actuator amounts to 100 m maximum.

Connecting cables

- Connecting cables must be protected against damage and securely fixed. Continuous strain relief must be ensured. Cables may not move within the cable glands. The plant operator or the contractor are responsible for providing the required cable protection.
  Figure 14: Example: connecting cable fixing correct and incorrect



⚠ CAUTION

Risk of damage to connecting cables and cable glands due to improper installation!

Leakage and ingress of water!

→ If there is need to pull cables for installation: Place lifting accessories like slings and ropes around the cable or use cable stockings.

→ DO NOT pull at plug/socket connector or cable glands for cable installation or lifting.

→ Respect minimum bending radii. When installing the connecting cables, make sure not to fall short of the minimum bending radius.

- Figure 15: Example: pull cables, correct and wrong



- Figure 16: Minimum bending radii at plug/socket connector of actuator

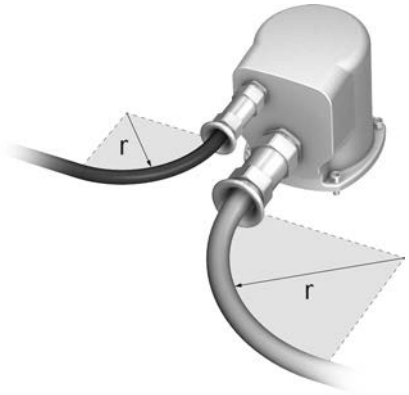


Table 10: Minimum bending radii

Connecting cable	Outer diameter (d) [mm]	Minimum bending radius r [mm]
Motor cable	approx. 12.1	90
Hybrid cable	approx. 21.7	130

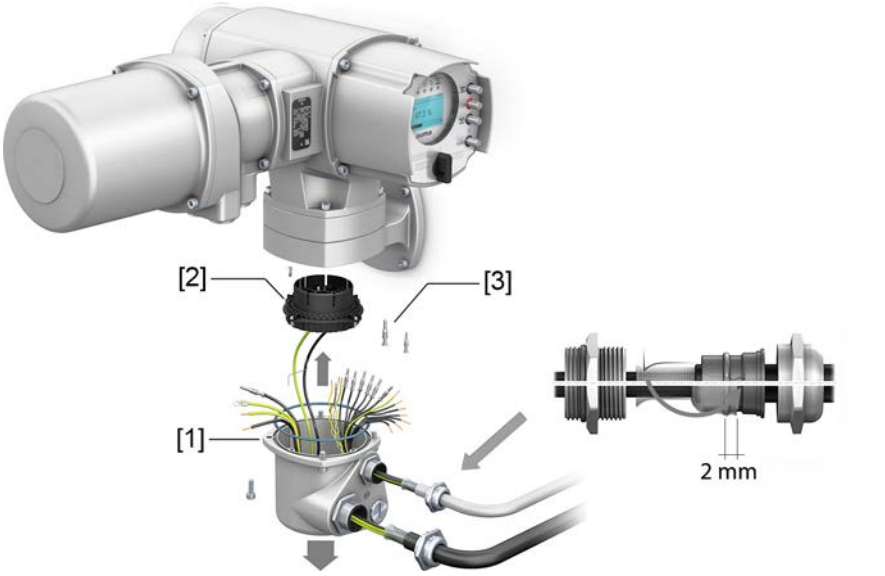
- Exclusively use AUMA “LSW” cable sets as connecting cables1

Table 11: AUMA cable sets

Cable set	LSW 68	LSW 69
Plug/socket connector for actuator	Ready-made, checked for leak tightness	Ready-made Tested for leak tightness
Plug/socket connector for wall bracket	Ready-made	Open connecting cable to wall bracket, wiring to be performed by the customer

- When mounting actuator controls outside the flooded area but below water level, we recommend using the DS intermediate double sealed frame between wall bracket and plug/socket connector.

- For LSW 69 cable set, the plug/socket connector must be opened at wall bracket level and the cables must be connected to the pin carrier according to the terminal plan. Appropriate crimping pliers are required for orderly crimping. Suitable pliers are available at AUMA (art. no. K007.979).
  Figure 17: Connection using LSW 69



[1] Cover for wall bracket plug/socket connector
[2] Pin carrier for crimp pin contacts
[3] Pin contacts (included in LSW 69 scope of delivery)

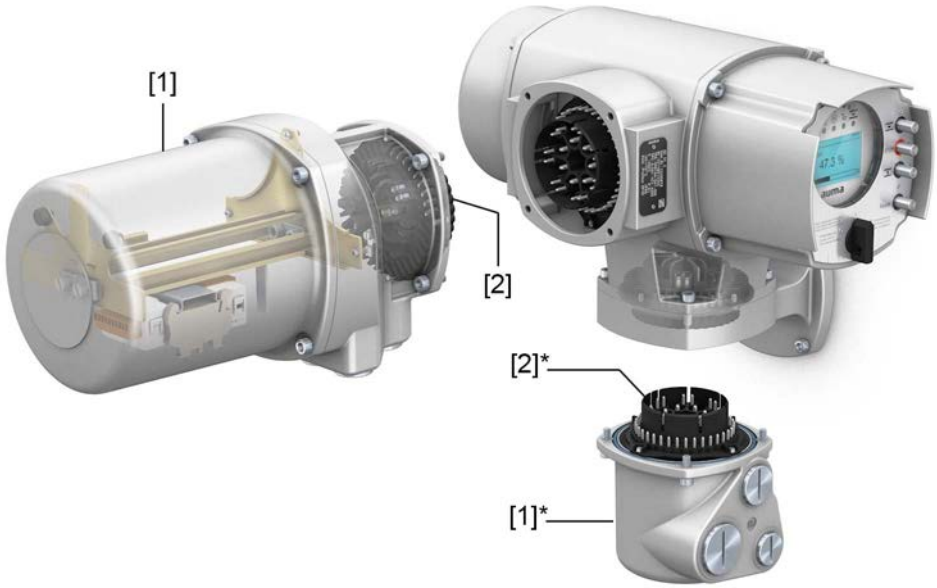
Table 12:

Art. no.	Pin contacts for	Pcs	Crimp range	Calibration pin Ø [mm]
Z030.022	Motor cables	3	2.50	2.00
Z006.161-1	Control contacts of hybrid cable	8	0.75 – 1.5	1,60
Z041.602	CAN contacts of hybrid cable	4	0.5 – 0.55	0.5 – 0.55

- When connecting, make sure that the shield of both connecting cables is sufficiently overlapping (approx. 2 mm over the O-ring) the contact socket of the cable gland.
- Connect all protective earth wires to the protective earthing (symbol ⏚) of housing cover using ring lugs.

5.3. SJ electrical connection (AUMA plug/socket connector)

Figure 18: SJ electrical connection



[1] Cover of electrical connection of actuator controls (XK) – (SJ version)
For customer connection of power supply and e.g. to control room

[2] Socket carrier with screw-type terminals

[1]* Cover of wall bracket plug socket connector (XM) – (S version)
The plug/socket connector of LSW 68 cable set is readily assembled (wired)
For LSW 69 cable set, the plug/socket connector must be opened and the cables must be connected to the pin carrier.

[2]* Pin carrier with crimp-type connection

Short description

Plug-in electrical connection with screw-type terminals for power and control contacts. Control contacts also available as crimp-type connection as an option.

SJ version . For power and control cable connection, remove the AUMA plug/socket connector and the socket carrier from terminal compartment. Removing the cover is sufficient for connecting the fieldbus cables.

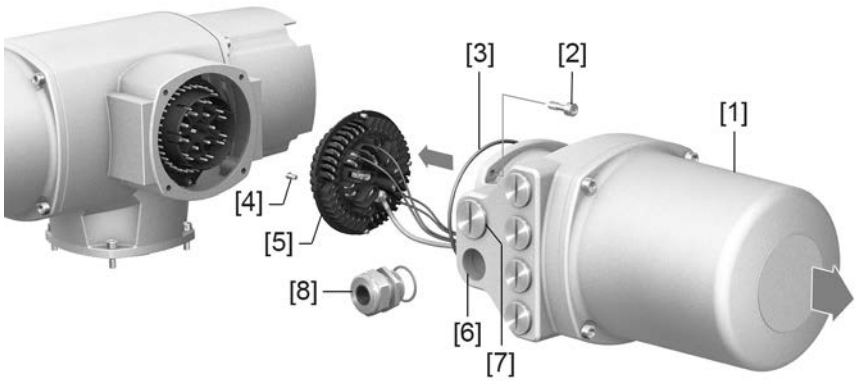
Technical data

Table 13:

Electrical connection via AUMA plug/socket connector		
	Power contacts	Control contacts
No. of contacts max.	6 (3 equipped) + protective earth conductor (PE)	50 pins/sockets
Designation	U1, V1, W1, U2, V2, W2, PE	1 to 50
Connection voltage max.	750 V	250 V
Rated current max.	25 A	16 A
Type of customer connection	Screw connection	Screw connection, crimp-type (option)
Connection diameter max.	6 mm^2 (flexible) 10 mm^2 (solid)	2.5 mm^2 (flexible or solid)

5.3.1. Open terminal compartment (for mains connection)

Figure 19: Open mains terminal compartment



[1] Connection housing
[2] Screws for frame
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable entries for mains connection (power and control contacts)
[7] Blanking plug
[8] Cable gland (not included in delivery)

DANGER

Electric shock due to presence of hazardous voltage!

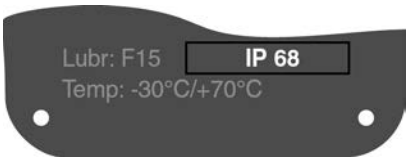
Death or serious injury.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove connection housing [1].
2. Loosen screws [4] and remove socket carrier [5] from connection housing [1].
3. Insert cable glands [8] suitable for connecting cables.

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

Figure 20: Example: Name plate for enclosure protection IP68



4. Seal unused cable entries [6] with suitable blanking plugs [7].

Information Fieldbus connection can be accessed separately from the mains connection (refer to <Fieldbus terminal compartment: open>.

5.3.2. Cable connection

Table 14:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U1, V1, W1, U2, V2, W2)	1.0 – 6 mm^2 (flexible) 1.5 – 10 mm^2 (solid)	1.2 – 1.5 Nm
Protective earth connection ⏚ (PE)	1.0 – 6 mm^2 (flexible) with ring lugs 1.5 – 10 mm^2 (solid) with loops	1.2 – 2.2 Nm
Control contacts (1 to 50)	0.25 – 2.5 mm^2 (flexible) 0.34 – 2.5 mm^2 (solid)	0.5 – 0.7 Nm

1. Remove cable sheathing.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
4. Strip wires.
   → Controls approx. 6 mm, motor approx. 10 mm
5. For flexible cables: Use wire end sleeves according to DIN 46228.
6. Connect cables according to order-related wiring diagram.

⚠ WARNING

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

Risk of death or serious injury!

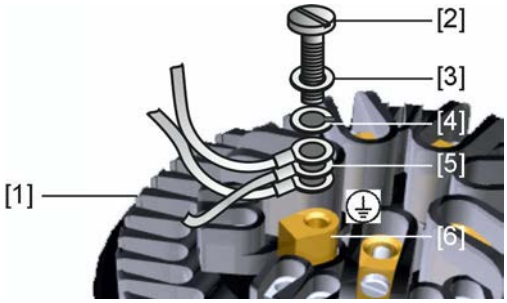
→ Connect all protective earth conductors.

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

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

7. Tighten PE conductors firmly to PE connection using ring lugs (flexible cables) or loops (solid cables).

   Figure 21: Protective earthing

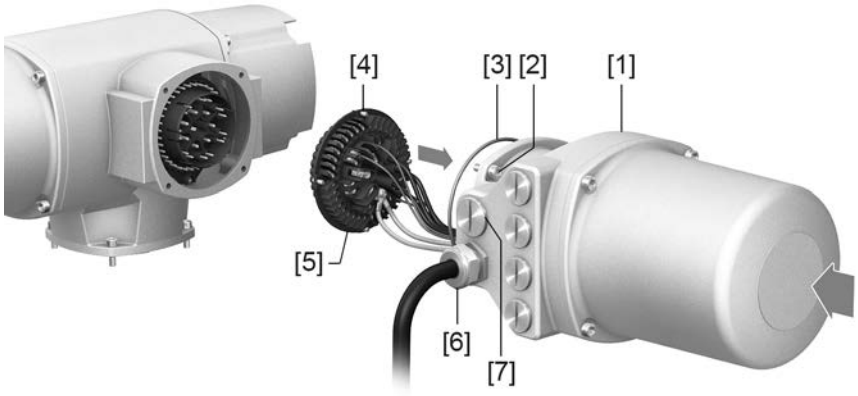


   [1] Socket carrier
   [2] Screw
   [3] Washer
   [4] Lock washer
   [5] Protective earth with ring lugs/loops
   [6] Protective earthing, symbol: ⏚

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

5.3.3. Close terminal compartment (for mains connection)

Figure 22: Close mains terminal compartment



[1] Connection housing
[2] Screws for frame
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable gland (not included in delivery)
[7] Blanking plug

⚠ WARNING

Short-circuit and electric shock due to pinching of cables!

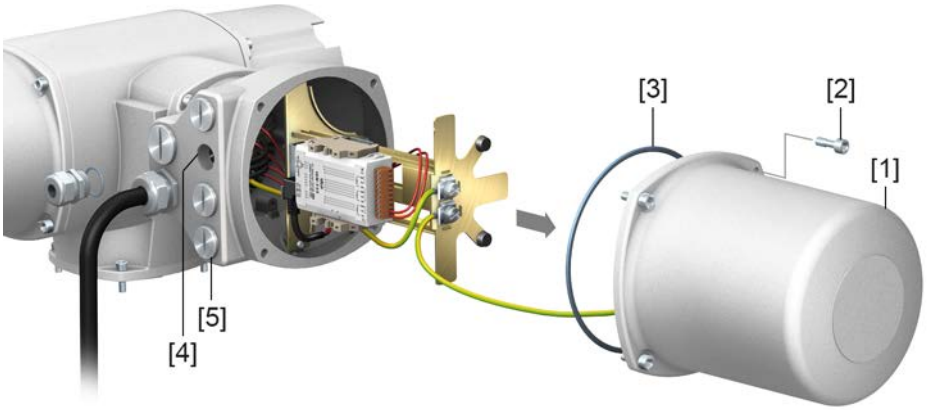
Risk of death or serious injury!

→ Carefully fit socket carrier to avoid pinching the cables.

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

5.3.4. Open fieldbus terminal compartment

Figure 23: Open cover to fieldbus terminal compartment



[1] Cover (fieldbus terminal compartment)
[2] Screws for cover
[3] O-ring
[4] Cable entries network cables
[5] Blanking plug

For connecting the Industrial Ethernet cable within the AUMA plug/socket connector, a field-assembled Ethernet connector is used. When removing the cover [1], the gateway or module is easily accessible.

DANGER

Electric shock due to presence of hazardous voltage!

Death or serious injury.

→ Disconnect device from the mains before opening.

NOTICE

Electrostatic discharge ESD!

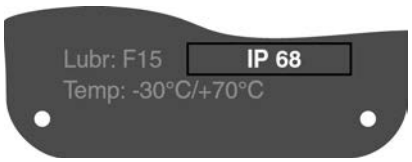
Risk of damage to electronic components.

→ Earth both operators and devices.

1. Loosen screws [2] and remove cover [1].
2. Insert cable glands suitable for fieldbus cables.

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

Figure 24: Example: Name plate for enclosure protection IP68



3. Seal unused cable entries with suitable plugs.

5.3.5. Fieldbus cables: connect

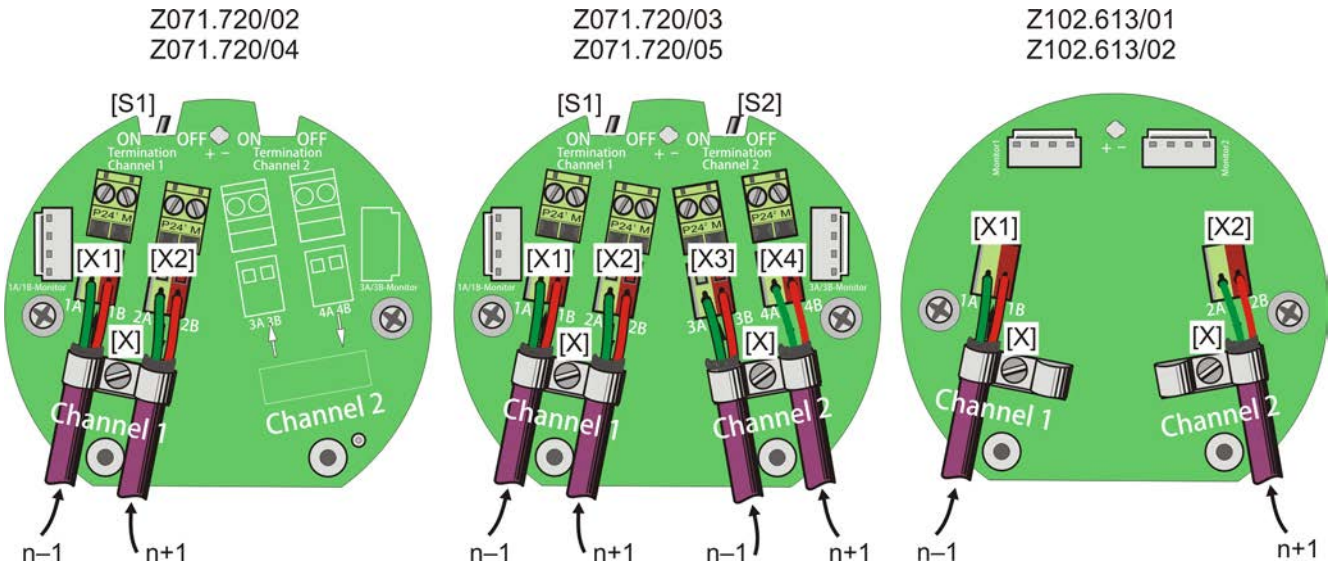
RS-485 connection boards

Table 15:

Variant	Overvoltage protection up to 4 kV	AUMA art. no. on label[1)]
1 channel (standard)	No	Z071.720/02
1 channel	Yes	Z071.720/04
2-channel for line redundancy	No	Z071.720/03
2-channel for line redundancy	Yes	Z071.720/05
2-channel for loop redundancy	No	Z102.613/01
2-channel for loop redundancy	Yes	Z102.613/02

1) Label with article number on connection board

Figure 25: Variants of connection boards



n–1 Fieldbus cable from previous device (input)
n+1 Fieldbus cable to next device (output)
[X] Shielding clamp
[X...] Terminal designation (X1, X2, X3, X4) according to wiring diagram
[S1/2] "Termination" switch for fieldbus termination

Table 16:

Functions of switches [S1] and [S2][1)2)]		
[S1]	ON	Fieldbus termination channel 1 ON
	OFF	Fieldbus termination channel 1 OFF
[S2]	ON	Fieldbus termination channel 2 ON (option)
	OFF	Fieldbus termination channel 2 OFF (option)

1) Upon delivery, the switches [S1] and [S2] are set to position OFF.
2) For loop redundancy, automatic termination is performed as soon as actuator controls are connected to the power supply. When interrupting the power supply, e.g. after removing the AUMA plug/socket connector, both RS-485 loop segments are automatically connected to each other.

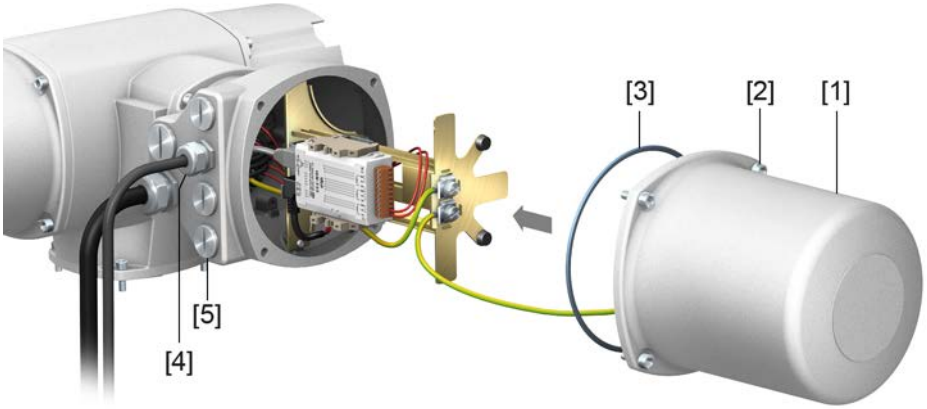
Cable connection

1. Always link A connections to green wire and B connections to red wire.

2. If the actuator is the final fieldbus device in the fieldbus segment:
   2.1 Switch on the termination resistor for channel 1 using switch [S1] (position ON).
   2.2 For line redundancy: Switch on the termination resistor for channel 2 using switch [S2] (position ON).
   Information: As soon as the termination resistors are switched on, the connection to the next fieldbus device is automatically interrupted to avoid multiple terminations.
3. Connect cable shield largely to shielding clamp [X].

5.3.6. Close fieldbus terminal compartment

Figure 26: Close fieldbus terminal compartment

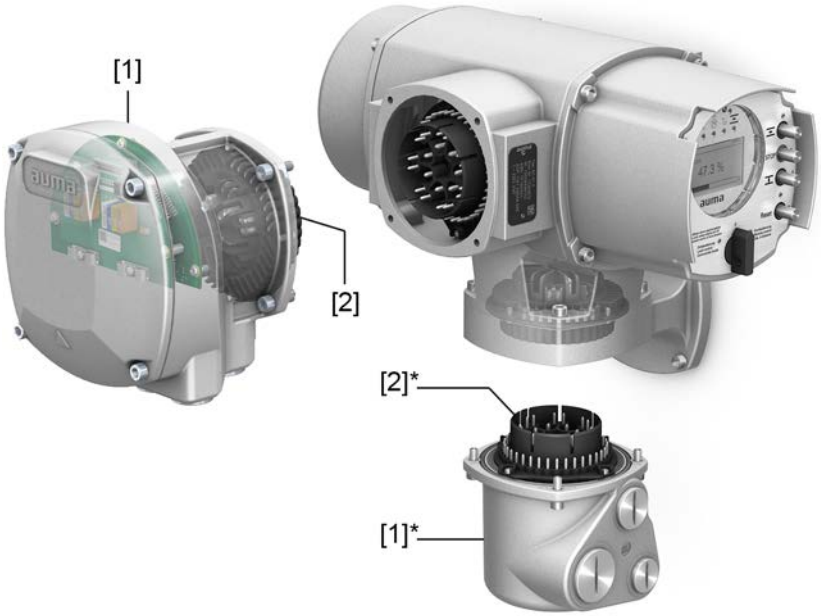


[1] Cover (fieldbus terminal compartment)
[2] Screws for cover
[3] O-ring
[4] Cable entries for fieldbus cables
[5] Blanking plug

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

5.4. Compact version SF electrical connection for Modbus TCP/IP

Figure 27: SF electrical connection



[1] Cover of actuator controls electrical connection (XK) – (SF version)
For customer connection of power supply and e.g. to control room

[2] Socket carrier with screw-type terminals

[1]* Cover of wall bracket plug socket connector (XM) – (S version)
Beim Leitungssatz LSW 68 ist der Steckverbinder bereits fertig konfektioniert (verdrahtet). Beim Leitungssatz LSW 69 muss der Steckverbinder geöffnet und die Leitungen noch am Stiftteil angeschlossen werden.

[2]* Stiftteil mit Crimpanschluss

Short description

Plug-in electrical connection with screw-type terminals for pins for motors and pins for controls.

SF version. For power and control cable connection, remove the AUMA plug/socket connector and the socket carrier from terminal compartment. The cover does not have to be removed for connecting network cables.

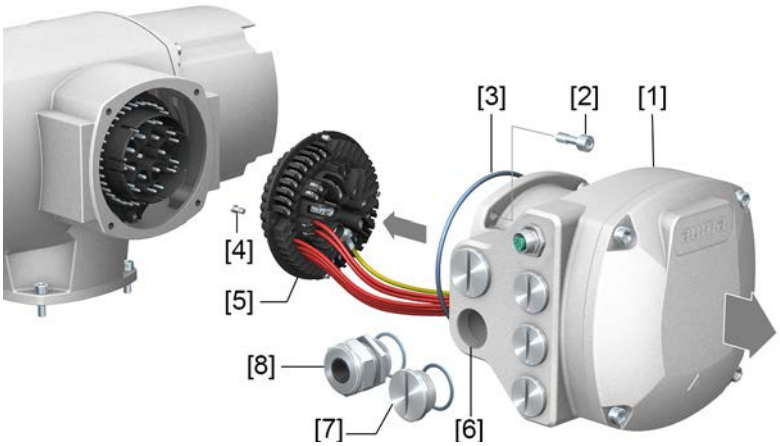
Technical data

Table 17:

Electrical connection via AUMA plug/socket connector		
	Power contacts	Control contacts
No. of contacts max.	6 (3 equipped) + protective earth conductor (PE)	50 pins/sockets
Designation	U1, V1, W1, U2, V2, W2, PE	1 to 50
Connection voltage max.	750 V	250 V
Rated current max.	25 A	16 A
Type of customer connection	Screw connection	Screw connection, crimp-type (option)
Connection diameter max.	6 mm^2 (flexible) 10 mm^2 (solid)	2.5 mm^2 (flexible or solid)

5.4.1. Terminal compartment (for mains connection): open

Figure 28: Open mains terminal compartment



[1] Connection housing
[2] Screws for frame
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable entries for mains connection (pins for motors and pins for controls)
[7] Blanking plug
[8] Cable gland (not included in scope of delivery)

DANGER

Electric shock due to presence of hazardous voltage!

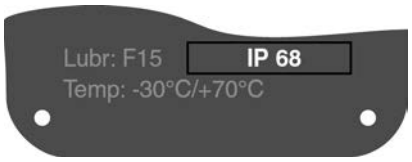
Death or serious injury.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove connection housing [1].
2. Loosen screws [4] and remove socket carrier [5] from connection housing [1].
3. Insert cable glands [8] suitable for connecting cables.

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

Figure 29: Example: Name plate for enclosure protection IP68



4. Seal unused cable entries [6] with suitable blanking plugs [7].

Information Fieldbus connection can be accessed separately from the mains connection (refer to <Fieldbus terminal compartment: open>.

5.4.2. Cable connection

Table 18:

Terminal cross sections and terminal tightening torques		
Designation	Terminal cross sections	Tightening torques
Power contacts (U1, V1, W1, U2, V2, W2)	1.0 – 6 mm^2 (flexible) 1.5 – 10 mm^2 (solid)	1.2 – 1.5 Nm
Protective earth connection ⏚ (PE)	1.0 – 6 mm^2 (flexible) with ring lugs 1.5 – 10 mm^2 (solid) with loops	1.2 – 2.2 Nm
Control contacts (1 to 50)	0.25 – 2.5 mm^2 (flexible) 0.34 – 2.5 mm^2 (solid)	0.5 – 0.7 Nm

1. Remove cable sheathing.
2. Insert the wires into the cable glands.
3. Fasten cable glands with the specified torque to ensure required enclosure protection.
4. Strip wires.
   → Controls approx. 6 mm, motor approx. 10 mm
5. For flexible cables: Use wire end sleeves according to DIN 46228.
6. Connect cables according to order-related wiring diagram.

⚠ WARNING

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

Risk of death or serious injury!

→ Connect all protective earth conductors.

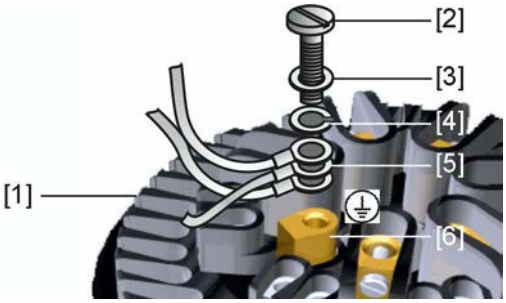
→ Connect PE connection to external protective earth conductor of connecting cables.

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

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7. Tighten PE conductors firmly to PE connection using ring lugs (flexible cables) or loops (solid cables).

   Figure 30: PE connection

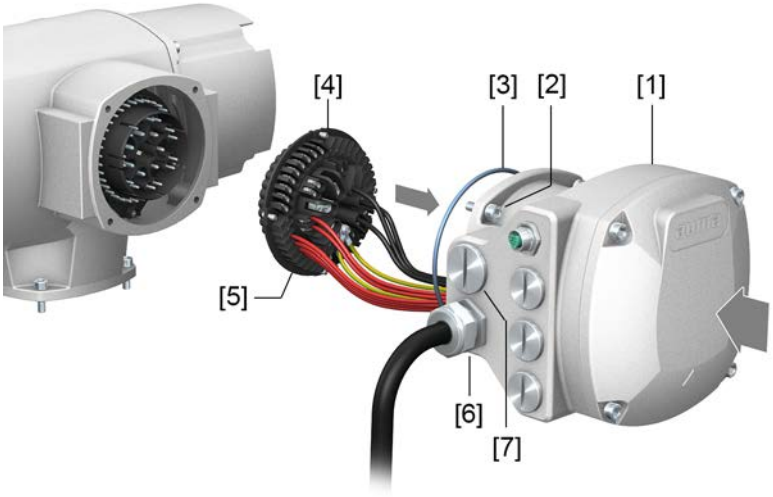


   [1] Socket carrier
   [2] Screw
   [3] Washer
   [4] Lock washer
   [5] PE conduction with ring lugs/loops
   [6] Protective earth connection, symbol: ⏚

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

5.4.3. Terminal compartment (for mains connection): close

Figure 31: Close mains terminal compartment



[1] Connection housing
[2] Screws for connection housing
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable gland (not included in scope of delivery)
[7] Blanking plug

⚠ WARNING

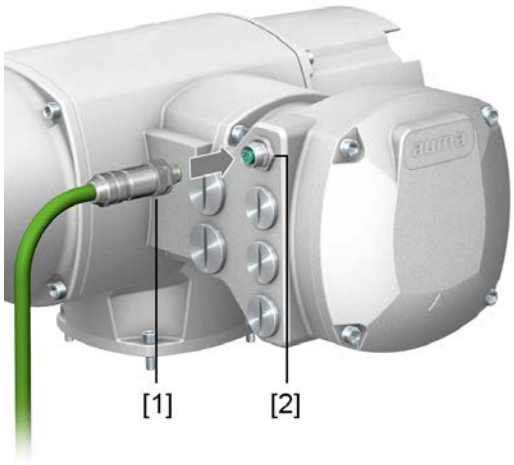
Short-circuit and electric shock due to pinching of cables!

Risk of death or serious injury!

→ Carefully fit socket carrier to avoid pinching the cables.

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

5.4.4. Industrial Ethernet cable: connect



[1] M12 connector for connecting the Industrial Ethernet cable
[2] M12 port

Cable connection

1. Remove protective cap.
2. Connect M12 connector [1] to M12 port for Ethernet cable [2].
3. Tighten cap nut.

5.5. Accessories for electrical connection

5.5.1. External earth connection

Figure 32: Earth connection for multi-turn actuator



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

Table 19:

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

6. Operation

6.1. Motor operation

NOTICE

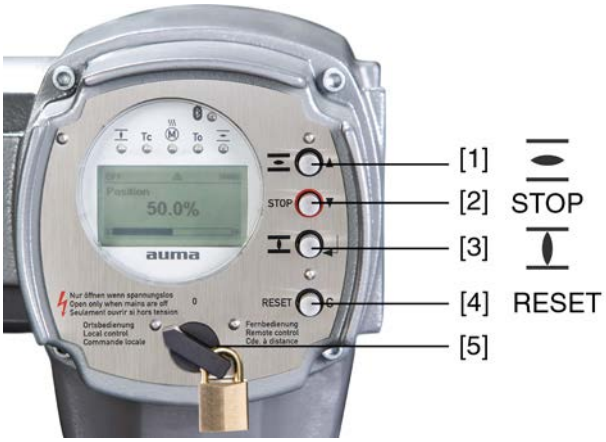
Valve damage due to incorrect basic setting!

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

6.1.1. Actuator operation from local controls

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

Figure 33: Local controls



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

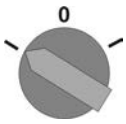
⚠ CAUTION

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

Risk of burns

→ Verify surface temperature and wear protective gloves.

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



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

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

Information

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

6.1.2. Actuator operation from remote

CAUTION

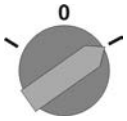
Risk of immediate actuator operation when switching on!

Risk of personal injuries or damage to the valve

→ If the actuator starts unexpectedly: Immediately turn selector switch to **0** (OFF).

→ Check input signals and functions.

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



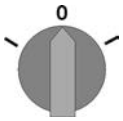
➥ Now, the actuator can be remote-controlled via fieldbus.

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

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

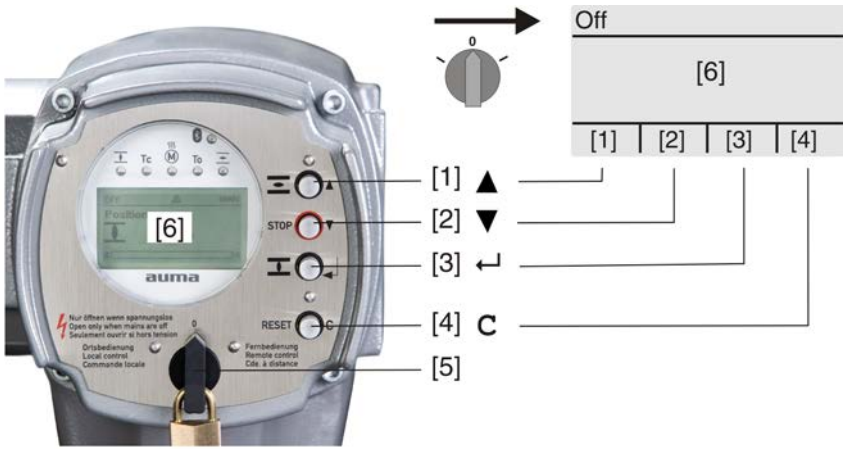
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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 34:



[1–4] Push buttons or navigation support

[5] Selector switch

[6] Display

Table 20: Important push button functions for menu navigation

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

Backlight

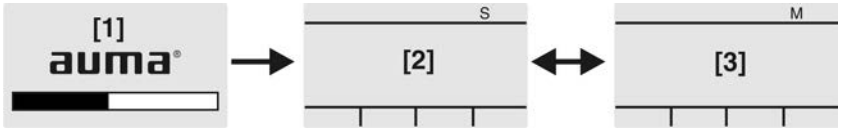
- The display is illuminated in white during normal operation. It is illuminated in red in case of a fault.
- The screen illumination is brighter when operating a push button. If no push button is operated for 60 seconds, the display will become dim again.

6.2.1. Menu layout and navigation

Groups

The indications on the display are divided into 3 groups:

Figure 35: Groups



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

ID

Status menu and main menu are marked with an ID.

Figure 36: Marking with ID



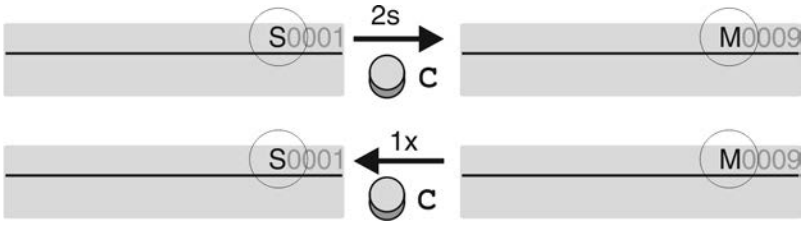
S ID starts with S = status menu
M ID starts with M = main menu

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 37: Select menu groups



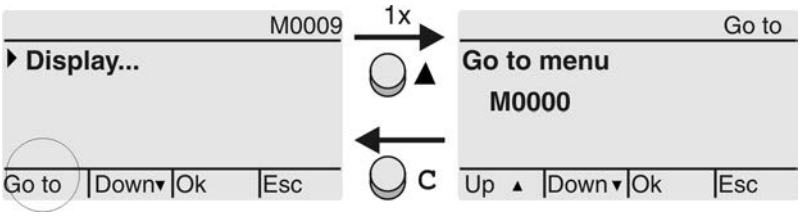
You return to the status menu if:

- 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 38: 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.

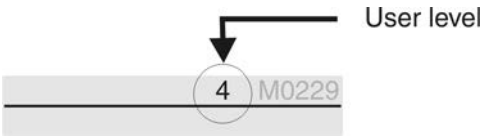
6.3. User level, password

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 39: User level display (example)



Password

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

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

Table 21:

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

Unauthorised access is made easier due to insecure password!

→ We urgently recommend changing the password during initial commissioning.

6.3.1. Password entry

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

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

2. Select higher user level via ▲ Up ▲ and confirm with ↵ Ok.

➥ Display indicates: Password 0***

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

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

6.3.2. Password change

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

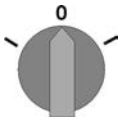
Example: If the user is signed in as Specialist (4), he/she can change passwords as for password levels (1) through (4).

M ▷ Device configuration M0053
Service functions M0222
Change passwords M0229

Menu item Service functions M0222 is only visible, if user level Specialist (4) or higher is selected.

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display

Change passwords

3. Select parameter Change passwords either:
   → click via the menu M ▷ to parameter, or
   → via direct display: press ▲ and enter ID M0229

- Display indicates: ▸ Change passwords
- The user level is indicated in the top row (1 – 6), e.g.:



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

4. For a user level between 2 and 6: Press push button ↵ Ok.

➥ The display indicates the highest user level, e.g.: For user 4

5. Select user level via push buttons ▲▼ Up ▲ Down ▼ and confirm with ↵ Ok.

➥ Display indicates: ▸ Change passwords Password 0***

6. Enter current password (→ enter password).

➥ Display indicates: ▸ Change passwords Password (new) 0***

7. Enter new password (→ enter password).

➥ Display indicates: ▸ Change passwords For user 4 (example)

8. Select next user level via push buttons ▲▼ Up ▲ Down ▼ or cancel the process via Esc.

6.4. Language in the display

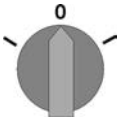
The display language can be selected.

6.4.1. Language change

M ▷ Display M0009
Language M0049

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display

Change language

3. Press ↵ Ok.

➥ Display indicates: ▸ Language

4. Press ↵ Ok.

➥ Display indicates the selected language, e.g.: ▸ Deutsch

5. The bottom row of the display indicates:
   → Save → continue with step 10
   → Edit → continue with step 6
6. Press ↵ Edit.

➥ Display indicates: ▸ Observer (1)

7. Select user level via ▲▼ Up ▲ Down ▼ resulting in the following significations:
   → black triangle: ▸ = current setting
   → white triangle: ▹ = selection (not saved yet)
8. Press ↵ Ok.

➥ Display indicates: Password 0***

9. Enter password (→ enter password).

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

Language selection

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

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

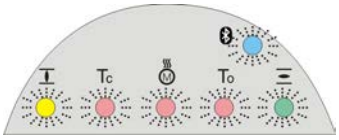
7. Indications

7.1. Indications during commissioning

LED test

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

Figure 40: LED test



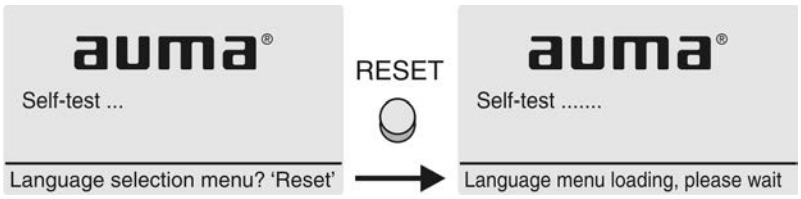
Language selection

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

Activate language selection:

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

Figure 41: Self-test

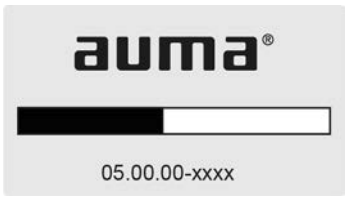


The language selection menu follows the startup menu.

Startup menu

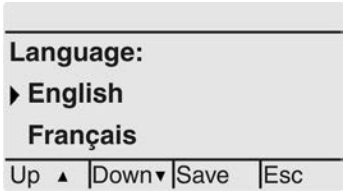
The current firmware version is displayed during the startup procedure:

Figure 42: Startup menu with firmware version: 05.00.00–xxxx



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

Figure 43: 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

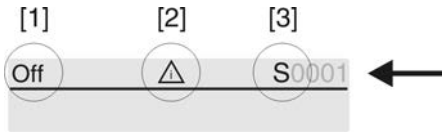
Menus and functions depend on the actuator controls firmware version!

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

Status bar

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

Figure 44: 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 45: 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.

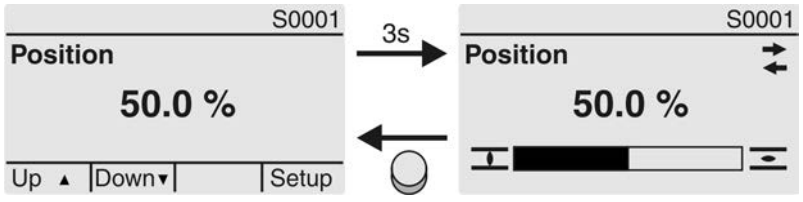
7.2.1. Feedback signals from actuator and valve

Display indications depend on the actuator version.

Valve position (S0001)

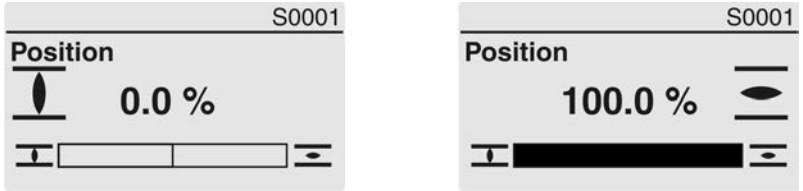
- S0001 on the display indicates the valve position in % of the travel.
- The bar graph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 46: Valve position and direction of operation



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

Figure 47: End position CLOSED/OPEN reached



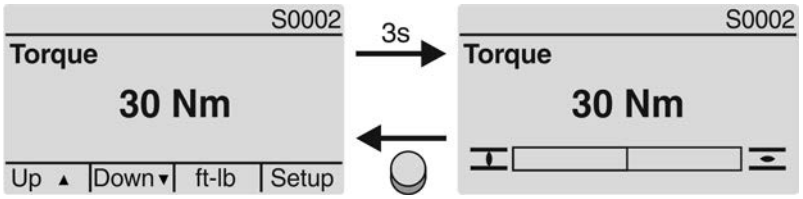
0% Actuator is in end position CLOSED
100% Actuator is in end position OPEN

Torque (S0002)

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

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

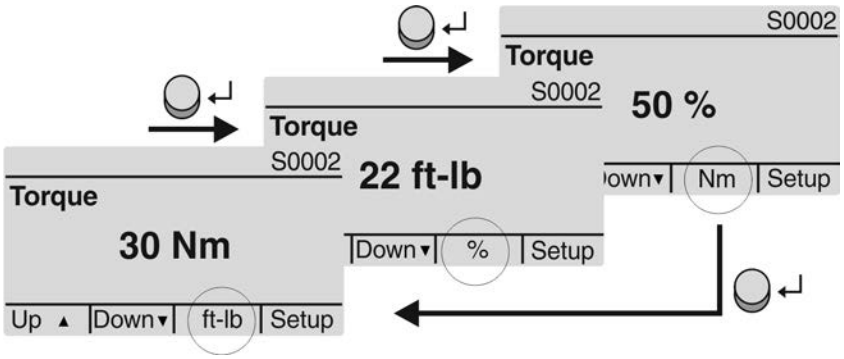
Figure 48: Torque



Select unit

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

Figure 49: Units of torque



Display in percent

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

Example: Torque range on name plate = 20 – 60 Nm.

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

Operation commands (S0003)

The display S0003 indicates:

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

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

OPEN - CLOSE control

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

Figure 50: Display for OPEN - CLOSE control



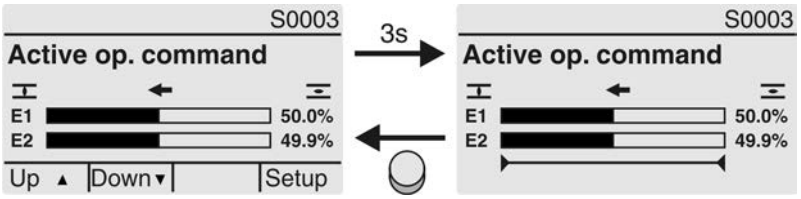
E2 Actual position value

Setpoint control

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

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

Figure 51: Indication 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 52: Examples: on the left pivot points (intermediate positions); on the right stepping mode



Table 22: 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	–

7.2.2. Status indications according to AUMA classification

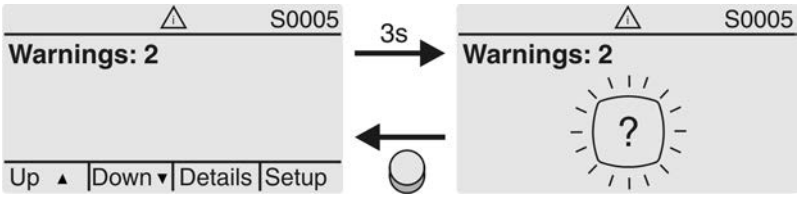
These indications are available if the parameter Diagnostic classific. M0539 is set to AUMA.

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>.

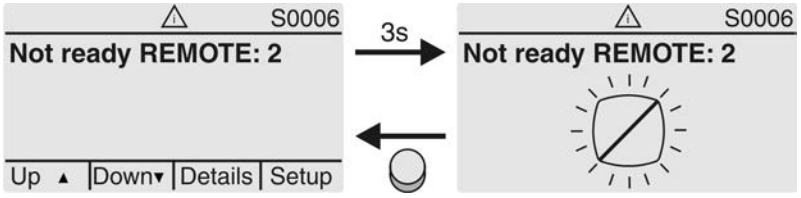
Not ready REMOTE (S0006)

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



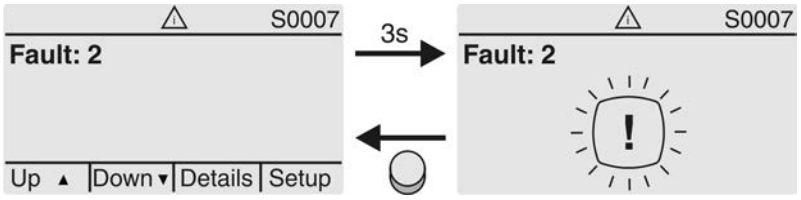
For further information, please also refer to <Corrective action>.

Fault (S0007)

Once a fault has occurred, the S0007 display shows:

- 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.

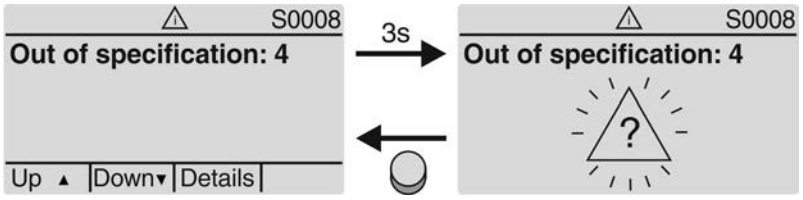
Out of Specification (S0008)

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>.

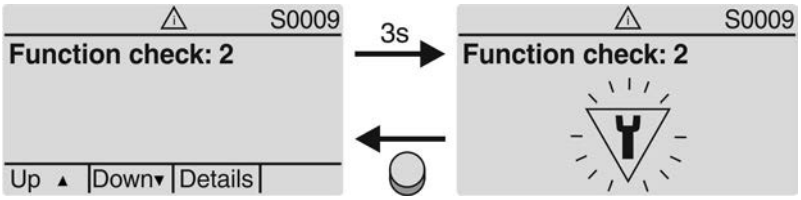
Function check (S0009)

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>.

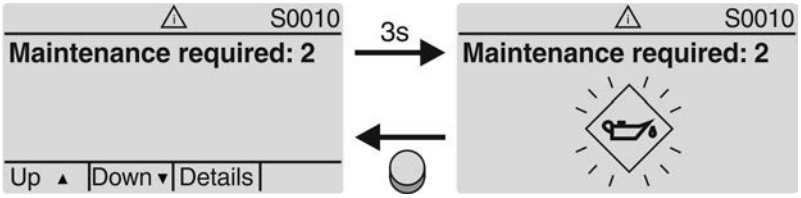
Maintenance required (S0010)

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 oilcan after approx. 3 seconds

Figure 58: Maintenance required



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

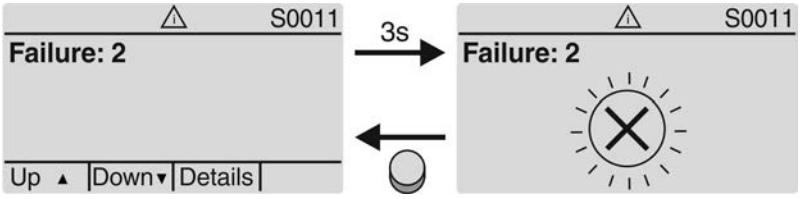
Failure (S0011)

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. Indication lights of local controls

Figure 60: Arrangement and signification of indication lights



[1] Marking with symbols (standard)

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

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

2 Tc Torque fault CLOSE

3 Motor protection tripped

4 To Torque fault OPEN

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

6 Bluetooth connection active

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

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

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

Further setting values:

Refer to Manual (Operation and setting).

8. Signals (output signals)

8.1. Signals via Modbus RTU

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

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

8.2. Status signals via output contacts (digital outputs)

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

8.2.1. Assignment of outputs

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

Required user level: Specialist (4) or higher.

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

Default values:

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

8.2.2. Coding the outputs

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

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

Signal active means that the conditions for the signal are fulfilled.

Required user level: Specialist (4) or higher.

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

Default values:

Coding DOUT 1 = Low active
Coding DOUT 2–Coding DOUT 6 = High active

8.3. Analogue signals (analogue outputs)

Requirements Analogue signals are only available if additional input signals are provided.

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

Designation in the wiring diagram: AOUT1 (position)

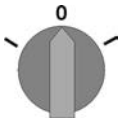
Torque feedback Signal: E6 = 0/4 – 20 mA (galvanically isolated)

Designation in the wiring diagram: AOUT2 (torque)

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

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: Observe heat-up time for ambient temperatures below –30 °C.
3. Perform basic settings.

9.1. Type of seating: set

NOTICE

Valve damage due to incorrect setting!

→ The type of seating setting (limit or torque seating) must match the selection for the valve.

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

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

Default value: Limit

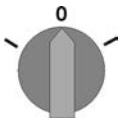
Setting values:

Limit — Seating in end positions via limit switching.

Torque — Seating in end positions via torque switching.

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display

Select parameter

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

➥ Display indicates: End position CLOSED

CLOSE or OPEN

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

➥ The black triangle ▸ indicates the current selection.

5. Press ↵ Ok.

➥ Display indicates the current setting: Limit or Torque

➥ The bottom row of the display indicates either:

- Edit → continue with step 6
- Save → continue with step 10

6. Press ↵ Edit.

➥ Display indicates: ▸ Specialist (4)

User login

7. Use ▲▼ Up ▲ Down ▼ to select user:
   Information: Required user level: Specialist (4) or higher

➥ The symbols have the following meaning:

- black triangle: ▸ = current setting
- white triangle: ▹ = selection (not saved yet)

8. Press ↵ Ok.

➥ Display indicates: Password 0***

9. Enter password (→ enter password).

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

Change settings

10. Use ▲▼ Up ▲ Down ▼ to select new setting.

➥ The symbols have the following meaning:

- black triangle: ▸ = current setting
- white triangle: ▹ = selection (not saved yet)

11. Confirm selection via ↵ Save.

➥ The setting for the type of seating is complete.

12. Back to step 4 (CLOSED or OPEN): Press ↵ Esc.

9.2. Set torque switching

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

NOTICE

Valve damage due to excessive tripping torque limit setting!

→ The tripping torque must suit the valve.

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

M ▷

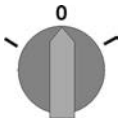
Customer settings M0041
Torque switching M0013
Trip torque CLOSE M0088
Trip torque OPEN M0089

Default value: According to order data

Setting range: Torque range according to actuator name plate

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display

Select parameter

3. Select parameter either:
   → click via the menu M ▷ to parameter, or
   → via direct display: press ▲ and enter ID M0088.

➥ Display indicates: Trip torque CLOSE

CLOSE or OPEN

4. Use ▲▼ Up ▲ Down ▼ to select:
   → ▸ Trip torque CLOSE
   → ▸ Trip torque OPEN
   ➥ The black triangle ▸ indicates the current selection.
5. ↵ Press Ok.
   ➥ Display shows the set value.
   ➥ The bottom row indicates: Edit Esc
6. ↵ Press Edit.
   ➥ Display indicates:
   - Specialist (4) → continue with step 7
   - in bottom row Up ▲ Down ▼ Esc → continue with step 11

User login

7. Use ▲▼ Up ▲ Down ▼ to select user:
   Information: Required user level: Specialist (4) or higher.
   ➥ The symbols have the following meanings:
   - black triangle: ▸ = current setting
   - white triangle: ▹ = selection (not saved yet)
8. ↵ Press Ok.
   ➥ Display indicates: Password 0***
9. Enter password (→ enter password).
   ➥ Display shows the set value.
   ➥ The bottom row indicates: Edit Esc
10. ↵ Press Edit.

Change value

11. Enter new value for tripping torque via ▲▼ Up ▲ Down ▼.
    Information: The adjustable torque range is shown in round brackets.
12. Save new value via ↵ Save.
    ➥ The tripping torque is set.
13. Back to step 4 (CLOSED or OPEN): Press ↵ Esc.

Information

The following fault signals are issued if the torque setting performed has been reached **in mid-travel**:

- In the display of the local controls: Status indication S0007 Fault = Torque fault OPEN or Torque fault CLOSE

The fault has to be acknowledged before the operation can be resumed. The acknowledgement is made:

1. either by an operation command in the opposite direction.
   - For Torque fault OPEN: Operation command in direction CLOSE
   - For Torque fault CLOSE: Operation command in direction OPEN
2. or, in case the torque applied is lower than the preset tripping torque:
   - in selector switch position **Local control** (LOCAL) via push button **RESET**.
   - in selector switch position **Remote control** (REMOTE):
     - via the fieldbus, command reset., if the fieldbus is the active command source.
     - via a digital input (I/O interface) with RESET command if a digital input is configured for signal RESET and the I/O interface is the active command source.

9.3. Set limit switching

NOTICE

Valve damage at valve/gearbox due to incorrect setting!

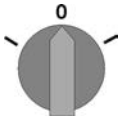
→ Allow for overrun when selecting limit seating.

→ Prior to setting the limit switching, set the torque switching to the lowest possible value to avoid valve damage when approaching the end positions.

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

Select main menu

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



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

➥ Display goes to main menu and indicates: ▸ Display

Select parameter

3. Select parameter either:
   → click via the menu M ▷ to parameter, or
   → via direct display: press ▲ and enter ID M0084.

➥ Display indicates: Set end pos.CLOSED?

CLOSED or OPEN

4. Select via ▲▼ Up ▲ Down ▼:
   → ▸ Set end pos.CLOSED? M0084
   → ▸ Set end pos. OPEN? M0085

➥ The black triangle ▸ indicates the current selection.

5. Press ↵ Ok.

➥ The display indicates either:

- Set end pos.CLOSED? CMD0009 → continue with step 9
- Set end pos. OPEN? CMD0010 → continue with step 12
- Specialist (4) → continue with step 6

User login

6. Use ▲▼ Up ▲ Down ▼ to select user:
   Information: Required user level: Specialist (4) or higher

➥ The symbols have the following meaning:

- black triangle: ▸ = current setting
- white triangle: ▹ = selection (not saved yet)

7. Press Ok to confirm selected user.

➥ Display indicates: Password 0***

8. Enter password (→ enter password).

➥ The display indicates either:

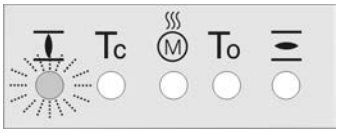
- Set end pos.CLOSED? CMD0009 → continue with step 9
- Set end pos. OPEN? CMD0010 → continue with step 12

Set end position CLOSED CMD0009 **(without handwheel)**

9. Set end position CLOSED again :
   Information: The following description applies to actuators **without** handwheel. For actuators **with** handwheel, continue with the next step.
   9.1 Set selector switch in position **Local control** (LOCAL) and operate actuator in via push button (CLOSE) to the end position.
   Information: To avoid valve damage, set the torque switching to a value as low as possible!
   9.2 Operate a small distance (in push-to-run operation via push button (OPEN)) out of end position CLOSED to consider overrun.
   9.3 Set selector switch to position **0** (OFF).
   ➥ Display indicates: Set end pos.CLOSED? Yes No

Confirm new end position

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



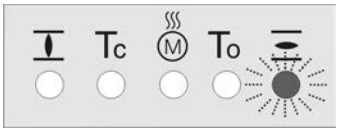
11. Make selection:
    → Edit → back to step 9: Set end position CLOSED "once again"
    → Esc → back to step 4; either set end position OPEN or exit the menu.

Set end position OPEN CMD0010 **(without handwheel)**

12. Re-set end position OPEN:
    Information: The following description applies to actuators **without** handwheel. For actuators **with** handwheel, continue with the next step.
    12.1 Set selector switch in position **Local control** (LOCAL) and operate actuator in via push button (OPEN) to the end position.
    Information: To avoid valve damage, set the torque switching to a value as low as possible!
    12.2 Operate a small distance (in push-to-run operation via push button (CLOSE)) out of end position CLOSED to consider overrun.
    12.3 Set selector switch to position **0** (OFF).
    ➥ Display indicates: Set end pos. OPEN? Yes No

Confirm new end position

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



14. Make selection:
    → Edit → back to step 12: Set end position OPEN "once again"
    → Esc → back to step 4; either set end position CLOSED or exit the menu.
15. After setting the limit switching, reset the torque switching to the value recommended by the valve manufacturer.

Information

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

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

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

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

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

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

9.4.1. Modbus TCP/IP gateway: set

Modbus TCP/IP gateway settings can be adapted by means of a web server.

Login password (default setting in the factory): admin

Table 23: Default setting of the IP interface:

Address Type	Static IP
Static IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Default Gateway	192.168.0.1

If required, only the IP interface must be adapted to the requirements of the Modbus TCP/IP network. All further settings of the Modbus TCP/IP gateway (particularly the port settings) are set as default in the factory.

9.5. Test run

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

9.5.1. Direction of rotation: check

NOTICE

Valve damage due to incorrect direction of rotation!

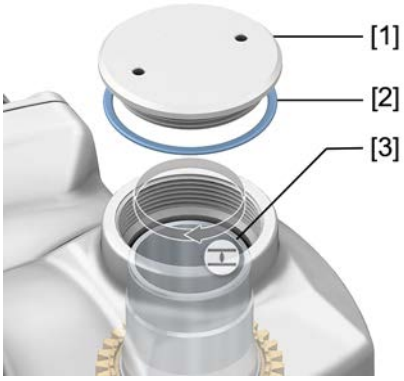
→ If the direction of rotation is wrong, switch off immediately (press STOP).
→ Eliminate cause, i.e. correct phase sequence for cable set wall bracket.
→ Repeat test run.

1. Move actuator to intermediate position or to sufficient distance from end position.
2. Unfasten threaded plug [1] and seal [2].

3. Switch on actuator via local controls push button in direction OPEN and observe the direction of rotation at the hollow shaft [3]:
   → Switch off before reaching the end position.

➥ The direction of rotation is correct if the **actuator runs in direction CLOSE** and the hollow shaft turns **clockwise**.

Figure 61: Hollow shaft for clockwise closing

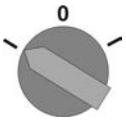


[1] Threaded plug
[2] Seal
[3] Hollow shaft

4. Insert seal [2] and tightly fasten threaded plug [1].
   Information: To ensure perfect tightness, make sure that the seal is correctly inserted and the threaded plug securely and tightly fastened.

9.5.2. Check limit switching

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.

10. Corrective action

10.1. Faults during commissioning

Table 24:

Faults during operation/commissioning		
Fault	Description/cause	Remedy
In spite of correct setting of mechanical limit switching, actuator operates into the valve or actuator end position.	The overrun was not considered when setting the limit switching. The overrun is generated by the inertia of both the actuator and the valve and the delay time of the actuator controls.	• Determine overrun: Overrun = travel covered from switching off until complete standstill. • Set limit switching again considering the overrun. (Turn actuator in the opposite direction away from the end position by the amount of overrun)

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. The display remains white.

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

Table 25:

Faults and warnings via status indications in the display		
Indication on display	Description/cause	Remedy
S0001	Instead of the valve position, a status text is displayed.	For a description of the status texts, refer to Manual (Operation and setting).
S0005 Warnings	Collective signal 02: Indicates the number of active warnings.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
S0006 Not ready REMOTE	Collective signal 04: Indicates the number of active signals.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
S0007 Fault	Collective signal 03: Indicates the number of active faults. The actuator cannot be operated.	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.
S0008 Out of specification	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal operation conditions.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Warnings and Out of specification> table.
S0009 Function check	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid.	For indicated value > 0: Press push button ↵ Details. For details, refer to <Not ready REMOTE and Function check> table.
S0010 Maintenance required	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance.	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications.
S0011 Failure	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid	For indicated value > 0: Press push button ↵ Details to display a list of detailed indications. For details, refer to <Faults and Failure> table.

Table 26:

Warnings and Out of specification		
Indication on display	Description/cause	Remedy
Config. warning	Collective signal 06: Possible cause: Configuration setting is incorrect. The device can still be operated with restrictions.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Internal warning	Collective signal 15: Device warnings The device can still be operated with restrictions.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
24 V DC external	The external 24 V DC voltage supply of the controls has exceeded the power supply limits.	Check 24 V DC voltage supply.
Wrn op.mode run time	Warning on time max. running time/h exceeded	• Check modulating behaviour of actuator. • Check parameter Perm. run time M0356, re-set if required.
Wrn op.mode starts	Warning on time max. number of motor starts (starts) exceeded	• Check modulating behaviour of actuator. • Check parameter Permissible starts M0357, re-set if required.
Failure behav. active	The failure behaviour is active since all required setpoints and actual values are incorrect.	Verify signals: • Setpoint E1 • Actual value E2 • Actual process value E4 • Check connection to master.
Wrn input AIN 1	Warning: Loss of signal analogue input 1	Check wiring.
Wrn input AIN 2	Warning: Loss of signal analogue input 2	Check wiring.
Wrn setpoint position	Warning: Loss of signal setpoint position Possible causes: For an adjusted setpoint range of e.g. 4 – 20 mA, the input signal is 0 (signal loss). For a setpoint range of 0 – 20 mA , monitoring is not possible.	Check setpoint signal.
Op. time warning	The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED.	The warning indications are automatically cleared once a new operation command is executed. • Check valve. • Check parameter Perm.op. time, manual M0570.
Wrn controls temp.	Temperature within controls housing too high.	Measure/reduce ambient temperature.
Time not set	Real time clock has not yet been set.	Set time.
RTC voltage	Voltage of the RTC button cell is too low.	Replace button cell.
PVST fault	Partial Valve Stroke Test (PVST) could not be successfully completed.	Check actuator (PVST settings).
PVST abort	Partial Valve Stroke Test (PVST) was aborted or could not be started.	Perform RESET or restart PVST.
Wrn no reaction	No actuator reaction to operation commands within the set reaction time.	• Check movement at actuator. • Check parameter Reaction time M0634.
Torque wrn OPEN	Limit value for torque warning in direction OPEN exceeded.	Check parameter Wrn torque OPEN M0768, re-set if required.
Torque wrn CLOSE	Limit value for torque warning in direction CLOSE exceeded.	Check parameter Wrn torque CLOSE M0769, re-set if required.
SIL fault[1)]	SIL sub-assembly fault has occurred.	Refer to separate Manual Functional Safety.
PVST required	Execution of PVST (Partial Valve Stroke Tests) is required.	
Maintenance required	Maintenance is required.	

1) For actuators controls in SIL version

Table 27:

Faults and Failure		
Indication on display	Description/cause	Remedy
Configuration error	Collective signal 11: Configuration error has occurred.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Config. error REMOTE	Collective signal 22: Configuration error has occurred.	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Internal error	Collective signal 14: Internal error has occurred.	AUMA service Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Torque fault CLOSE	Torque fault in direction CLOSE	Perform one of the following measures: • Issue operation command in direction OPEN. • Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. • Execute reset command via fieldbus.
Torque fault OPEN	Torque fault in direction OPEN	Perform one of the following measures: • 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	• When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. • When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.	Test/connect phases.
Incorrect phase seq	The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system.	Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases.
Mains quality	Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring.	• Check mains voltage. For 3-phase/1-phase AC current, the permissible variation of the mains voltage is ±10 % (option ±30 %). The permissible variation of the mains frequency is ±5 % • Check parameter Tripping time M0172, extend time frame if required.
Thermal fault	Motor protection tripped	• Cool down, wait. • If the fault indication display persists after cooling down: - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**. - Execute reset command via fieldbus. • Check fuses.
Fault no reaction	No actuator reaction to operation commands within the set reaction time.	Check movement at actuator.
Poti Out of Range	Potentiometer is outside the permissible range.	Check device configuration: Parameter Low limit Uspan M0832 must be less than parameter Volt.level diff. potent. M0833.
LPV not ready[1)]	LPV: Lift Plug Valve function The master actuator signals a fault	
Wrn input AIN 1	Loss of signal analogue input 1	Check wiring.

Faults and Failure		
Indication on display	Description/cause	Remedy
Wrn input AIN 2	Loss of signal analogue input 2	Check wiring.
Incorrect rotary direct.	Contrary to the configured direction of rotation and the active operation command, the motor turns into the wrong direction.	Check operation command control. For 3-phase AC current mains, activate phase monitoring (parameter Adapt rotary dir. M0171). Check device configuration setting (parameter Closing rotation M0176). To delete the fault indication: Disconnect actuator controls from the mains and perform reboot.
DMF fault OPEN[2)]	The torque in direction OPEN, measured at the output drive shaft using the torque measurement flange, is too high.	Check DMF trip torque OP parameter. Check DMF fault level parameter.
DMF fault CLOSE[2)]	The torque in direction CLOSE, measured at the output drive shaft using the torque measurement flange, is too high.	Check DMF trip torque CL parameter. Check DMF fault level parameter.
FQM collective fault[3)]	Collective signal 25:	Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).

1) For lift plug valve product variant
2) For actuators equipped with torque measurement flange (DMF)
3) For actuators equipped with fail safe unit

Table 28:

Not ready REMOTE and Function check (collective signal 04)		
Indication on display	Description/cause	Remedy
Wrong oper. cmd	Collective signal 13: Possible causes: • 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	• Check operation commands (reset/clear all operation commands and send one operation command only). • Set parameter Positioner to Function active. • Check setpoint. Press push button ↵ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).
Sel. sw. not REMOTE	Selector switch is not in position REMOTE.	Set selector switch to position REMOTE.
Service active	Operation via service interface (Bluetooth) and AUMA CDT service software.	Exit service software.
Disabled	Actuator is in operation mode Disabled.	Check setting and status of function <Local controls enable>.
EMCY stop active	The EMERGENCY stop switch has been operated. The motor control power supply (contactors or thyristors) is disconnected.	• Enable EMERGENCY stop switch. • Reset EMERGENCY stop state by means of Reset command.
EMCY behav. active	Operation mode EMERGENCY is active (EMERGENCY signal was sent). 0 V are applied at the EMERGENCY input.	• Detect cause for EMERGENCY signal. • Verify failure source. • Apply +24 V DC at EMERGENCY input.
I/O interface	The actuator is controlled via the I/O interface (parallel).	Check I/O interface.
Handwheel active	Manual operation is activated.	Start motor operation.
FailState fieldbus	Fieldbus connection available, however no process data transmission by the master.	Verify master configuration
Local STOP	A local STOP is active. Push button STOP of local controls is operated.	Release push button STOP.
Interlock OPEN + CLOSE	An interlock is active.	Check interlock signal.

Not ready REMOTE and Function check (collective signal 04)		
Indication on display	Description/cause	Remedy
Interlock bypass	By-pass function is interlocked.	Check states of main and by-pass valve.
PVST active	Partial Valve Stroke Test (PVST) is active.	Wait until PVST function is complete.
SIL function active[1)]	SIL function is active	

1) For actuators controls in SIL version

10.3. Fuses

10.3.1. Fuses within the actuator controls

F1/F2

Table 29:

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

F3 Internal 24 V DC supply

Table 30:

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

F4

Table 31:

Secondary fuse F4 (internal AC supply)[1)]		
G-fuse according to IEC 60127-2/III	F4	AUMA art. no.
Size	5 x 20 mm	
Voltage output (power supply unit) = 24 V	1.25 A T; 250 V	K001.184
Voltage output (power supply unit) = 115 V	—	—

1) Fuse for: Switch compartment heater, reversing contactor control, PTC tripping device (at 24 V AC only), at 115 V AC also control inputs OPEN, STOP, CLOSE

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

10.3.2. Motor protection (thermal monitoring)

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

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

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

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

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

The acknowledgement is made:

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

Proof-test motor protection

Correct function of the motor protection can be tested.

Information

For weatherproof actuator controls mounted on wall bracket controlling an explosion-proof actuator, the functionality of the motor protection must be verified at the latest when performing the maintenance (refer to chapter <Servicing and maintenance>).

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

Required user level: Specialist (4) or higher.

M ▷ Diagnostics M0022
TMS proof test M1950

Test procedure:

1. Set selector switch to position **0** (OFF).
2. Return to the main menu and select the simulation value in parameter TMS proof test M1950: Select Thermal test.
3. Activate motor protection simulation: Press Ok push button.
   The safety function is correct if no fault signal is displayed.
4. Reset simulation: Press Ok push button or exit the simulation menu and reset the selector switch to its initial position.

11. Servicing and maintenance

⚠ CAUTION

Damage caused by inappropriate maintenance!

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

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

AUMA Service & Support

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

11.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Carry out visual inspection:
  Cable entries, cable glands, blanking plugs, etc. have to be checked for correct tightness and sealing.
  Consider 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.

11.2. Maintenance

Lubrication

- In the factory, the gear housing is filled with grease.
- Additional lubrication of the gear housing is not required during operation.
- Perform maintenance with grease change after approximately 5 years.
- We recommend replacing the seals when changing the grease.
- After maintenance, perform leak tightness test at actuator and electrical connections.
  The mobile PV 1691 leakage tester by AUMA can be used for leak tightness test.

11.3. Disposal and recycling

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

- Electronic scrap
- Various metals
- Plastic materials
- Greases and oils

The following generally applies:

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

12. Technical data

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

12.1. Technical data Multi-turn actuators

Features and functions		
Type of duty (Multi-turn actuators for open-close duty)	Standard:	Short-time duty S2 - 15 min, classes A and B according to EN 15714-2
	Option:	with 3-phase AC motor: Short-time duty S2 - 30 min, classes A and B according to EN 15714-2
	For nominal voltage and +40 °C ambient temperature and at load with 35 % of the max. torque.	
Type of duty (Multi-turn actuators for modulating duty)	Standard:	Intermittent duty S4 - 25 %, class C according to EN 15714-2
	Option:	With 3-phase AC motor: Intermittent duty S4 - 50 %, class C according to EN 15714-2 Intermittent duty S4 - 25 % (insulation class H required), class C according to EN 15714-2
	For nominal voltage and +40 °C ambient temperature and at modulating torque load.	
Motors	3-ph AC asynchronous motor, type IM B9 according to IEC 60034-7, cooling procedure IC410 according to IEC 60034-6	
Mains voltage, mains frequency	Refer to motor name plate Permissible variation of mains voltage: ±10 % Permissible variation of mains frequency: ±5 % (for 3-phase and 1-phase AC current)	
Overvoltage category	Category III according to IEC 60364-4-443	
Insulation class	Standard:	F, tropicalized
	Option:	H, tropicalized (with 3-phase AC motor)
Motor protection	Standard:	Thermoswitches (NC)
	Option:	PTC thermistors (according to DIN 44082) PTC thermistors additionally require a suitable tripping device in the actuator controls.
Self-locking	Self-locking: Output speeds up to 90 rpm (50 Hz) or 108 rpm (60 Hz) NOT self-locking: Output speeds from 125 rpm (50 Hz) or 150 rpm (60 Hz) Multi-turn actuators are self-locking if the valve position cannot be changed from standstill while torque acts upon the output drive.	
Motor heater (option)	Voltages:	110 – 120 V AC, 220 – 240 V AC or 380 – 480 V AC
	Power depending on the size 12.5 – 25 W	
Electrical connection	The AUMA plug/socket connector is part of the cable set with wall bracket (which must be ordered separately) and is customised for connection. DS Terminal compartment additionally sealed against interior (double sealed)	
Terminal plan	Terminal plan according to order number enclosed with delivery	
Valve attachment	Standard:	B1 according to EN ISO 5210
	Options:	B3, B4 according to EN ISO 5210; B2 on request B, D, E according to DIN 3210
	Special valve attachments: B3D, DD	

Electronic control unit	
Non-Intrusive setting	Magnetic limit and torque transmitter (MWG) Turns per stroke: 1 to 500 (standard) or 10 to 5,000 (option)
Position feedback signal	Via actuator controls
Torque feedback signal	Via actuator controls
Running indication	Blinking signal via actuator controls
Heater in switch compartment	Resistance type heater with 5 W, 24 V AC

Service conditions		
Use	For continuous underwater use as well as indoor and outdoor use.	
Enclosure protection according to EN 60529	Increased enclosure protection IP68-C15. The maximum head of water is 15 m. Higher heads of water available on request	
Mounting position	Any position	
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level on request	
Ambient temperature	–30 °C to +70 °C	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range	
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)	
Vibration resistance according to IEC 60068-2-6	2 g, from 10 to 200 Hz (for actuators in AUMA NORM version) 1 g, from 10 to 200 Hz (for actuators with mounted AUMA actuator controls) Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Indications apply to actuators with AUMA 3-phase AC motor and AUMA plug/socket connector. They are not valid in combination with gearboxes.	
Corrosion protection	KX-G: Suitable for use in freshwater (Im1), seawater (Im2) and on seafloor (Im3), aluminium-free version (outer parts)	
Coating	Two-layer powder coating with additional wet painting	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Available colours on request
Lifetime	AUMA multi-turn actuators meet or exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.	
Noise level	< 72 dB (A)	

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

12.2. Technical data Actuator controls

Features and functions	
Power supply	Refer to name plate Permissible variation of mains voltage: ±10 % Permissible variation of mains voltage: ±30 % (option) Permissible variation of mains frequency: ±5 %
External supply of the electronics (option)	24 V DC: +20 %/-15 % Current consumption: Basic version approx. 250 mA, with options up to 500 mA For external electronics supply, the power supply of integral controls must have an enhanced isolation against mains voltage in compliance with IEC 61010-1 and the output power be limited to 150 VA.
Current consumption	Current consumption of the actuator controls depending on mains voltage: For permissible variation of mains voltage of ±10 %: • 100 to 120 V AC = max. 740 mA • 208 to 240 V AC = max. 400 mA • 380 to 500 V AC = max. 250 mA • 515 V AC = max. 200 mA For permissible variation of mains voltage of ±30 %: • 100 to 120 V AC = max. 1,200 mA • 208 to 240 V AC = max. 750 mA • 380 to 500 V AC = max. 400 mA • 515 to 690 V AC= max. 400 mA
Overvoltage category	Category III according to IEC 60364-4-443
Rated power	The actuator controls are designed for the nominal motor power, refer to motor name plate

Features and functions		
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
	The reversing contactors are designed for a lifetime of 2 million starts. For applications requiring a high number of starts, we recommend the use of thyristor units. For the assignment of AUMA power classes, please refer to Electrical data on actuator	
Control and feedback signals	Via Modbus TCP/IP interface	
Modbus TCP/IP interface with additional input signals (option)	• 2 free analogue inputs (0/4 – 20 mA), 4 free digital inputs - Signal transmission is made via fieldbus interface • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface: Selection of control type (fieldbus interface or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA) for position setpoint • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common) - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface: Selection of control type (fieldbus interface or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint) - Additionally 1 analogue input (0/4 – 20 mA) for setpoint position and 1 analogue input (0/4 – 20 mA) for actual process value	
Control voltage/current consumption for control inputs	Standard:	24 V DC, current consumption: approx. 10 mA per input
	Options:	48 V DC, current consumption: approx. 7 mA per input 60 V DC, current consumption: approx. 9 mA per input 100 – 125 V DC, current consumption: approx. 15 mA per input 100 – 120 V AC, current consumption : approx. 15 mA per input
	All input signals must be supplied with the same potential.	
Status signals	Via Modbus TCP/IP interface	
Modbus TCP/IP interface with additional output signals (option)	Additional, binary output signals (only available in combination with additional input signals (option)) These output signals are not available via DeviceNet interface. • 6 programmable output contacts: - 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load) Default configuration: End position CLOSED, end position OPEN, selector switch REMOTE, torque fault CLOSE, torque fault OPEN - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) Default configuration: Collective fault signal (torque fault, phase failure, motor protection tripped) • 6 programmable output contacts: - 5 potential-free change-over contacts with one common, max. 250 V AC, 1 A (resistive load) - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 6 potential-free change-over contacts without one common, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 4 mains failure proof potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load), 1 potential-free NO contact, max. 250 V AC, 1 A (resistive load), 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load) • 6 programmable output contacts: - 4 mains failure proof potential-free NO contacts, max. 250 V AC, 5 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load), All binary output signals must be supplied with the same potential. • Analogue output signal for position feedback - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)	

Features and functions		
Local controls	Standard:	• Selector switch: LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE, RESET - 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: - 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
	Option:	• Special colours for the indication lights: - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), end position OPEN (red)
Bluetooth Communication interface	Bluetooth Class II Chip, Version 2.1: With a range up to 10 m in industrial environments supports the SSP Bluetooth profile (Serial Port Profile). Required accessories: • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool)	
Application functions	Standard:	• Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED • Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time) • Start and end of stepping mode as well as ON and OFF times can be set individually for directions OPEN and CLOSE, 1 to 1,800 seconds • Any 8 intermediate positions: can be set between 0 and 100 %, reaction and signal behaviour programmable • Running indication blinking: can be set • Positioner - Position setpoint via Modbus TCP/IP interface - Programmable behaviour on loss of signal - Automatic adaptation of dead band (adaptive behaviour selectable) - Split range operation - Change-over between OPEN-CLOSE control and setpoint control possible via fieldbus interface
	Options:	• PID process controller: with adaptive positioner, via 0/4 – 20 mA analogue inputs for process setpoint and actual process value • Multiport valve: Up to 16 positions, signals (pulse or edge), accuracy < 0.2 % • Automatic deblocking: Up to 5 operation trials, travel time in opposite direction can be set • Static and dynamic torque recording for both rotation directions with torque measurement flange as additional accessory
Safety functions	Standard:	• EMERGENCY operation (programmable behaviour) - Via additional input (option, low active) or via Fieldbus interface - Reaction can be selected: Stop, run to end position CLOSED, run to end position OPEN, run to intermediate position - Torque monitoring can be by-passed during EMERGENCY operation - Thermal protection can be by-passed during EMERGENCY operation (only in combination with thermoswitch within actuator, not with PTC thermistor).
	Options:	• Release of local controls via fieldbus interface. Thus, actuator operation can be enabled or disabled via push buttons on local controls. • Local STOP - The actuator can be stopped via push button Stop of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.) • Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via fieldbus interface • EMERGENCY Stop push button (latching): Interrupts electrical operation, irrespective of the selector switch position • PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time

Features and functions		
Monitoring functions	• Valve overload protection: Adjustable, results in switching off and generates fault signal • Motor temperature monitoring (thermal monitoring): Results in switching off and generates fault signal • Monitoring the heater within actuator: Generates warning signal • Monitoring of permissible on-time and number of starts: Adjustable, generates warning signal • Operating 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	• Electronic device ID with order and product data • Operating data logging: A resettable counter and a lifetime counter each for: - Motor running time, number of starts, torque switch trippings in end position CLOSED, limit switch trippings in end position CLOSED, torque switch trippings in end position OPEN, limit switch trippings in end position OPEN, torque faults CLOSE, torque faults OPEN, motor protection trippings • Time-stamped event report with history for setting, operation and faults • Status signals according to NAMUR recommendation NE 107: "Failure", "Function check", "Out of specification", "Maintenance required" • Torque characteristics (for version with MWG in actuator): - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately. - Torque characteristics stored can be shown on the display.	
Motor protection evaluation	Standard:	Monitoring the motor temperature in combination with thermoswitches within actuator motor
	Options:	• Thermal overload relay in controls combined with thermoswitches within actuator • PTC tripping device in combination with PTC thermistors within actuator motor
Electrical connection	Standard:	AUMA plug/socket connector with screw-type connection
	Option:	Gold-plated control plug (sockets and plugs)
Threads for cable entries	Standard:	Metric threads
	Options:	• Pg-threads, NPT-threads, G-threads
Wiring diagram	Refer to name plate	

Further options for Non-intrusive version with MWG in the actuator	
Setting of limit and torque switching via local controls	
Torque feedback signal	Via Modbus TCP/IP interface Galvanically isolated analogue output 0/4 – 20 mA (load max. 500 Ω). Option, only possible in combination with output contacts.

Settings/programming the Modbus TCP/IP interface	
Setting the fieldbus address	Baud rate, parity and Modbus address are set via the display of actuator controls
Setting the Modbus gateway	Settings are made via web server Default settings of the IP interface:

IP Address Selection	
Address Type	Static IP
Static IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Default Gateway	192.168.0.1

General Modbus TCP/IP data	
Communication protocol	Modbus TCP/IP according to IEC 61158 and IEC 61784
Network topology	Star topology/ point-to-point topology
Transmission medium	IEC IEEE 802.3, cable recommendation: Cat. 6_A
Transmission rate/cable length	• Baud rate of 10/100 Mbits/s • Maximum cable length: 100 m
Supported Modbus functions (services)	01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Force Single Coil 15 (0FHex) Force Multiple Coils 06 Preset Single Register 16 (10Hex) Preset Multiple Registers 17 (11Hex) Report Slave ID 08 Diagnostics: • 00 00 Loopback • 00 10 (0AHex) Clear Counters and Diagnostic Register • 00 11 (0BHex) Return Bus Message Count • 00 12 (0CHex) Return Bus Communication Error Count • 00 13 (0DHex) Return Bus Exception Error Count • 00 14 (0EHex) Return Slave Message Count • 00 15 (0FHex) Return Slave No Response Count • 00 16 (10Hex) Return Slave NAK Count • 00 17 (11Hex) Return Slave Busy Count • 00 18 (12Hex) Return Character Overrun Count

Commands and signals of the Modbus TCP/IP 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)	• End positions OPEN, CLOSED • Actual position value • Actual torque value, requires magnetic limit and torque transmitter (MWG) in actuator • Selector switch in position LOCAL/REMOTE • Running indication (directional) • Torque switches OPEN, CLOSED • Limit switches OPEN, CLOSED • Manual operation by handwheel or via local controls • Analogue (2) and digital (4) customer inputs
Process representation input (fault signals)	• Motor protection tripped • Torque switch tripped in mid-travel • One phase missing • Failure of analogue customer inputs
Behaviour on loss of communication	The behaviour of the actuator is programmable: • Stop in current position • Travel to end position OPEN or CLOSED • Travel to any intermediate position • Execute last received operation command

Service conditions	
Use	Indoor and outdoor use permissible
Mounting position	Any position
Installation altitude	≤ 2 000 m above sea level > 2,000 m above sea level, on request
Ambient temperature	Refer to name plate of actuator controls
Humidity	Up to 100 % relative humidity across the entire permissible temperature range

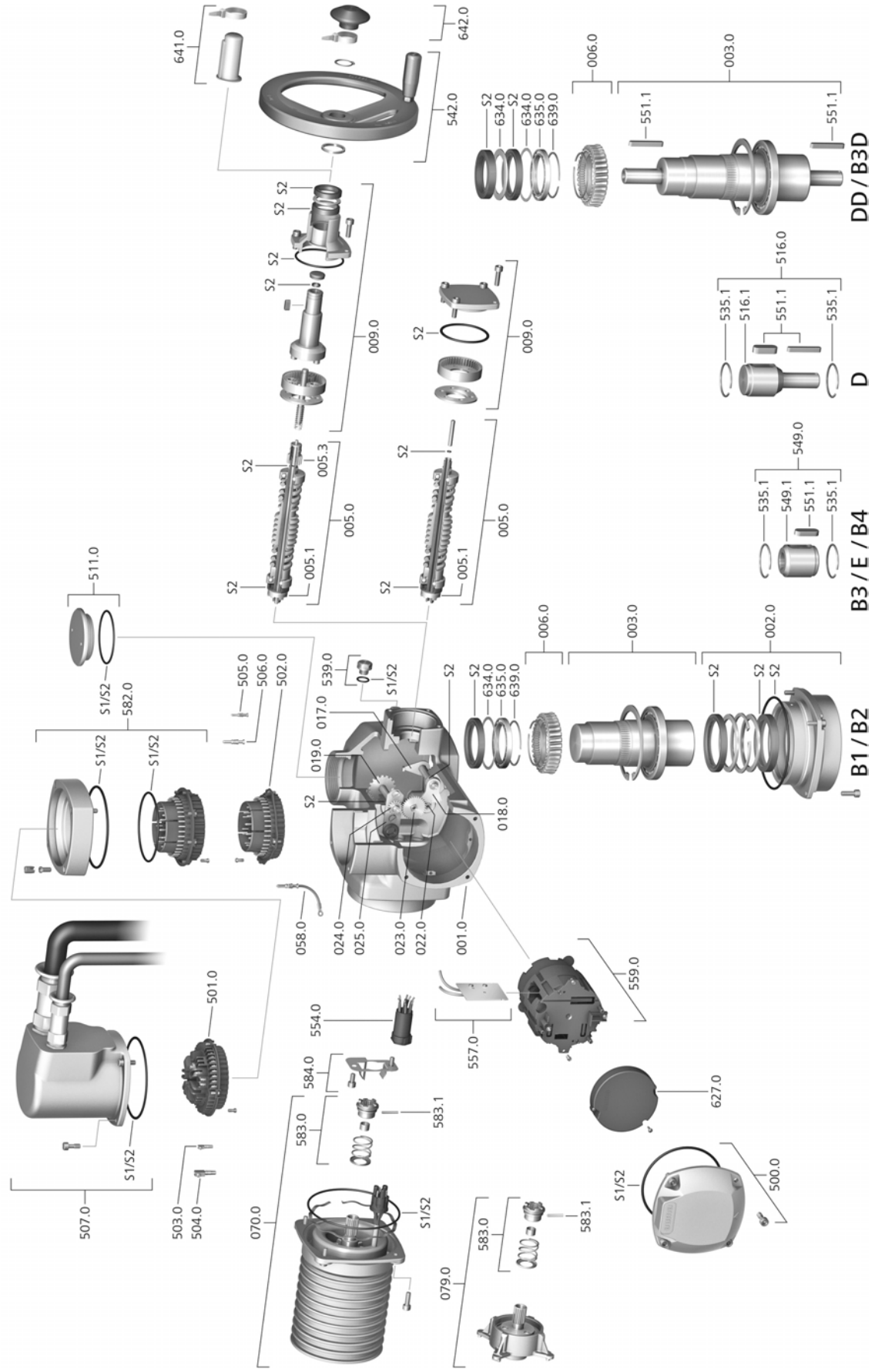
Service conditions		
Enclosure protection in accordance with IEC 60529	Standard:	IP68
	Option:	Terminal compartment additionally sealed against interior of actuator controls (double sealed)
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: Maximum 8 m head of water • Continuous immersion in water: maximal 96 hours • Up to 10 operations during immersion • Modulating duty is not possible during immersion. For exact version, refer to actuator controls name plate.	
Pollution degree according to IEC 60664-1	Pollution degree 4 (when closed), pollution degree 2 (internal)	
Vibration resistance according to IEC 60068-2-6	Resistance against vibration can be given on request	
Corrosion protection	Standard:	KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Coating	Double layer powder coating Two-component iron-mica combination	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Available colours on request

Accessories	
Wall bracket	For fixing actuator controls mounted separately from the actuator, including plug/socket connector, connecting cable on request Cable length between actuator and actuator controls is max. 100 m.
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool)
Torque measurement flange DMF	Accessory for torque measurement for SA/SAR 07.2 – SA/SAR 16.2

Further information	
Weight	Approx. 7 kg (with AUMA plug/socket connector)
EU Directives	Machinery Directive 2006/42/EC Low Voltage Directive 2014/35/EU EMC Directive 2014/30/EU RoHS Directive 2011/65/EU

13. Spare parts

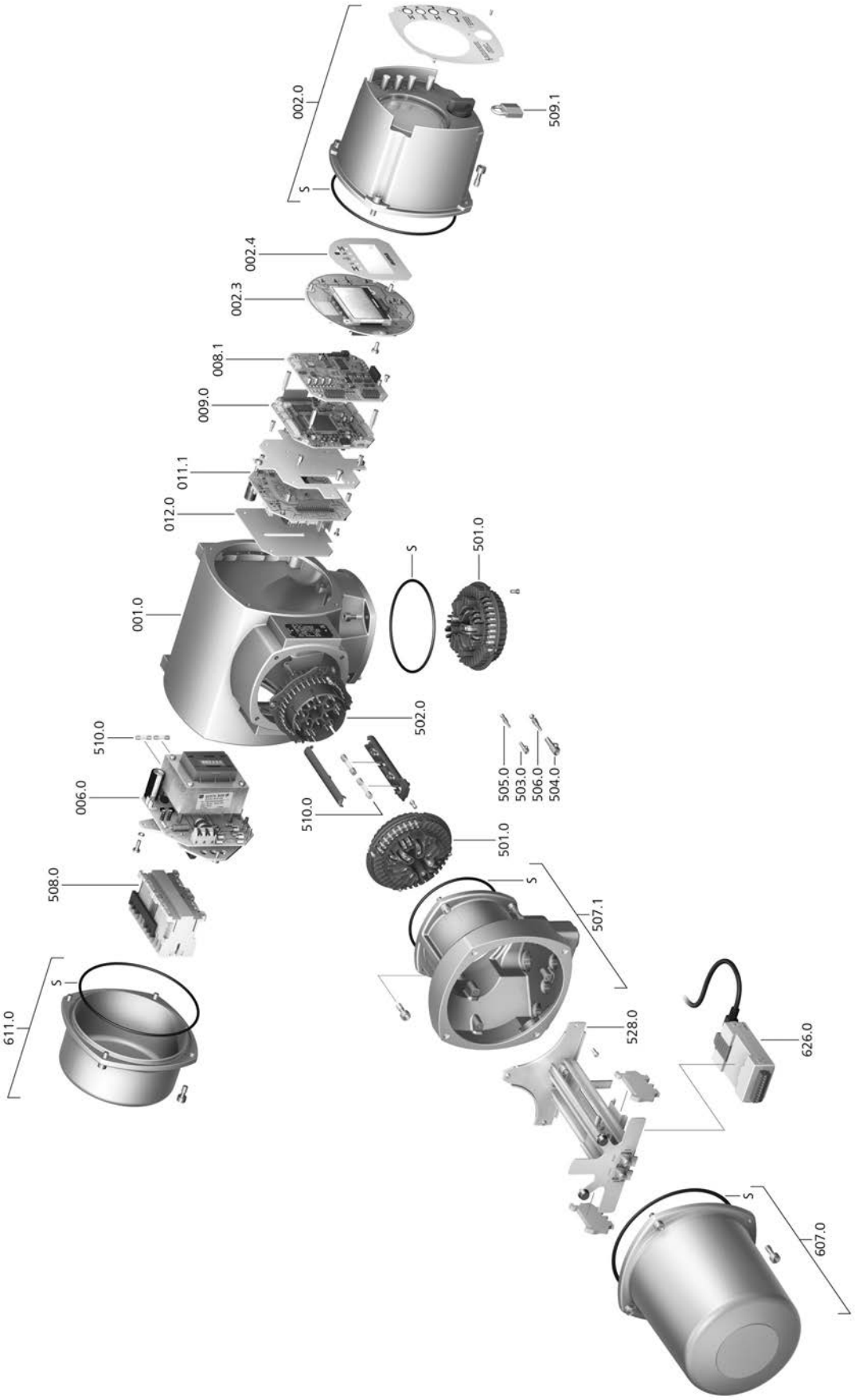
13.1. Multi-turn actuators SA 07.2-UW – SA 16.2-UW/SAR 07.2-UW – SAR 16.2-UW



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

Ref. no.	Designation	Type	Ref. no.	Designation	Type
001.0	Housing	Sub-assembly	507.0	Cover for electrical connection	Sub-assembly
002.0	Bearing flange	Sub-assembly	511.0	Threaded plug	Sub-assembly
003.0	Solid shaft B1/B2/DD/B3D	Sub-assembly	516.0	Output drive type D	Sub-assembly
005.0	Drive shaft	Sub-assembly	516.1	Output drive shaft D	
005.1	Motor coupling		535.1	Snap ring	
005.3	Manual drive coupling		539.0	Screw plug	Sub-assembly
006.0	Worm wheel		542.0	Handwheel with ball handle	Sub-assembly
009.0	Manual gearing	Sub-assembly	549.0	Output drive type B3/E/B4	Sub-assembly
017.0	Torque lever	Sub-assembly	549.1	Output drive sleeve B3/E/B4	Sub-assembly
018.0	Gear segment		551.1	Parallel key	
019.0	Crown wheel		554.0	Socket carrier for motor plug/socket connector with cable harness	Sub-assembly
022.0	Drive pinion II for torque switching	Sub-assembly	557.0	Heater	
023.0	Output drive wheel for limit switching	Sub-assembly	559.0	Electronic control unit with magnetic limit and torque transmitter (MWG)	Sub-assembly
024.0	Drive wheel for limit switching	Sub-assembly	582.0	Double sealed frame	Sub-assembly
025.0	Locking plate	Sub-assembly	583.0	Motor coupling on motor shaft	Sub-assembly
058.0	Cable for protective earth	Sub-assembly	583.1	Pin for motor coupling	
070.0	Motor (only for V... motors incl. ref. no. 079.0)	Sub-assembly	584.0	Retaining spring for motor coupling	Sub-assembly
079.0	Planetary gearing for motor drive (only for V... motors)	Sub-assembly	627.0	MWG cover 05.3	
500.0	Cover	Sub-assembly	634.0	Shim washer (size 16.2 only)	
501.0	Socket carrier (complete with sockets)	Sub-assembly	635.0	Ball bearing	
502.0	Pin carrier without pins	Sub-assembly	639.0	Retaining ring (size 16.2 only)	
503.0	Socket for controls	Sub-assembly	641.0	Shaft protection assy	
504.0	Socket for motor	Sub-assembly	642.0	Bellows assy	
505.0	Pin for controls	Sub-assembly	S1	Seal kit, small	Set
506.0	Pin for motor	Sub-assembly	S2	Seal kit, large	Set

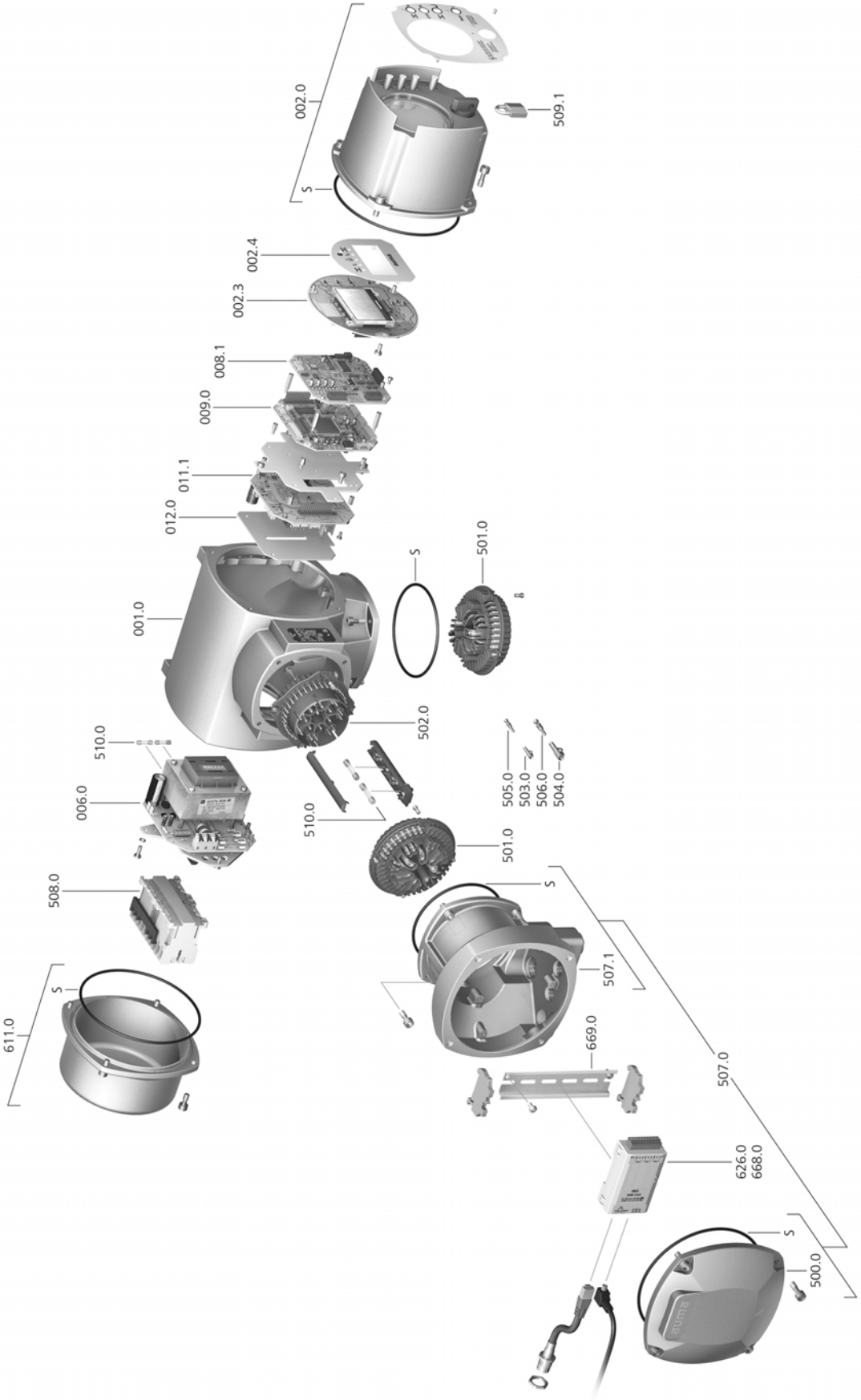
13.2. AC 01.2 actuator controls with SJ electrical connection



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

Ref. no.	Designation	Type
001.0	Housing	Sub-assembly
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
501.0	Socket carrier (complete with sockets)	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly
503.0	Socket for control	Sub-assembly
504.0	Socket for motor	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.1	Frame for electrical connection	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	Sub-assembly
510.0	Fuse kit	Kit
528.0	Terminal frame (without terminals)	Sub-assembly
607.0	Cover	
611.0	Cover	
626.0	Modbus TCP/IP Gateway	
668.0	EtherNet/IP Gateway	
S	Seal kit	Set

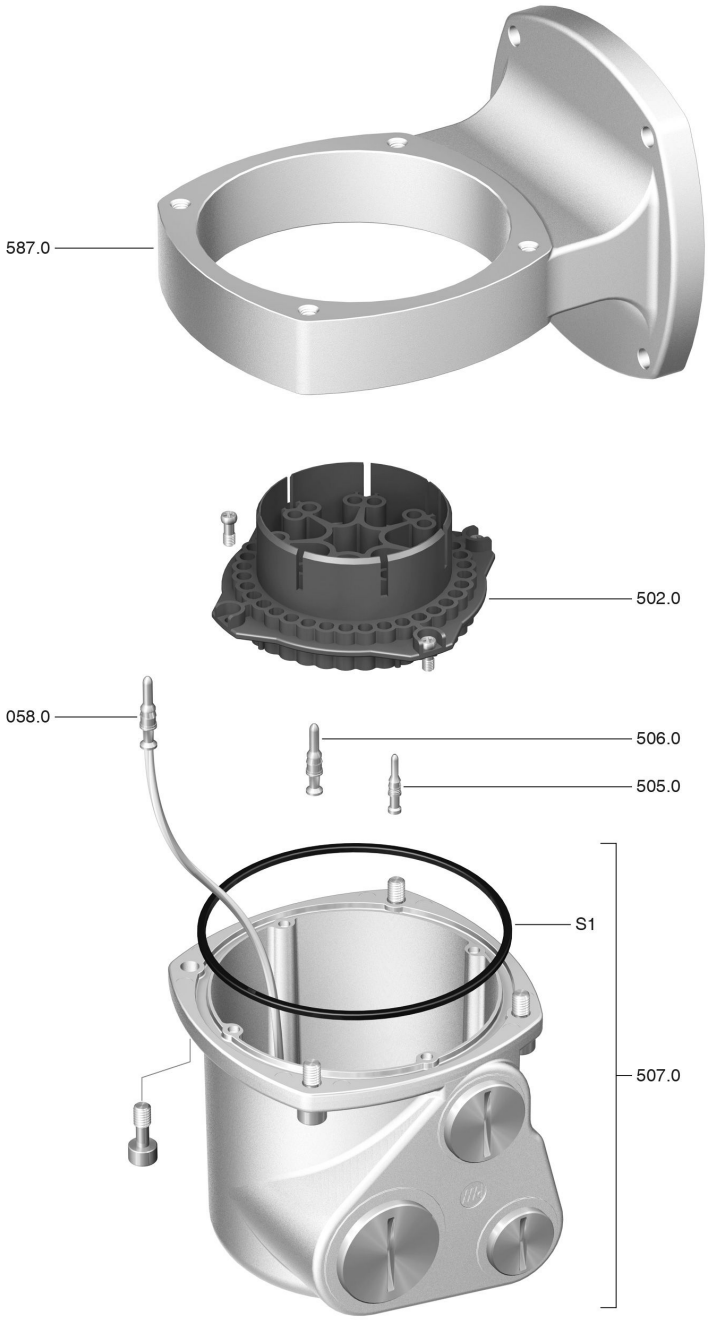
13.3. AC 01.2 actuator controls with SF compact electrical connection



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

Ref. no.	Designation	Type
001.0	Housing	Sub-assembly
002.0	Local controls	Sub-assembly
002.3	Local controls board	Sub-assembly
002.4	Face plate for display	
006.0	Power supply unit	Sub-assembly
008.1	Fieldbus board	
009.0	Logic board	Sub-assembly
011.1	Relay board	Sub-assembly
012.0	Option board	
500.0	Cover	Sub-assembly
501.0	Socket carrier (complete with sockets)	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly
503.0	Socket for controls	Sub-assembly
504.0	Socket for motor	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Electrical connection for fieldbus without connection board (050.1)	Sub-assembly
507.1	Frame for electrical connection	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	Sub-assembly
510.0	Fuse kit	Set
611.0	Cover	Sub-assembly
626.0	Modbus TCP/IP Gateway	
668.0	EtherNet/IP Gateway	
669.0	Mounting rail for compact version of Gateway	
S	Seal kit	Set

13.4. Wall bracket



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

Ref. no.	Designation	Type
058.0	Cable for protective earth	Sub-assembly
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
587.0	Wall bracket	
S	Seal	

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