auma®
Solutions for a world in motion

Multi-turn actuators
SA 25.1 – SA 48.1
SAR 25.1 – SAR 30.1
with actuator controls
AC 01.2 Intrusive

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

Operation instructions

Assembly, operation, commissioning

Read operation instructions first.

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

Purpose of the document:

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

Reference documents:

- Manual (Operation and setting) of actuator controls AC 01.2 HART
- Manual (Fieldbus device integration) of actuator controls AC 01.2 HART

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

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1. Safety instructions

1.1. Basic information on safety

Standards/directives

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

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

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

Operation

Prerequisites for safe and smooth operation:

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

Protective measures

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

Maintenance

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

Any device modification requires prior written consent of the manufacturer.

1.2. Range of application

AUMA multi-turn actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves, and ball valves.

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

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

- Industrial trucks according to EN ISO 3691
- Lifting appliances according to EN 14502
- Passenger lifts according to DIN 15306 and 15309
- Service lifts according to EN 81-1/A1

- Escalators
- Continuous duty
- Buried service
- Continuous submersion (observe enclosure protection)
- Potentially explosive areas
- 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. Applications in Ex zone 22 (option)

Actuators of the indicated series basically meet the requirements for applications in dust hazardous locations of ZONE 22 in compliance with the ATEX directive 2014/34/EU.

To comply with all requirements of the ATEX directive, observe the following points:

- Actuators are marked with the explosion protection designation II3D... for use in ZONE 22.
- Maximum surface temperature of actuators
  - T150 °C for ambient temperatures up to +60 °C or
  - T190 °C for ambient temperatures up to +80 °C.

  Increased dust deposit on the equipment was not considered for the determination of the maximum surface temperature.
- The following conditions must be fulfilled to respect the maximum permissible surface temperatures at the actuator:
  - Respecting types of duty and technical manufacturer data
  - Correct connection of thermal motor protection (thermoswitches or PTC thermistor)

Table 1:

Ambient temperature	Tripping temperature Thermal motor protection	Maximum surface temperature
up to +60 °C	140 °C	T150 °C
up to +80 °C	155 °C	T190 °C

- The connector may only be connected or disconnected when not live.
- The cable glands and cable entries used have to meet the requirements of category II3D and must at least comply with enclosure protection IP67.
- The actuators must be connected by means of an external earth connection (accessory part) to the equipotential earth bonding or integrated into an earthed piping system.
- To ensure combustible dust hazard protection, seal hollow shaft against ingress of dust:
  - Using threaded plug (ref. no. 511.0) and appropriate seal
  - Using metallic stem protection tube, protective cap and V-seal (ref. no. 568.1, 568.2, 568.3) for rising valve stem
- As a general rule, the requirements of IEC 60079 Parts 14 and 17 must be respected in dust hazardous locations. During commissioning, service, and maintenance, special care as well as qualified and trained personnel are required for safe actuator operation.

1.4. Warnings and notes

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

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

Arrangement and typographic structure of the warnings

⚠ DANGER

Type of hazard and respective source!

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

→ Measures to avoid the danger

→ Further measure(s)

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

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

1.5. References and symbols

The following references and symbols are used in these instructions:

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

Symbol for CLOSED (valve closed)

Symbol for OPEN (valve open)

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

M ▷ **Via the menu to parameter**

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

< > Reference to other sections

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

2. Identification

2.1. 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. It is capable of withstanding thrust.

Figure 1: Example, Multi-turn actuator SA 25.1

AUMA multi-turn actuators SA 25.1 – SA 48.1/SAR 25.1 – SAR 30.1 are driven by an electric motor and are capable of withstanding thrust in combination with output drive type A. For manual operation, a handwheel is provided. Switching off in end positions may be either by limit or torque seating. Actuator controls are required to operate or process the actuator signals.

Actuator controls

AC 01.2 actuator controls are used to operate AUMA actuators and are supplied ready for use. The actuator controls may be mounted directly to the actuator or separately on a wall bracket. For high nominal motor currents of the actuator, the switchgear of the actuator controls require a control box.

Figure 2: Mounting variants actuator controls and control box

[1] Actuator controls directly mounted
[2] Actuator controls on wall bracket
[3] Control box

The functions of the AC 01.2 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).

Local controls/ AUMA CDT

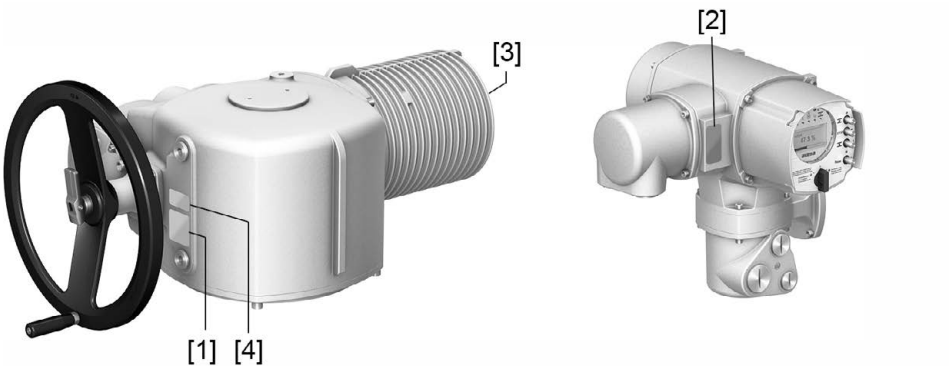
Operation, setting, and display can be performed directly at the actuator controls or alternatively from REMOTE via a fieldbus interface.

When set to local control, it is possible to

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

2.2. Name plate

Figure 3: 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

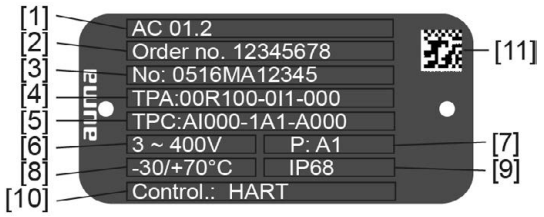
Figure 4: Actuator name plate (example)

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

[1] Name of manufacturer
[2] Address of manufacturer
[3] **Type designation**
[4] **Order number**
[5] **Serial number**
[6] 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

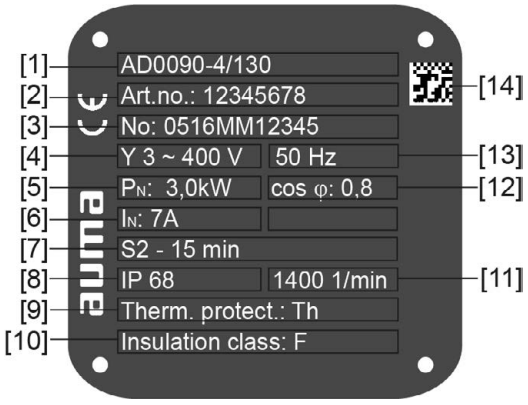
Figure 5: Name plate for actuator controls (example)



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

Motor name plate

Figure 6: 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] Rated power
[6] Rated current
[7] Type of duty
[8] Enclosure protection
[9] Motor protection (temperature protection)
[10] Insulation class
[11] Speed
[12] Power factor cos phi
[13] Mains frequency
[14] Data Matrix code

Descriptions referring to name plate indications

Type designation

Figure 7: Type designation (example)

1. Type and size of actuator
2. Flange size

Type and size

These instructions apply to the following devices types and sizes:

- Type SA = Multi-turn actuators for open-close duty
  Sizes: 25.1, 30.1, 35.1, 40.1, 48.1
- Type SA**R** = Multi-turn actuators for modulating duty
  Sizes: 25.1, 30.1
- Type AC = AUMATIC actuator controls
  Size: 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 2:

Description of serial number (with example 0516MD12345)			
05	16	MD12345	
05	Positions 1+2: Assembly in week = week 05		
	16	Positions 3+4: Year of manufacture = 2016	
		MD12345	Internal number for unambiguous product identification

Actuator terminal plan

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

0 = without position transmitter

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

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

AUMA power class for switchgear

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

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

Control

Table 3:

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

Data Matrix code

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

Figure 8: Link to AUMA Assistant App:

For further Service & Support, software/apps/... refer to www.auma.com.

3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.

DANGER

Hovering load!

Risk of death or serious injury.

→ Do NOT stand below hovering load.

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

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

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

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

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

→ Secure load against falling down, sliding or tilting.

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

Figure 9: Example: Lifting the actuator

Table 4:

Weight for AC 01.2 actuator controls	
with electrical connection type:	Weight approx. [kg]
AUMA plug/socket connector with screw-type connection	7

Table 5:

Weights for multi-turn actuators SA 25.1 – SA 48.1 / SAR 25.1 – SAR 30.1 with 3-phase AC motors		
Type designation Actuator	Motor type[1)]	Weight[2)] approx. [kg]
SA 25.1/ SAR 25.1	AD... 90-...	150
	AD... 132-...	160
SA 30.1/ SAR 30.1	AD... 112-...	190
	AD... 160-...	260

Weights for multi-turn actuators SA 25.1 – SA 48.1 / SAR 25.1 – SAR 30.1 with 3-phase AC motors		
Type designation Actuator	Motor type[1)]	Weight[2)] approx. [kg]
SA 35.1	AD... 132-...	410
	AD... 160-...	425
SA 40.1	AD... 160-...	510
SA 48.1	AD... 180-...	750

1) Refer to motor name plate
2) Indicated weight includes AUMA NORM multi-turn actuator with 3-phase AC motor, electrical connection in standard version, output drive type B1 and handwheel. For other output drive types, heed additional weights.

Table 6:

Weights for output drive type A 25.2 – A 40.2		
Type designation	Flange size	[kg]
A 25.2	F 25.2	42
A 30.2	F 30.2	69
A 35.2	F 35.2	126
A 40.2	F 40.2	202

Table 7:

Weights for output drive type AF 25.2 – AF 40.2		
Type designation	Flange size	[kg]
AF 25.2	F 25.2	61
AF 30.2	F 30.2	103
AF 35.2	F 35.2	180
AF 40.2	F 40.2	320

3.2. Storage

NOTICE

Danger of corrosion due to inappropriate storage!

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

NOTICE

Damage on display caused by temperatures below permissible level!

→ AC actuator controls MUST NOT be stored below –30 °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 in any mounting position.

Restriction: When using oil instead of grease within the actuator gear housing, the hollow shaft mounting position must be perpendicular, with the flange pointing downward. The type of lubricant used is indicated on the actuator name plate (short designation **F**...= grease; **O**...= oil).

4.2. Handwheel fitting

Information For transport reason, handwheels with a diameter of 400 mm and larger are supplied separately within the scope of delivery.

NOTICE

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

→ Only pivot change-over lever manually.

→ Do NOT use extensions as lever for operation.

→ First engage manual operation correctly, then mount handwheel.

1. Manually lift the red change-over lever while slightly turning the shaft back and forth until manual operation engages.

➥ Manual operation is properly engaged if the change-over lever can be shifted by approx. 85°.

Figure 10:

2. Push handwheel over the red change-over lever then onto the shaft.

Figure 11:

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

4. Secure handwheel using the retaining ring supplied.
   Figure 12:

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

NOTICE

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

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

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

4.3.1. Output drive type A

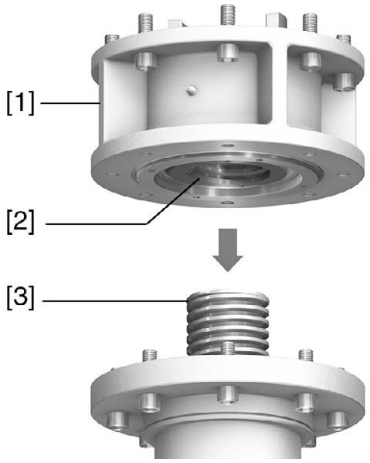
Application

- Output drive for rising, non-rotating valve stem
- Capable of withstanding thrust

Design

Output mounting flange [1] with axial bearing stem nut [2] form one unit. Torque is transmitted to valve stem [3] via stem nut [2].

Figure 13: Design of output drive type A

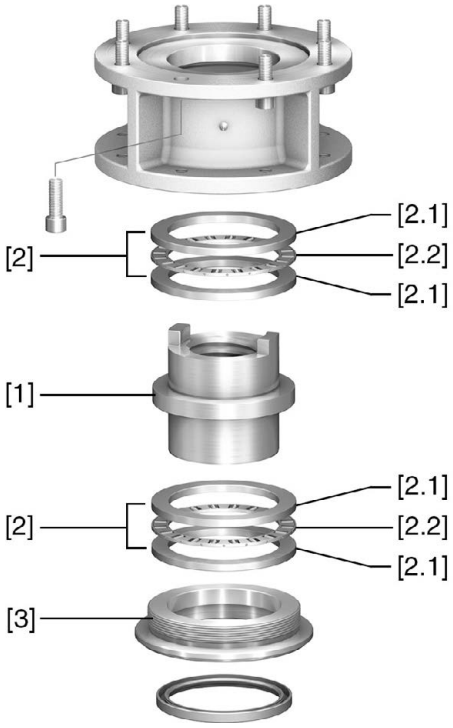


[1] Output mounting flange
[2] Stem nut with dog coupling
[3] Valve stem

4.3.1.1. Stem nut: finish machining

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

Figure 14: Output drive type A

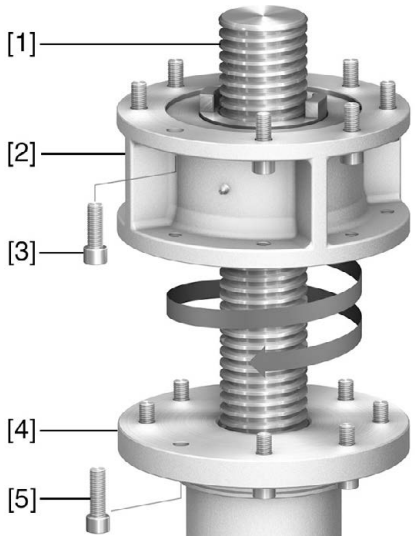


[1] Stem nut
[2] Axial needle roller bearing
[2.1] Axial bearing washer
[2.2] Axial needle roller and cage assembly
[3] Spigot ring

1. Remove spigot ring [3] from output drive.
2. Remove stem nut [1] together with axial needle roller bearings [2].
3. Remove axial bearing washers [2.1] and axial needle roller and cage assemblies [2.2] from stem nut [1].
   Information: For output drive types A from size 35.2 and larger: Record the order of axial bearing washers [2.1].
4. Drill and bore stem nut [1] and cut thread.
   Information: When fixing in the chuck, make sure stem nut runs true!
5. Clean the machined stem nut [1].
6. Apply sufficient Lithium soap EP multi-purpose grease to axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1], ensuring that all hollow spaces are filled with grease.
7. Place greased axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1] onto stem nut [1].
   Information: For output drive types A from size 35.2: Observe correct order of axial bearing washers [2.1].
8. Re-insert stem nut [1] with bearings [2] into output drive.
   Information: Ensure that dogs or splines are placed correctly in the keyway of the hollow shaft.
9. Screw in spigot ring [3] until it is firm against the shoulder.

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

Figure 15: Assembly of output drive type A



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

1. If the output drive type A is already mounted to the multi-turn actuator: Loosen screws [3] and remove output drive type A [2].
2. Check if the flange of output drive type A matches the valve flange [4].
3. Apply a small quantity of grease to the valve stem [1].
4. Place output drive type A on valve stem and turn until it is flush on the valve flange.
5. Turn output drive type A until alignment of the fixing holes.
6. Screw in fastening screws [5], however do not completely tighten.
7. Fit multi-turn actuator on the valve stem so that the stem nut dogs engage into the output drive sleeve.

➥ The flanges are flush with each other if properly engaged.

8. Adjust multi-turn actuator until alignment of the fixing holes.
9. Fasten multi-turn actuator with screws [3].
10. Fasten screws [3] crosswise with a torque according to table.

Table 8:

Tightening torques for screws		
Threads	Tightening torque [Nm]	
	Strength class	
	8.8	A2-80
M16	214	200
M20	431	392
M30	1,489	1,422
M36	2,594	2,481

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

4.3.2. Output drive types B and E

Application

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

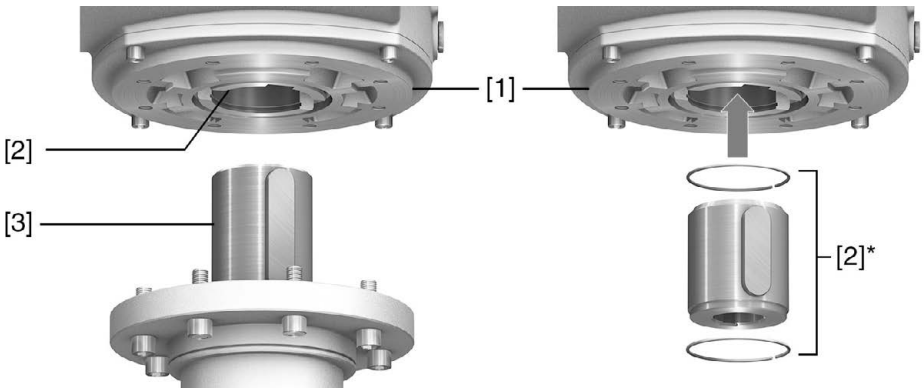
Design

For output drive types B/B1/B2, the connection to the valve or the gearbox is made by directly placing the multi-turn actuator hollow 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 hollow 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

Figure 16: Output drive type B



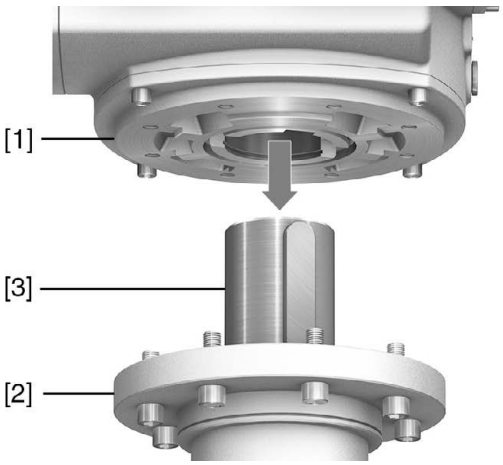
[1] Multi-turn actuator flange
[2] For output drive types B/B1/B2 hollow shaft with keyway
[2]* For output drive types B3/B4/E, an output drive sleeve is fitted into the hollow shaft
[3] Gearbox/valve shaft with parallel key

Information

Spigot at valve flanges should be loose fit.

4.3.2.1. Multi-turn actuator with output drive types B: mount to valve/gearbox

Figure 17: Mounting output drive types B



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

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. Fit multi-turn actuator [1].
   Information: Ensure that the spigot fits uniformly in the recess and that the mounting faces are in complete contact.
5. Fasten multi-turn actuator with screws according to table.
   Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.
6. Fasten screws crosswise to a torque according to table.

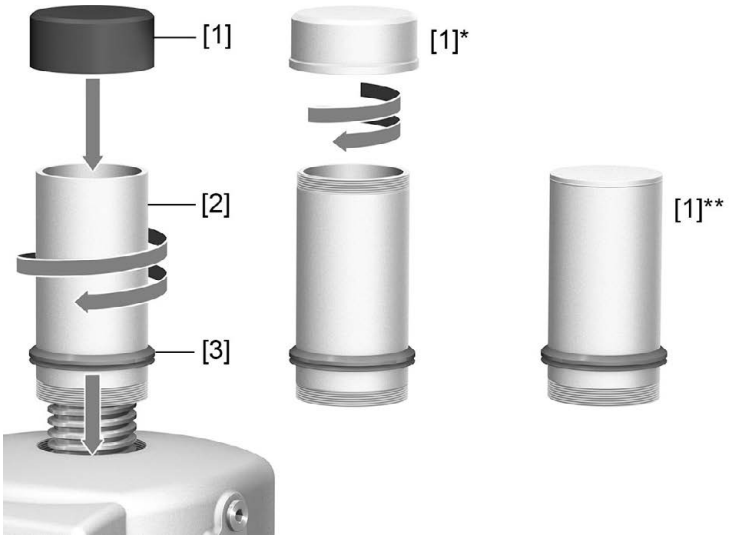
Table 9:

Tightening torques for screws		
Threads	Tightening torque [Nm]	
	Strength class	
	8.8	A2-80
M16	214	200
M20	431	392
M30	1,489	1,422
M36	2,594	2,481

4.4. Accessories for assembly

4.4.1. Stem protection tube for rising valve stem

Figure 18: Assembly of the stem protection tube

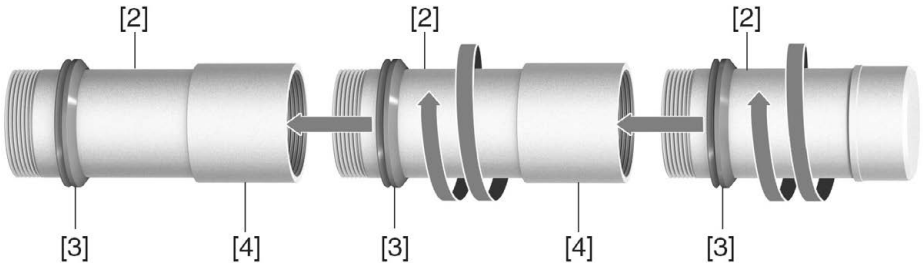


[1] Protective cap for stem protection tube (fitted)
[1]* Option for size 25.1: Protective cap made of steel (screwed)
[1]** Option from size 30.1: Protective cap made of steel (welded)
[2] Stem protection tube
[3] V-seal

1. Seal all threads with hemp, Teflon tape, or thread sealing material.

2. Screw stem protection tube [2] into thread and tighten it firmly.
   Information: For stem protection tubes made of two or more segments, all parts have to be thoroughly screwed together.

   Figure 19: Protection tube made of segments with threaded sleeves (SA 25.1/30.1: >900 mm)



   [2] Segment of stem protection tube
   [3] V-seal
   [4] Threaded sleeve

3. Push down the sealing ring [3] onto the housing.
   Information: For mounting segments, push down seals of segments down to the sleeve (connecting piece).
4. Check whether protective cap [1] for stem protection tube is available, in perfect condition and tightly placed on or screwed to the tube.

NOTICE

Risk of bending or oscillation of protection tubes exceeding a length of 2 m!

Risk of damage at stem and/or protection tube.

→ Secure protection tubes exceeding 2 m by an appropriate support.

4.5. Mounting positions of local controls

Figure 20: Mounting positions

The mounting position of the local controls is implemented according to the order. If, after mounting the actuator to the valve or the gearbox on site, the local controls are in an unfavourable position, the mounting position can be changed at a later date. Four mounting positions shifted by respectively 90° are possible (by maximum 180° into one direction).

4.5.1. Mounting positions: modify

DANGER

Hazardous voltage!

Risk of electric shock.

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

NOTICE

Cable damage due to twisting or pinching!

Risk of functional failures.

→ Turn local controls by a maximum of 180°.

→ Carefully assemble local controls to avoid pinching the cables.

4. Fasten screws evenly crosswise.

5. Electrical connection

5.1. Basic information

⚠ WARNING

Danger due to incorrect electrical connection

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

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

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

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

Wiring diagram/terminal plan

The pertaining wiring diagram/terminal plan (in German 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).

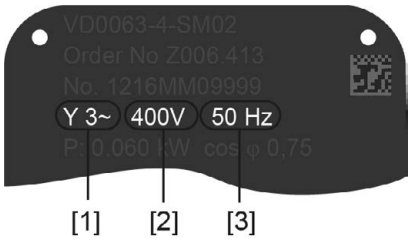
Permissible networks (supply networks)

Actuator controls (actuators) are suitable for use in TN and TT networks with directly earthed star point for mains voltage up to maximum 690 V AC. Use in IT networks for nominal voltages up to maximum 600 V AC are permissible. 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 21: Motor name plate (example)



[1] Type of current

[2] Mains voltage

[3] Mains frequency (for 3-phase and 1-phase AC motors)

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 10:

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	1,000 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 11:

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)
Reversing contactor A4 (in control box)	up to 30 kW	125A (gL/gG)
Reversing contactor A5 (in control box)	up to 55 kW	200A (gL/gG)
Reversing contactor A6 (in control box)	up to 75 kW	315A (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 (I_A) (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 with thyristors, we recommend safety fuses instead of circuit breakers.

We recommend refraining from using residual current devices (RCD). However, if an RCD is used within the mains, the residual current device must be of type B.

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 12:

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

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

Potential of customer connections

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

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

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 for the place of installation.

Connecting cables

- We recommend using connecting cables and connecting terminals according to rated current (I_N) (refer to motor name plate or electrical data sheet).
- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- Use connecting 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

Signal and fieldbus cables are susceptible to interference. Motor cables are interference sources.

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.

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

HART cable recommendation:

Twisted wire pair, shielded.

For cable length <1,500 m: Cross section min. 0.2 mm²

For cable length >1,500 m: Cross section min. 0.5 mm²

Multiple-twisted pair cables must not be used.

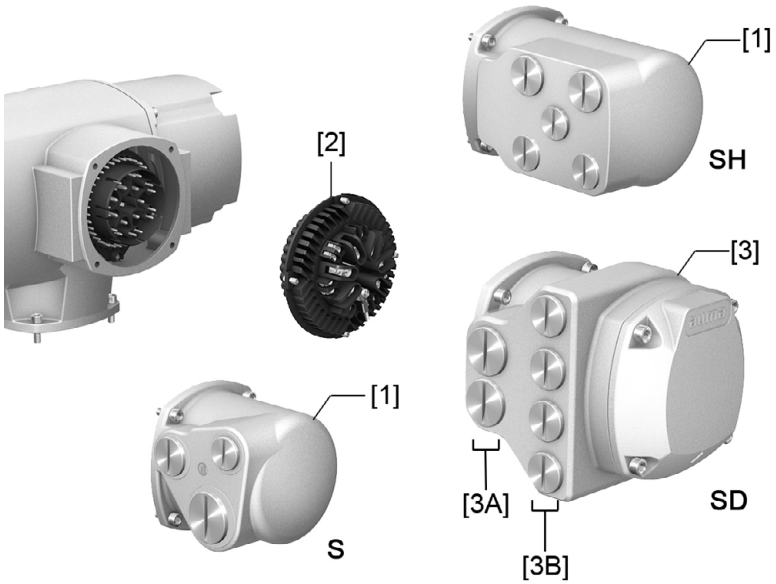
Prior to installation, please note:

- Connection is made as point-to-point topology.
- Respect a distance of minimum 20 cm between HART cables and other cables if possible. The cables should be laid in a separate, conductive, and earthed cable tray, if possible.
- Make sure that there are no potential differences between participants.
- Maximum cable length depends on characteristics of devices connected (impedance), of cables used (cable capacity and resistance) and the impedance of all devices installed between two end devices.

5.2. Electrical connection of actuator controls

5.2.1. S/SH/SD electrical connection (AUMA plug/socket connector)

Figure 22: S, SH and SD electrical connection



[1] Cover
[2] Socket carrier with screw-type terminals
[3] Terminal compartment (in cover)
[3A] Cable entries for mains connection (pins for motor and pins for controls)
[3B] Cable entries for HART cables

Short description

Plug-in electrical connection with screw-type terminals for pins for motor and pins for controls. Pins for controls also available as crimp-type connection as an option.

S version (standard) with three cable entries. SH version (enlarged) with additional cable entries. For cable connection, remove the AUMA plug/socket connector and the socket carrier from cover.

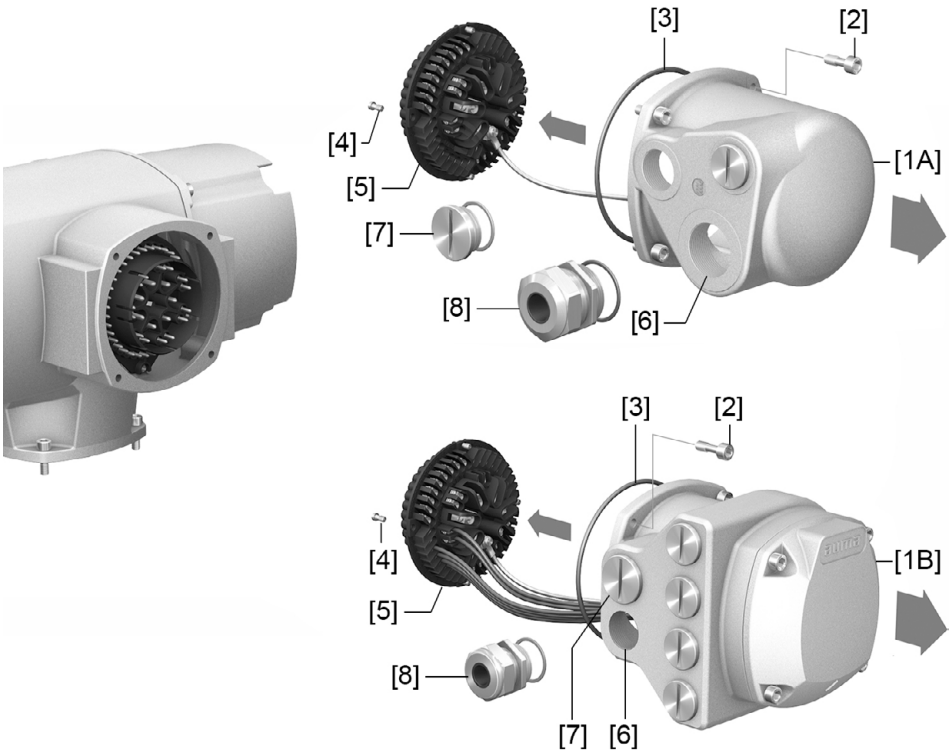
Technical data

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)

5.2.1.1. Terminal compartment (for mains connection): open

Figure 23: Terminal compartment: open



[1A] S/SH cover (figure shows S version)
[1B] Connection housing (SD version)
[2] Screws
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable entry
[7] Blanking plug
[8] Cable gland (not included in delivery)

Information For S/SH version, connection of HART cables is made at the socket carrier. For SD version, connection of HART cables is separate of mains connection (refer to <HART terminal compartment: open>).

DANGER

Hazardous voltage!

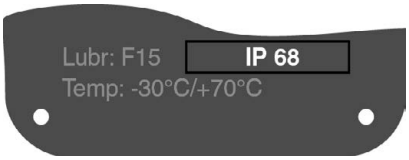
Risk of electric shock.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove cover [1] or connection housing [1B].
2. Loosen screws [4] and remove socket carrier [5] from cover [1A] or connection housing [1B].
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 24: Example: Name plate for enclosure protection IP68



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

5.2.1.2. 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: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

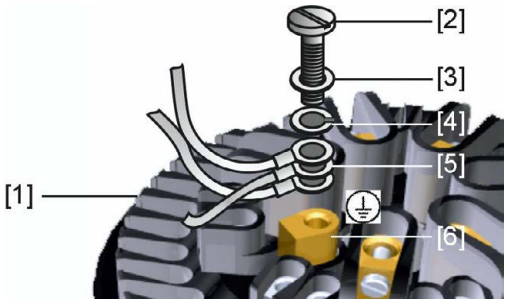
→ Connect all protective earth conductors.

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

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

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

   Figure 25: Protective earthing

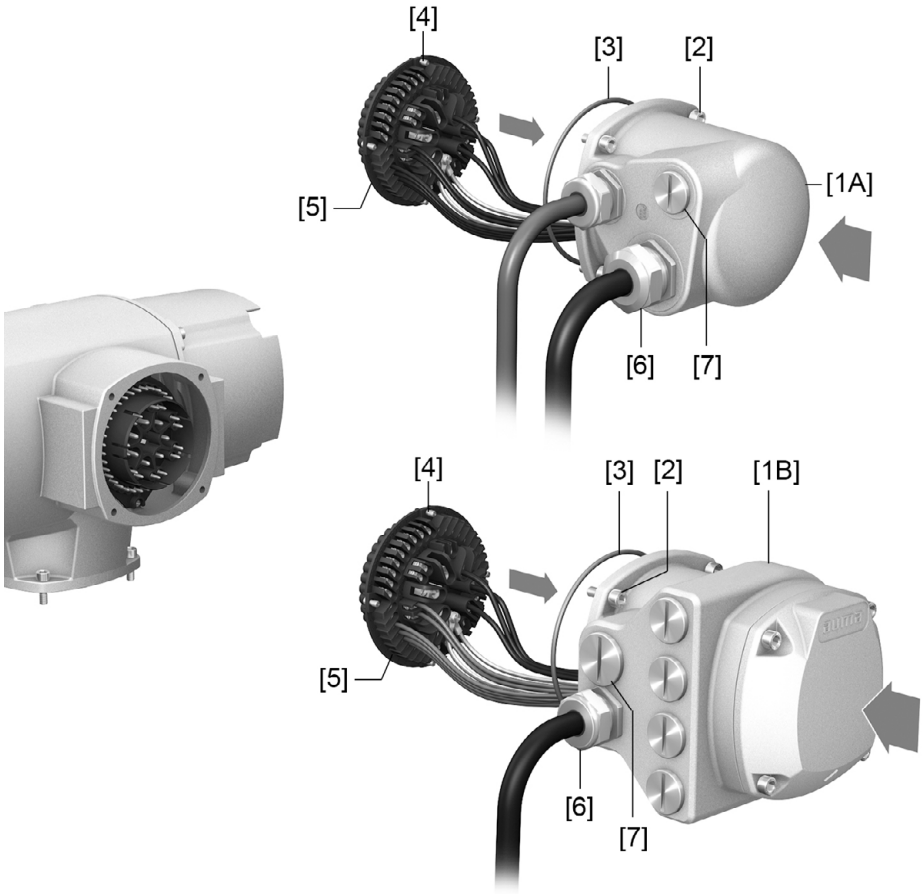


   [1] Socket carrier
   [2] Screw
   [3] Washer
   [4] Lock washer
   [5] Protective earth with ring lugs/loops
   [6] Protective earthing, symbol: ⏚

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

5.2.1.3. Terminal compartment (for mains connection): close

Figure 26: Terminal compartment: close



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

⚠ WARNING

Short-circuit due to pinching of cables!

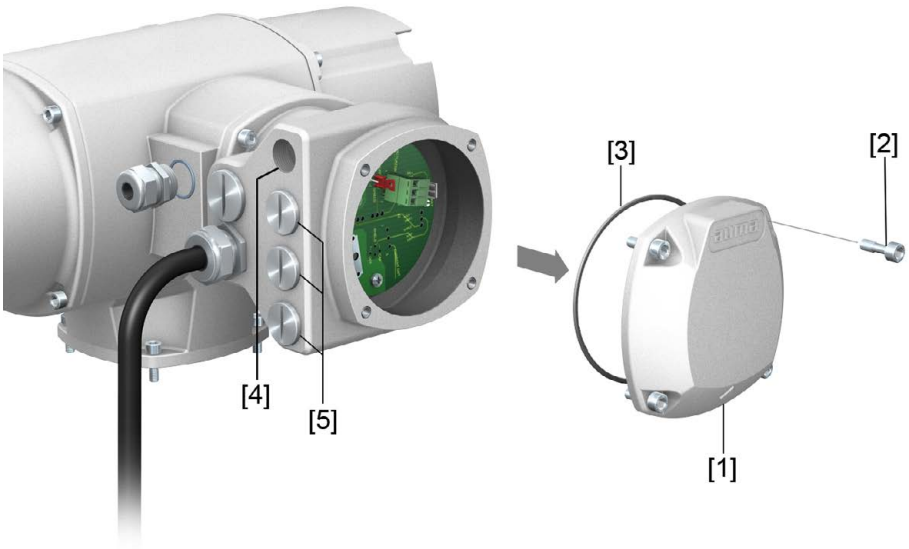
Risk of electric shock and functional failures.

→ Carefully fit socket carrier to avoid pinching the cables.

1. Insert the socket carrier [5] into the cover [1A] or connection housing [1B] and fasten with screws [4].
2. Clean sealing faces of cover [1A] or connection housing [1B] 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 cover [1A] or connection housing [1B] and fasten screws [2] evenly crosswise.
6. Fasten cable glands and blanking plugs applying the specified torque to ensure the required enclosure protection.

5.2.1.4. HART terminal compartment: open (version with HART connection board)

Figure 27: Open cover to HART terminal compartment



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

Only for version with SD electrical connection, with HART connection board.

DANGER

Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

NOTICE

Electrostatic discharge ESD!

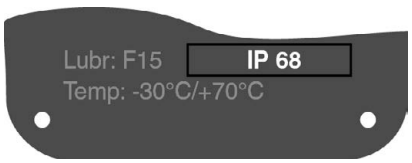
Risk of damage to electronic components.

→ Earth both operators and devices.

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

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

Figure 28: Example: Name plate for enclosure protection IP68

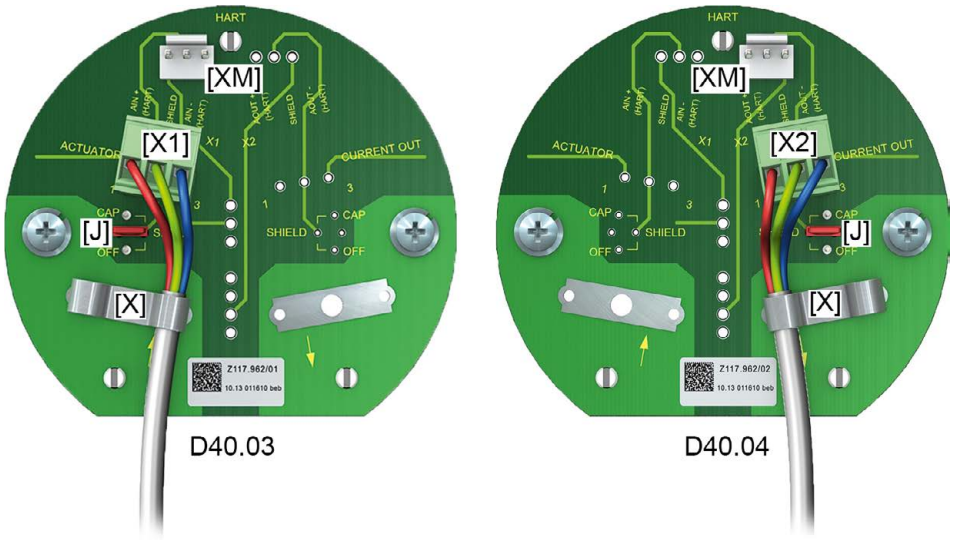


3. Seal unused cable entries with suitable plugs.

5.2.1.5. HART cables: connect

Connection boards

Figure 29: Variants of HART connection boards



[X] Shielding clamp
[XM] Connection for HART modem
[X1/2] 4 – 20 mA HART cable
[J] Jumper for shield

Table 15:

Variant	Device category	AUMA art. no. on label [1)]
D40.03	Actuator	Z117.962/01
D40.04	Current Output	Z117.962/02

1) Label with article number on connection board

Connection assignment for “Actuator” device category

Table 16:

X1, screw-type terminal, 3-pole: analogue connection with HART signal (“Actuator”)			
Pin	Signal	Signal type	Function
1	AIN+_H	Current with HART	Positive (analogue) input (target value) with HART signal
2	Shield (drain)	Shield (EMC protection)	Wire or shield of infeed cable
3	AIN-_H	Current with HART	Negative (analogue) input (target value) with HART signal

Table 17:

J: Jumper for shield		
Item	Position	Function
1	Jumper from CAP to SHIELD	Shield via capacitor (2.2 nF/200 V) to PE
2	Jumper from horizontal level to SHIELD	Shield directly to PE (default)
3	Jumper from OFF to SHIELD	Shield not to PE (not recommended)

Table 18:

XM 3-pole: Monitoring HART signal “Actuator”			
Pin	Signal name	Signal type	Explanation/function
1	AIN+_H	Current with HART	Positive (analogue) input (target value) with HART signal following overvoltage protection
2	Shield (drain)		Not used on internal sub-assembly
3	AIN-_H	Current with HART	Negative (analogue) input (target value) with HART signal following overvoltage protection

Connection assignment for “Current Output” device category

Table 19:

X2, screw-type terminal, 3-pole: analogue connection with HART signal (“Current output”)			
Pin	Signal name	Signal type	Function
1	AOUT+_H	Current with HART	Positive (analogue) output (target value) with HART signal
2	Shield (drain)	Shield (EMC protection)	Wire or shield of infeed cable
3	AOUT-_H	Current with HART	Negative (analogue) output (target value) with HART signal

Table 20:

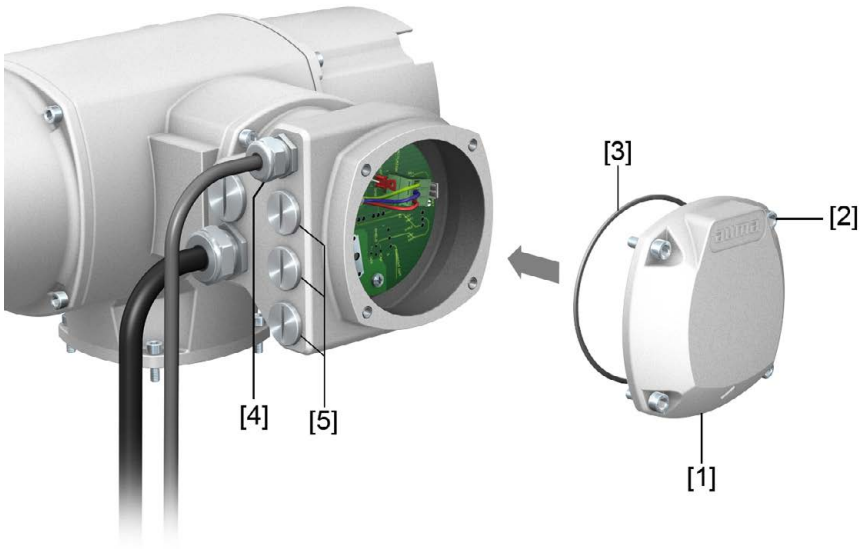
J: Jumper for shield		
Item	Position	Function
1	Jumper from CAP to SHIELD	Shield via capacitor (2.2 nF/200 V) to PE
2	Jumper from horizontal level to SHIELD	Shield directly to PE (default)
3	Jumper from OFF to SHIELD	Shield not to PE (not recommended)

Table 21:

XM 3-pole: Monitoring“Current Output” HART signal			
Pin	Signal name	Signal type	Explanation/function
1	AIN+_H	Current with HART	Positive (analogue) input (target value) with HART signal Following overvoltage protection
2	Shield (drain)		Not used for “monitoring”
3	AIN-_H	Current with HART	Negative (analogue) input (target value) with HART signal Following overvoltage protection

5.2.1.6. HART terminal compartment: close (version with HART connection board)

Figure 30: Close HART terminal compartment



[1] Cover (HART terminal compartment)
[2] Screws for cover
[3] O-ring
[4] Cable entries for HART 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.

5.3. Electrical connection of actuator

Figure 31: Connection arrangement for sizes 25.1 – 40.1

[1] Motor connection compartment for nominal currents exceeding 25 A
[2] Cable entry for motor connection
[3] Electrical connection (S) for control connections as well as for motor connections up to 25 A (only available for actuator controls on wall bracket).

Figure 32: Connection arrangement for size 48.1

[1] Motor connection compartment
[2] Cable entry for motor connection
[3] Electrical connection (S) for control connections (only available for actuator controls on wall bracket)

Information Motor connection is performed within motor connection compartment [1] for motors with nominal currents exceeding 25 A. Motor connection can also be made via the pins for motors at the electrical connection [3] in case of lower nominal currents.

5.3.1. Motor connection

5.3.1.1. Motor connection compartment: open

Figure 33: Motor connection compartment: open

[1] Cover
[2] Screws for cover
[3] O-ring
[4] Cable gland

DANGER

Hazardous voltage!

Risk of electric shock.

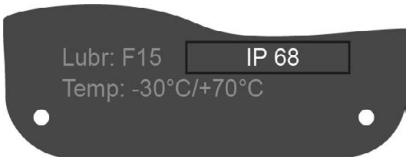
→ Disconnect device from the mains before opening.

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

2. Insert cable gland suitable for connecting cable.

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

Figure 34: Name plate, example with enclosure protection IP68



5.3.1.2. Motor cables: connect

Table 22:

Terminal cross sections and terminal tightening torques			
Type	Speed	Terminal cross sections	Tightening torques
SA 25.1 SAR 25.1	4 – 22	0.5 – 16 mm^2	2.0 Nm
	32 – 90	2.5 – 35 mm^2	3.5 Nm
SA 30.1 SAR 30.1	4 – 22	4 – 16 mm^2	1.2 – 2.4 Nm
	32 – 45	10 – 35 mm^2	4.0 – 5.0 Nm
	63 – 90	16 – 70 mm^2	6.0 – 12 Nm
SA 35.1	4 – 5.6	4 – 16 mm^2	1.2 – 2.4 Nm
	8 – 22	10 – 35 mm^2	4.0 – 5.0 Nm
	32 – 45	16 – 70 mm^2	6.0 – 12 Nm
SA 40.1	4 – 11	10 – 35 mm^2	4.0 – 5.0 Nm
	16 – 32	16 – 70 mm^2	6.0 – 12 Nm
SA 48.1	4	10 – 35 mm^2	4.0 – 5.0 Nm
	5.6 – 16	16 – 70 mm^2	6.0 – 12 Nm

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

⚠ WARNING

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

Risk of electric shock.

→ Connect all protective earth conductors.

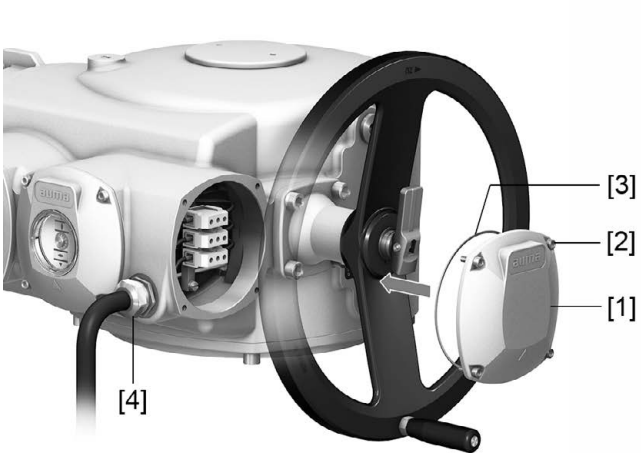
→ Connect PE connection to external protective earth conductor of connecting cables.

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

6. Firmly tighten protective earth to PE connection (symbol: ⏚).
7. For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).

5.3.1.3. Motor connection compartment: close

Figure 35: Close motor connection compartment



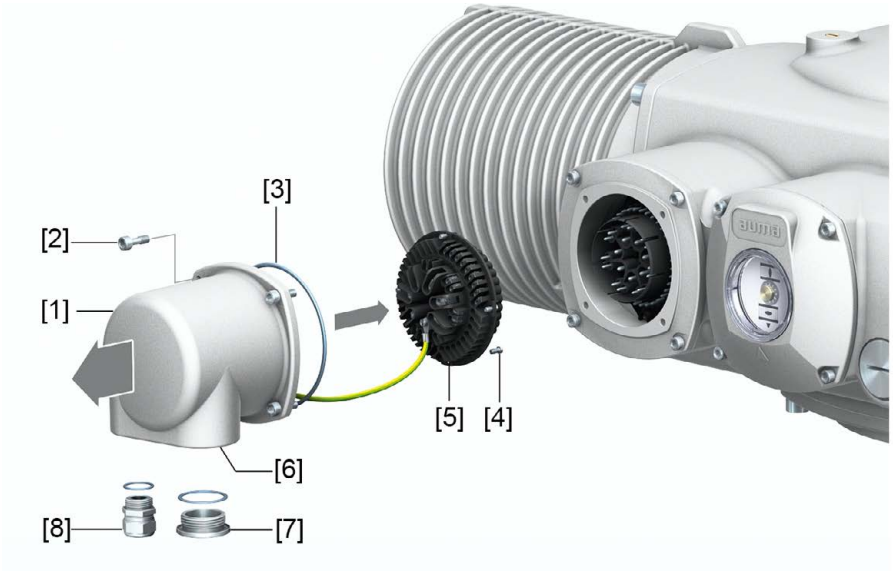
[1] Cover
[2] Screws for cover
[3] O-ring
[4] Cable gland

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

5.3.2. S/SH electrical connection (AUMA plug socket connector)

5.3.2.1. Terminal compartment: open

Figure 36: Terminal compartment: open



[1] Cover (figure shows S version)
[2] Screws for cover
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Cable entry
[7] Blanking plug
[8] Cable gland (not included in delivery)

DANGER

Hazardous voltage!

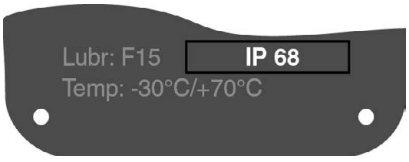
Risk of electric shock.

→ Disconnect device from the mains before opening.

1. Loosen screws [2] and remove cover [1].
2. Loosen screws [4] and remove socket carrier [5] from cover [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 37: Example: Name plate for enclosure protection IP68



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

5.3.2.2. Cable connection

Table 23:

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: Hazardous voltage while protective earth conductor is NOT connected!

Risk of electric shock.

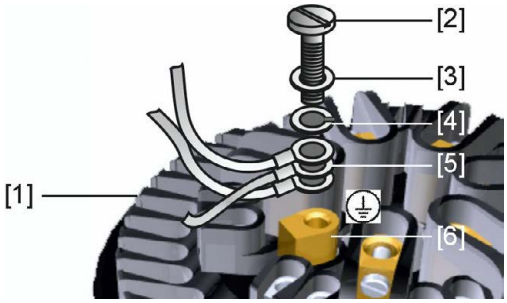
→ Connect all protective earth conductors.

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

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

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

   Figure 38: Protective earthing

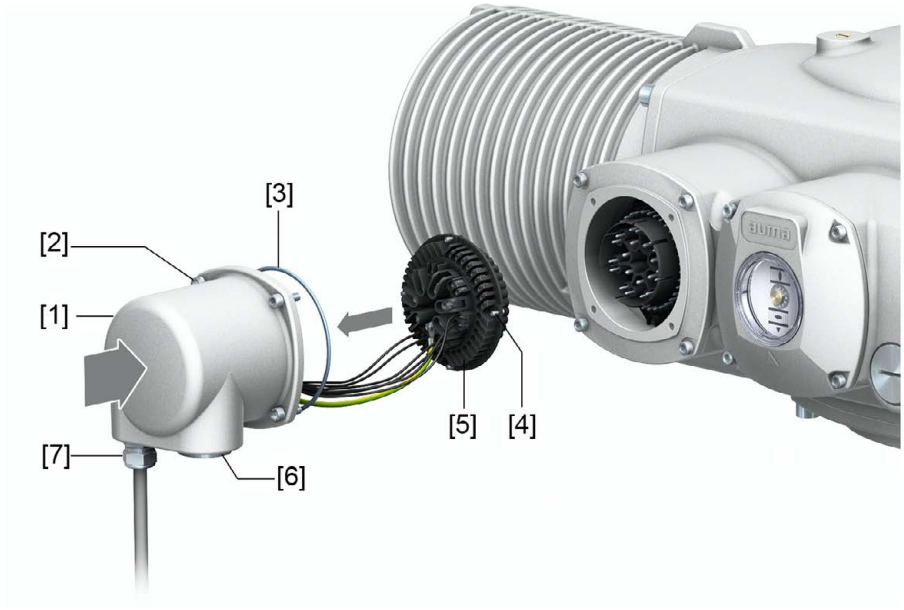


[1] Socket carrier
[2] Screw
[3] Washer
[4] Lock washer
[5] Protective earth with ring lugs/loops
[6] Protective earthing, symbol: ⏚

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

5.3.2.3. Terminal compartment: close

Figure 39: Terminal compartment: close



[1] Cover (figure shows S version)
[2] Screws for cover
[3] O-ring
[4] Screws for socket carrier
[5] Socket carrier
[6] Blanking plug
[7] Cable gland (not included in delivery)

⚠ WARNING

Short-circuit due to pinching of cables!

Risk of electric shock and functional failures.

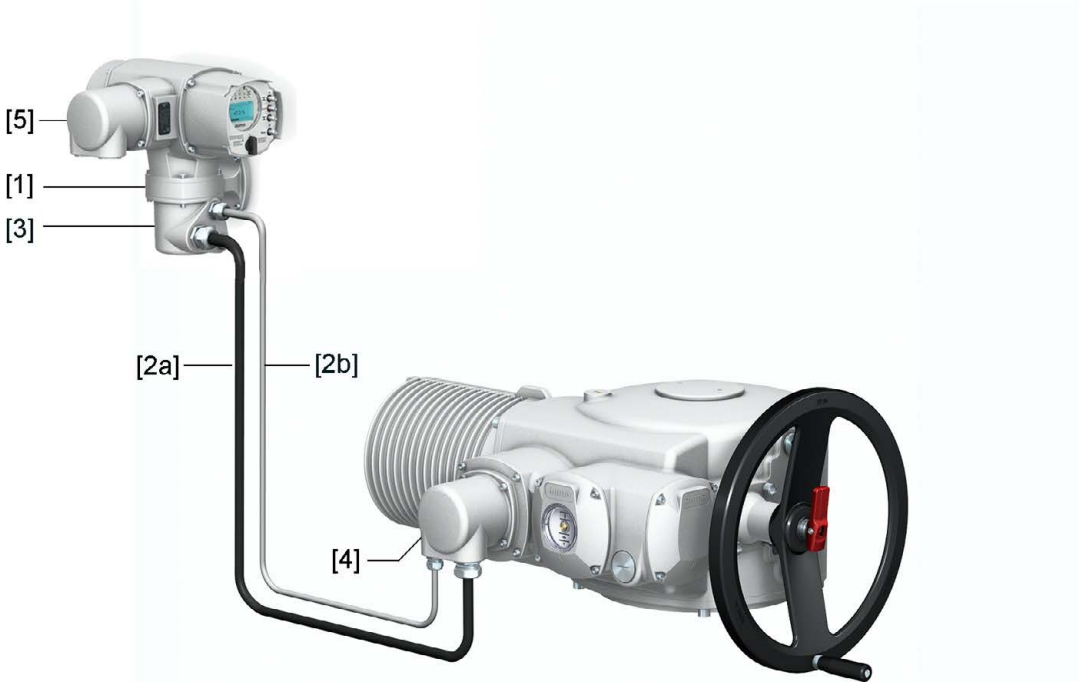
→ Carefully fit socket carrier to avoid pinching the cables.

1. Insert the socket carrier [5] into the cover [1] and fasten with screws [4].
2. Clean sealing faces of cover [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 cover [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. Accessories for electrical connection

5.4.1. Actuator controls on wall bracket

Design Figure 40: Design principle with wall bracket (example)



[1] Wall bracket
[2a] Motor connection/motor control
[2b] Feedback signals from actuator
[3] Electrical connection of wall bracket (XM)
[4] Electrical connection of actuator (XA)
[5] Electrical connection of actuator controls (XK) - customer plug

Application The wall bracket allows separate mounting of actuator controls and actuator.

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

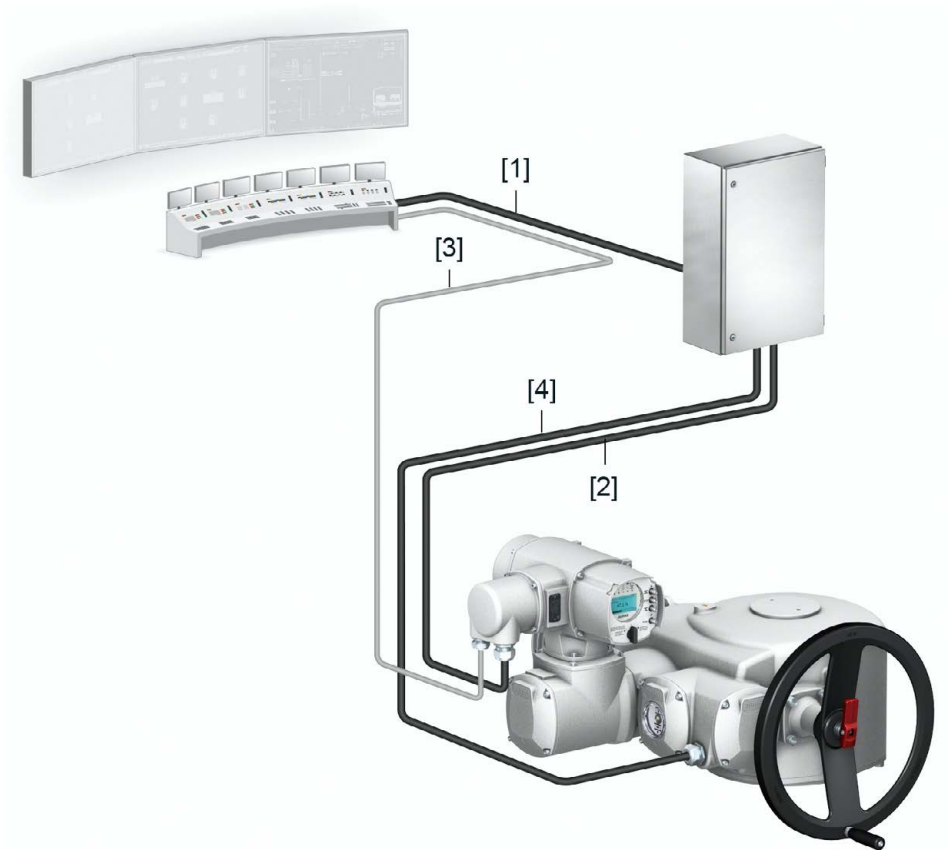
Information on installation with wall bracket

- The permissible cable length between actuator controls on wall bracket and the actuator amounts to 100 m maximum.
- If the actuator is equipped with a position transmitter (EWG, RWG):
  - Use suitable flexible and screened connecting cables.
  - Earth cable shield at both ends.
  - Versions with potentiometer in the actuator are not suitable.
- We recommend using an AUMA “LSW” cable set .
- If the AUMA cable set is not used: Use suitable flexible and screened connecting cables.
- When using connecting cables, e.g. of the heater or switch, requiring direct wiring from the actuator to the XK customer plug (XA-XM-XK, refer to wiring diagram), these connecting cables must be subject to an insulation test in compliance with EN 50178. Connecting cables of position transmitters (EWG, RWG, IWG, potentiometer) do not belong to this group. They may **not** be subjected to an insulation test.

Information For actuator controls with control box, additionally heed <Connection with control box> chapter.

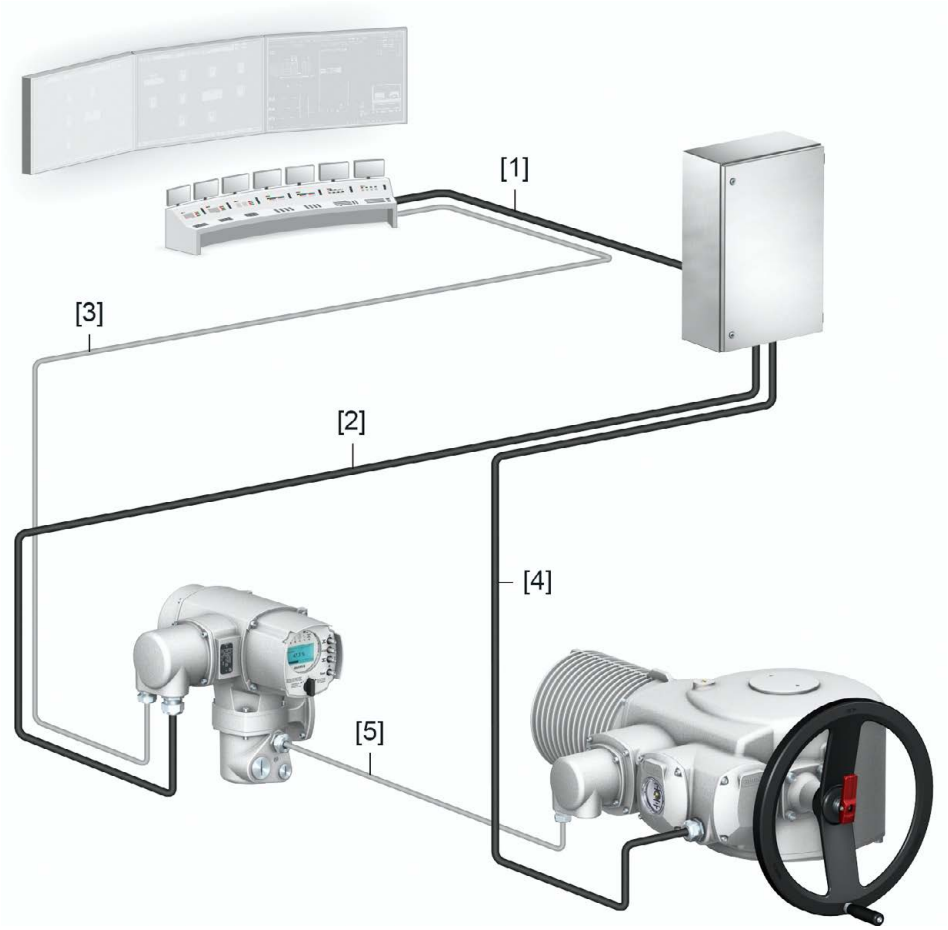
5.4.2. Connection with control box

Figure 41: Example of cable installation for actuator controls with control box



[1] Power supply, e.g. 3~/PE/400V/50 Hz
[2] Power supply of actuator controls (switchgear control)
[3] Customer connection (XK) control contacts/signals
[4] Motor connection/motor control

Figure 42: Example of cable installation for actuator controls on wall bracket and with control box for wall mounting



[1] Power supply, e.g. 3~/PE/400V/50 Hz
[2] Power supply of actuator controls (switchgear control)
[3] Customer connection (XK) control contacts/signals
[4] Motor connection/motor control
[5] Feedback signals from actuator

For actuators with high nominal motor current (AUMA power class switchgear from category A4), a control box is required. Switchgear (reversing contactors) will then be installed in the control box and not within the actuator controls. The control box is mounted separately on a wall.

Information on installation with control box

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

Information For wall-mounted actuator controls, additionally observe <Actuator controls on wall bracket> chapter.

5.4.3. Parking frame

Figure 43: Parking frame, example with plug/socket connector and cover

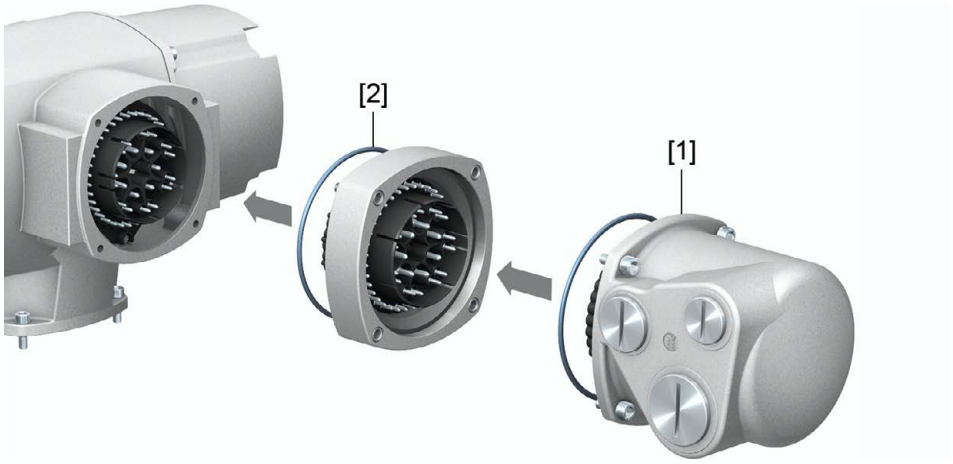
Application

Parking frame for safe storage of a disconnected plug or cover.

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

5.4.4. DS intermediate frame for double sealing

Figure 44: Electrical connection with DS intermediate frame



[1] Electrical connection

[2] DS intermediate frame

Application

When removing the electrical connection or due to leaky cable glands, there is a potential risk of ingress of dust and water into the housing. This is prevented effectively by inserting the double sealed intermediate frame [2] between the plug/socket connector [1] and the housing of the device. The enclosure protection of the device (IP68) will not be affected, even if the electrical connection [1] is removed.

5.4.5. External earth connection

Figure 45: Earth connection for multi-turn actuator

Application

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

Table 24:

Terminal cross sections and earth connection tightening torques		
Conductor type	Terminal cross sections	Tightening torques
Solid wire and stranded	6 mm² to 16 mm²	3 – 4 Nm
Fine stranded	4 mm² to 10 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. Manual operation

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

6.1.1. Engage manual operation

Information

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

NOTICE

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

→ Engage manual operation only during motor standstill.

→ Only pivot change-over lever manually.

→ Do NOT use extensions as lever for operation.

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

   Figure 46:

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

   Figure 47:

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

   Figure 48:

6.1.2. Manual operation: disengage

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

6.2. Motor operation

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

NOTICE

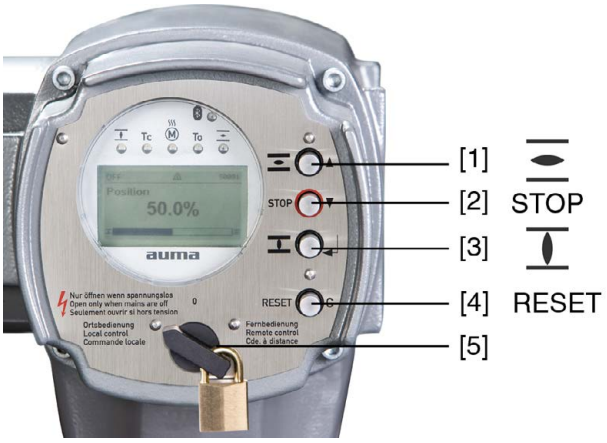
Valve damage due to incorrect basic setting!

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

6.2.1. Local actuator operation

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

Figure 49: Local controls



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

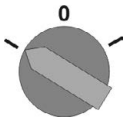
CAUTION

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

Danger of burns

→ 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

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 Manual (Operation and setting).

6.2.2. Actuator operation from remote

CAUTION

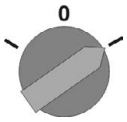
Risk of immediate actuator operation when switching on!

Risk of personal injuries or damage to the valve

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

→ Check input signals and functions.

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

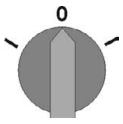


➥ Actuator control from Remote can be made either via the analogue setpoint indication (4 – 20 mA) or via digital HART commands.

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

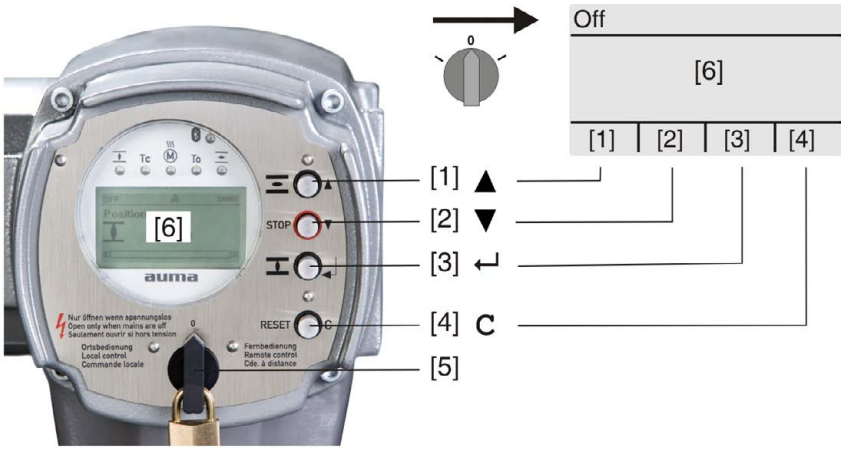
Menu navigation for display and setting is made via the push buttons [1 – 4] of the local controls.

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



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

Figure 50:



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

Table 25: 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

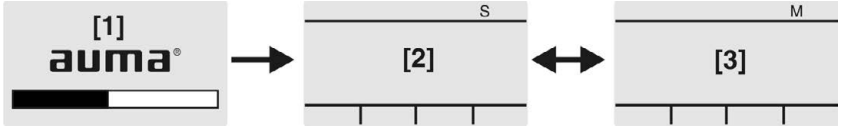
Backlight

- 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.

6.3.1. Menu layout and navigation

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

Figure 51: Groups



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

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

Figure 52: Marking with ID

S ID starts with S = status menu

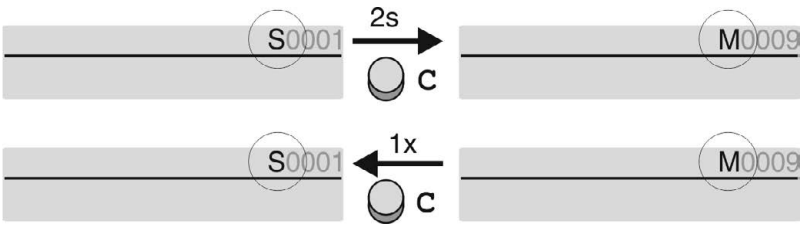
M ID starts with M = main menu

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 53: Select menu groups



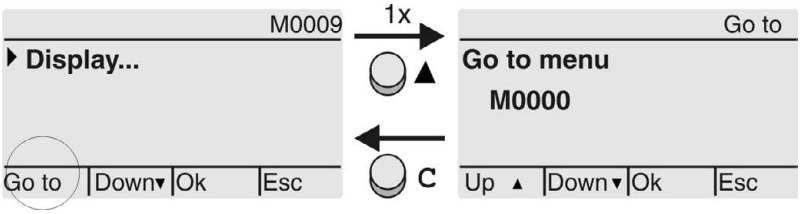
You return to the status menu if:

- 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 54: Direct display (example)



Display indicates in the bottom row: Go to

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

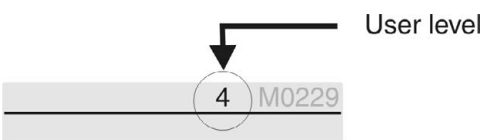
6.4. User level, password

User level

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

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

Figure 55: 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 26:

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

6.4.1. Password entry

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

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

2. 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.

6.4.2. Password change

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

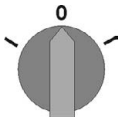
Example: If the user is signed in as Specialist (4), he/she can change passwords as for password levels (1) through (4).

M ▷ Device configuration M0053
Service functions M0222
Change passwords M0229

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

Select main menu

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

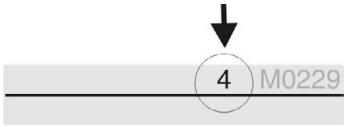


2. Press push button **C** Setup and hold it down for approx. 3 seconds.

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

Change passwords

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



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

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

6.5. Language in the display

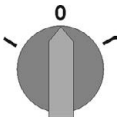
The AUMATIC actuator controls display is multilingual.

6.5.1. Language change

M ▷ Display... M0009
Language M0049

Select main menu

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



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

Change language

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

9. Enter password (→ enter password).

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

Language selection

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

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

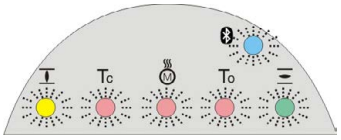
7. Indications

7.1. Indications during commissioning

LED test

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

Figure 56: LED test



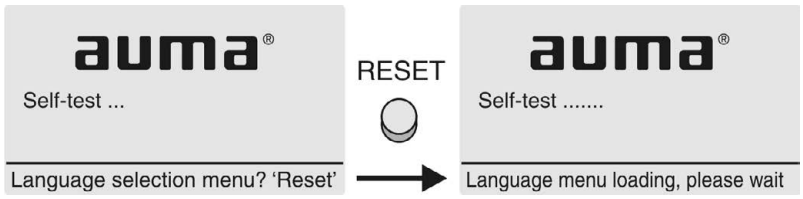
Language selection

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

Figure 57: Self-test

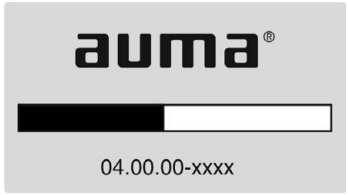


The language selection menu follows the startup menu.

Startup menu

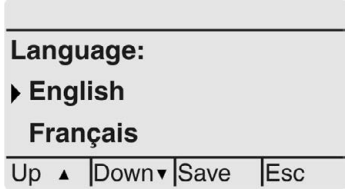
The current firmware version is displayed during the startup procedure:

Figure 58: Startup menu with firmware version: 04.00.00–xxxx



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

Figure 59: Language selection



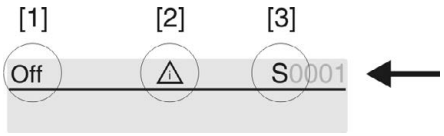
If no entry is made over a longer period of time (approx. 1 minute), the display automatically returns to the first status indication.

7.2. Indications in the display

Status bar

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

Figure 60: 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 61: Navigation support (bottom)

[1] shows list with detailed indications

[2] shows further available information

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

7.2.1. Feedback indications from actuator and valve

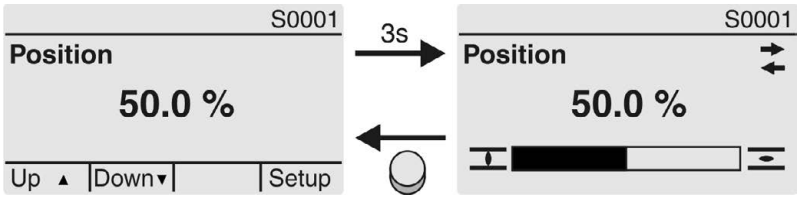
Display indications depend on the actuator version.

Valve position (S0001)

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

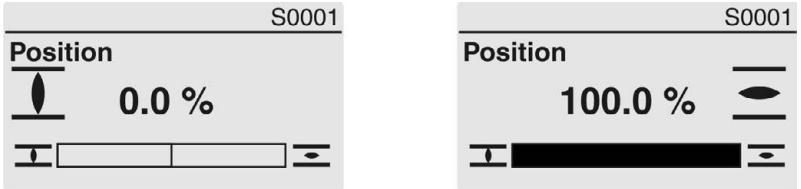
- S0001 on the display indicates the valve position in % of the travel.
- The bar graph display appears after approx. 3 seconds.
- When issuing an operation command, an arrow indicates the direction (OPEN/CLOSE).

Figure 62: Valve position and direction of operation



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

Figure 63: End position CLOSED/OPEN reached



0% Actuator is in end position CLOSED

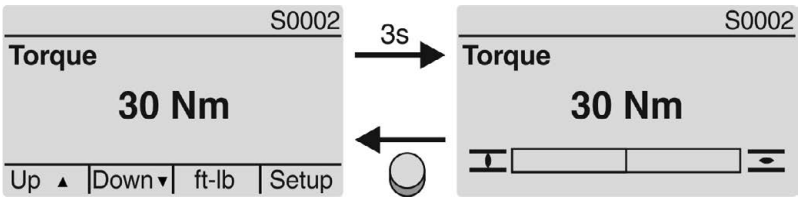
100% Actuator is in end position OPEN

Torque (S0002)

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

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

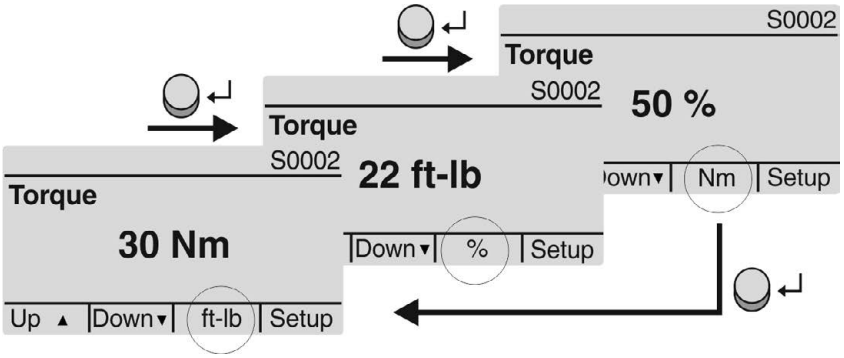
Figure 64: Torque



Select unit

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

Figure 65: Units of torque



Display in percent

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

Example: SA 07.6 with 20 – 60 Nm.

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

Operation commands (S0003)

The display S0003 indicates:

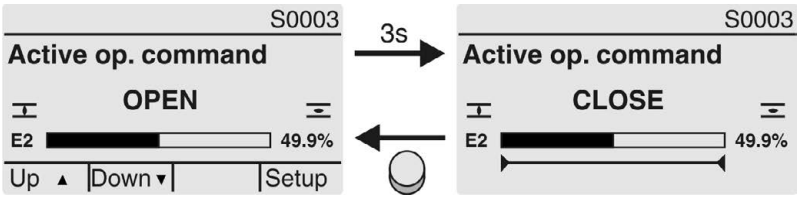
- active operation commands, like e.g.: Operation in direction CLOSE or in direction OPEN
- the actual value E2 as bar graph indication and as value between 0 and 100 %.
- for setpoint control (positioner): setpoint E1
- for stepping mode or for intermediate positions with operation profile: pivot points 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 66: Display for OPEN - CLOSE control



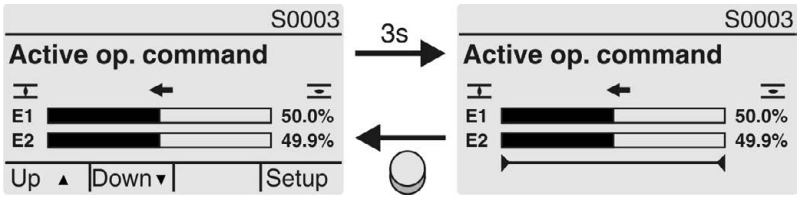
E2 Actual position value

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 67: 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 68: Examples: on the left pivot points (intermediate positions); on the right stepping mode

Table 27: 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

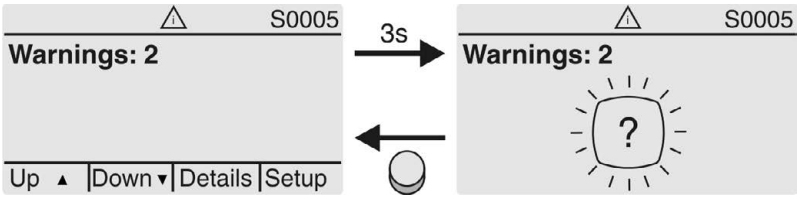
These indications are available if the parameter Diagnostic classific. M0539 is set to AUMA.

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 69: Warnings



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

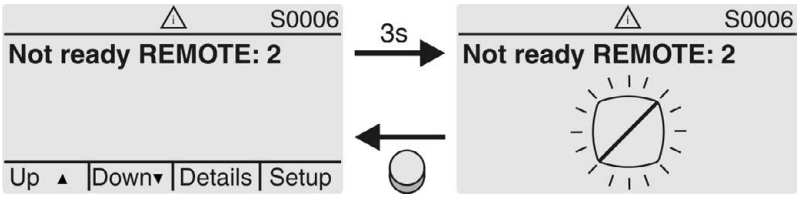
Not ready REMOTE (S0006)

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 70: Not ready REMOTE indications



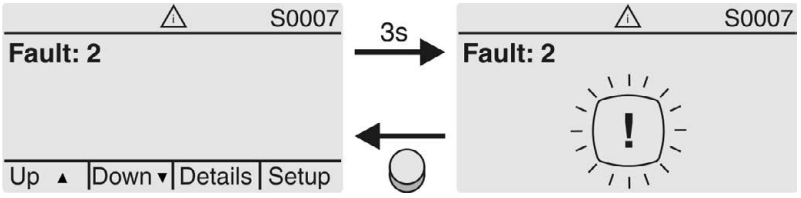
For further information, please also refer to <Corrective action>.

Fault (S0007)

If a fault has occurred, the display shows S0007:

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

Figure 71: 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.

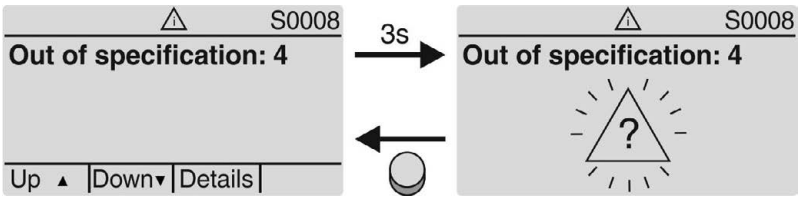
Out of Specification (S0008)

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 72: Out of specification



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

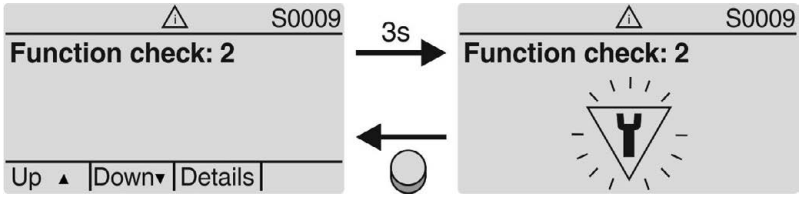
Function check (S0009)

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 73: Function check



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

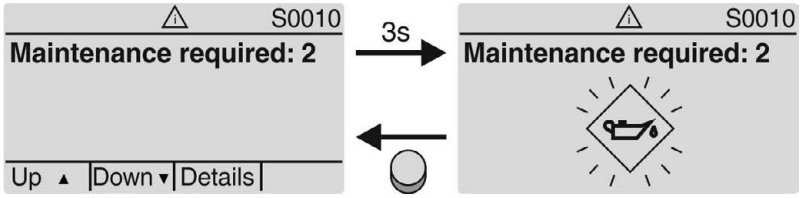
Maintenance required (S0010)

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 74: Maintenance required



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

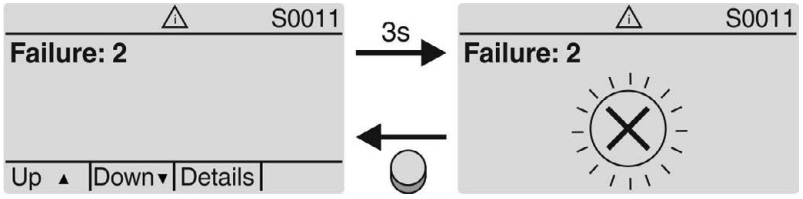
Failure (S0011)

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

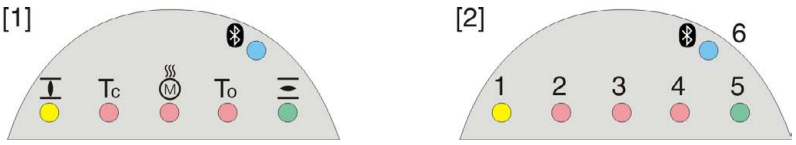
Figure 75: Failure



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

7.3. Indication lights of local controls

Figure 76: 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

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).

7.4. Optional indications

7.4.1. Mechanical position indication via indicator mark

Figure 77: Mechanical position indicator

[1] End position OPEN reached
[2] End position CLOSED reached
[3] Indicator mark at cover

Characteristics

- Independent of power supply
- Used as running indication: Indicator disc rotates during actuator operation and continuously indicates the valve position
  (For “clockwise closing version”, the symbols ⏤/⏥ rotate in counterclockwise direction for operation in direction CLOSE)
- Indicates that end positions (OPEN/CLOSED) have been reached
  (Symbols ⏤ (OPEN)/ ⏥ (CLOSED) point to the indicator mark ▲ at cover)

8. Signals (output signals)

8.1. Signals via HART

HART offers different feedback signals. Configuration is possible for both data structure and data contents.

For details regarding feedback signals via HART interface, please refer to the Manual (Device integration) HART.

8.2. Status signals via output contacts (digital outputs)

Characteristics

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

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

8.2.1. 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 the following conditions are met:

- Actuator controls are equipped with additional control inputs.
- The actuator is equipped with a position transmitter (potentiometer, RWG or EWG).

Valve position

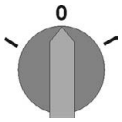
Signal: E2 = 0/4 – 20 mA (galvanically isolated)

Designation in the wiring diagram: AOUT1 (position)

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

9. Commissioning (basic settings)

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



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

2. Switch on the power supply.
   Information: 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 must suit the valve.

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

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

Default value: Limit

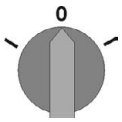
Setting values:

Limit — Seating in end positions via limit switching.

Torque — Seating in end positions via torque switching.

Select main menu

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



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

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

Select parameter

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

➥ Display indicates: End position CLOSED

CLOSE or OPEN

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

➥ The black triangle ▸ indicates the current selection.

5. Press ↵ Ok.

➥ Display indicates the current setting: Limit or Torque

➥ The bottom row of the display indicates either:

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

6. Press ↵ Edit.

➥ Display indicates: ▸ Specialist (4)

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. HART address (slave address): set

HART address adaptation is only required for multidrop operation. Without multidrop operation, address 0 must be set.

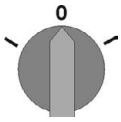
M ▷ Customer settings M0041
HART M1238
Address M1253

Default value: 0

Setting range: 0 – 63

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...

Set HART address

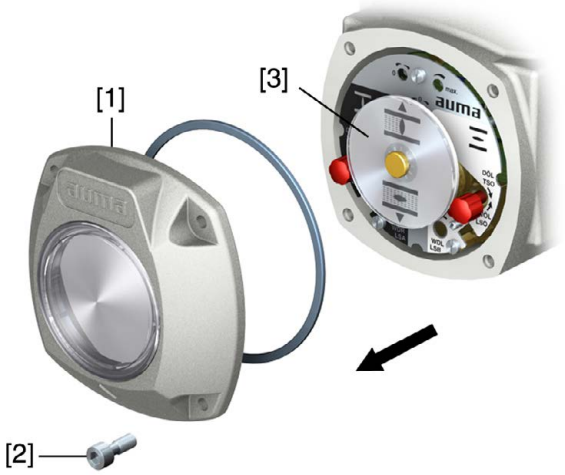
3. Select parameter either:
   → M ▷ (by clicking through the menu)
   → or press ▲ and enter ID M0098 (direct selection)
   ➥ Display indicates: Address
4. Press ↵ Ok.
   ➥ Display shows the set address.
5. The bottom row of the display indicates:
   → Edit→ continue with step 6
   → Up ▲ Down ▼ → continue with step 10
6. Press ↵ Edit.
   ➥ Display indicates: Observer (1)
7. Select access level via ▲▼ Up ▲ Down ▼ resulting in the following significations:
   → black triangle: ▸ = current setting
   → white triangle: ▹ = selection (not yet saved)
   Information: Required access level: Specialist (4) or higher

8. Press ↵ Ok.
➥ Display indicates: Password 0***
9. Enter password (→ enter password).
➥ Display shows the set address.
10. Enter new address via ▲▼ Up ▲ Down ▼.
Information: The address range is displayed in round brackets on the screen.
11. Confirm selection via ↵ Save.
➥ The HART address setting is complete.

9.3. Switch compartment: open

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

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



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

9.4. Torque switching: set

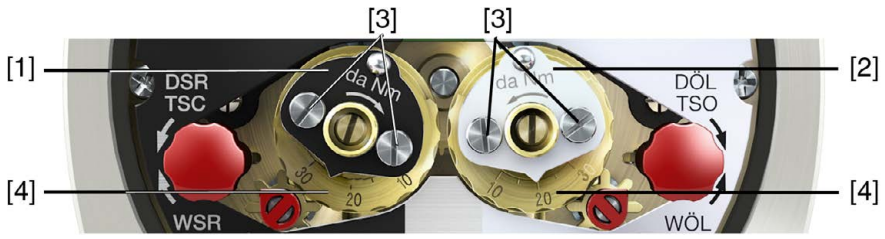
Once the set torque is reached, the torque switches will be tripped (overload protection of the valve).

Information The torque switches may also trip during manual operation.

NOTICE

Valve damage due to excessive tripping torque limit setting!
→ The tripping torque must suit the valve.
→ Only change the setting with the consent of the valve manufacturer.

Figure 78: Torque measuring heads



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

1. Loosen both lock screws [3] at the indicator disc.
2. Turn torque dial [4] to set the required torque (1 da Nm = 10 Nm). Example:

- Black torque switching head set to approx. 25 da Nm ≙ 250 Nm for direction CLOSE
- White torque switching head set to approx. 20 da Nm ≙ 200 Nm for direction OPEN

3. Fasten lock screws [3] again.
   Information: Maximum tightening torque: 0.3 – 0.4 Nm

➥ The torque switch setting is complete.

9.5. Limit switching: set

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

Figure 79: Setting elements for limit switching

Black section:
[1] Setting spindle: End position CLOSED
[2] Pointer: End position CLOSED
[3] Mark: End position CLOSED is set
White section:
[4] Setting spindle: End position OPEN
[5] Pointer: End position OPEN
[6] Mark: End position OPEN is set

9.5.1. End position CLOSED (black section): set

1. Engage manual operation.
2. Turn handwheel clockwise until valve is closed.

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

➥ The end position CLOSED setting is complete.

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

9.5.2. End position OPEN (white section): set

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

➥ The end position OPEN setting is complete.

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

9.6. Intermediate positions: set

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

Figure 80: Setting elements for limit switching

Black section:

[1] Setting spindle: Running direction CLOSE

[2] Pointer: Running direction CLOSE

[3] Mark: Intermediate position CLOSED is set

White section:

[4] Setting spindle: Running direction OPEN

[5] Pointer: Running direction OPEN

[6] Mark: Intermediate position OPEN is set

Information After 177 turns (control unit for 2 – 500 turns/stroke) or 1,769 turns (control unit for 2 – 5,000 turns/stroke), the intermediate switches release the contact.

9.6.1. Running direction CLOSE (black section): set

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

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

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

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

9.6.2. Running direction OPEN (white section): set

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

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

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

9.7. Test run

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

The direction of rotation can be checked at the position indicator if available. (Chapter <Direction of rotation at mechanical position indicator: check>)

The direction of rotation must be checked at the hollow shaft/stem if no mechanical position indicator is available. (Chapter <Direction of rotation at hollow shaft/stem: check>)

9.7.1. Direction of rotation at mechanical position indicator: 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.

Information Switch off before reaching the end position.

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

2. Switch on actuator in direction CLOSE and observe the direction of rotation on the mechanical position indication:
   → **For mechanical position indication via indicator mark:** (not self-adjusting)
   ➥ The direction of rotation is correct if the actuator operation in direction **CLOSE** and the symbols (⊼/⊻) turn **counterclockwise**:

   Figure 81: Direction of rotation ⊼/⊻ (for “clockwise closing version”)

9.7.2. Direction of rotation at hollow shaft/stem: 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.

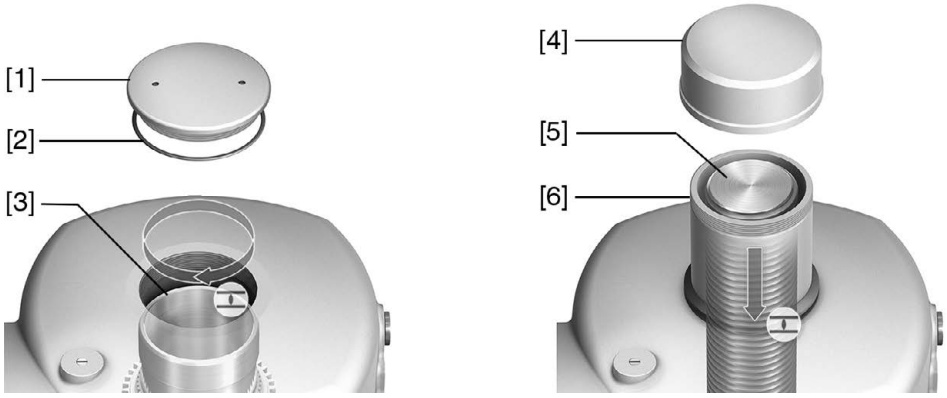
Information Switch off before reaching the end position.

1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Unscrew threaded plug [1] and seal [2] or protective cap for stem protection tube [4].

3. Switch on actuator in direction CLOSE and observe direction of rotation at hollow shaft [3] or stem [5]:

➥ The direction of rotation is correct if the actuator moves in direction **CLOSE** and the hollow shaft in **clockwise** direction, or the stem moves downward.

Figure 82: Hollow shaft/stem movement (for “clockwise closing”)

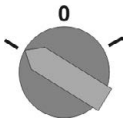


[1] Threaded plug
[2] Seal
[3] Hollow shaft
[4] Protective cap for stem protection tube
[5] Stem
[6] Stem protection tube

4. Correctly fit/screw on threaded plug [1] and seal [2] or protective cap for stem protection tube [4], fasten thread.

9.7.3. Limit switching: check

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



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

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

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

➥ The limit switching is set incorrectly if:

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

3. If the end position setting is incorrect: Reset limit switching.

9.7.4. Reference operation position feedback: perform

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

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

10. Commissioning (optional equipment settings)

10.1. EWG 01.1 electronic position transmitter

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

Technical data

Table 28: EWG 01.1

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

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

Setting elements

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

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

Figure 83: View on control unit when switch compartment is open

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

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

Table 29:

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

10.1.1. Measuring range: set

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

For output current verification, connect a test device for 0 – 20 mA to measurement points (+/–) (for 2-wire systems, connecting a test device is imperatively required).

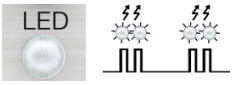
Information

- Both measuring ranges 0/4 – 20 mA and 20 – 0/4 mA (inverse operation) can be set.
  During setting process, the measuring range (normal or inverse operation) is assigned to the end positions by push button S1/S2 assignment.
- For 2-wire systems, switch off <LED end position signalling> prior to setting the measuring range.
- Setting mode activation clears the settings in both end positions and sets the output current to a value of 3.5 mA. After activation, both end values (0/4 mA and 20 mA) need to be reset.
- In case of inadvertent incorrect adjustment, the settings can always be reset by renewed activation of the setting mode (simultaneous pressing of [S1] and [S2]).

Activate setting mode

1. Press both push buttons [S1] and [S2] and hold down for 5 seconds:

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



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

Set measuring range

2. Operate valve in one of the end positions (OPEN/CLOSED).
3. Set desired output current (0/4 mA or 20 mA):
   → for **4 mA**: Hold down push button [S1] for approx. 3 seconds, until **LED is blinking slowly**.
   → for **0 mA**: Hold down push button [S1] for approx. 6 seconds, until **LED is blinking fast**.
   → for **20 mA**: Hold down push button [S2] for approx. 3 seconds, until **LED is illuminated**.

   Information: For 2-wire systems read current values at test device.
4. Operate valve into opposite end position.

➥ The value set in end position (0/4 mA or 20 mA) does not change during travel in setting mode.

5. Perform setting in the second end position following the same steps.
6. Approach both end positions again to check the setting.
   → If the measuring range cannot be set:
   Refer to <Faults during commissioning>.
   → If the current values (0/4/20 mA) are incorrect:
   Refer to <Current values: adjust>.
   → If the current value fluctuates (e.g. Between 4.0 – 4.2 mA):
   Switch off LED end position signalling.
   Refer to <LED end position signalling: switch on/off>.

10.1.2. Current values : adjust

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

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

→ Operate valve in desired end position (OPEN/CLOSED).

→ Reduce current value: Press push button [S1]
(the current is reduced by 0.02 mA every time the push button is pressed)

→ Increase current value: Press push button [S2]
(the current is increased by 0.02 mA every time the push button is pressed)

10.1.3. LED end position signalling: switch on/off

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

Switching on and off

1. Operate valve in one of the end positions (OPEN/CLOSED).
2. Hold down push buttons [S1] or [S2] for approx. 3 seconds.

➥ End position signalling is switched on or off.

Table 30:

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

10.2. Potentiometer

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

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

Setting is made via potentiometer [1].

Figure 84: View on control unit

[1] Potentiometer

10.2.1. Potentiometer: set

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

1. Move valve to end position CLOSED.

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

10.3. RWG electronic position transmitter

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

Technical data

Table 31: RWG 4020

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

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

Setting elements

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

Setting is made via three potentiometers [1], [2] and [3].

Figure 85: View on control unit when switch compartment is open

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

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

10.3.1. Measuring range: set

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

1. Move valve to end position CLOSED.

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

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

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

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

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

10.4. Mechanical position indicator: set

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

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

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

   If the symbol ⊥ (CLOSED) is no longer in alignment with ▲ mark on the cover:

   7.1 Repeat setting procedure.

   7.2 Check whether the appropriate reduction gearing has been selected, if required.

10.5. Switch compartment: close

✔ If options (e.g. potentiometer, position transmitter) are available: Only close switch compartment once all optional equipment has been successfully set.

NOTICE

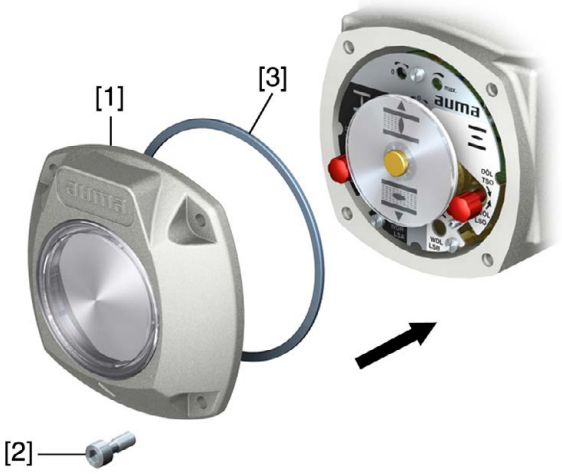
Danger of corrosion due to damage to paint finish!

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

1. Clean sealing faces of housing and cover.
2. Check whether O-ring [3] is in good condition, replace if damaged.

3. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.

   Figure 86:



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

11. Corrective action

11.1. Faults during commissioning

Table 32:

Faults during operation/commissioning		
Fault	Description/cause	Remedy
Mechanical position indicator cannot be set.	Reduction gearing is not suitable for turns/stroke of the actuator.	Set gear stage of the reduction gearing.
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 handwheel back by the amount of the overrun)
Measuring range 0/4 – 20 mA or maximum value 20 mA at position transmitter cannot be set or supplies an incorrect value.	Reduction gearing is not suitable for turns/stroke of the actuator.	Set gear stage of the reduction gearing.
The measuring range 0/4 – 20 mA at EWG position transmitter cannot be set.	The LED on the EWG either flashes in setting mode a) single flash or b) triple flash:  a) EWG is not calibrated. b) Magnet positions of EWG are not aligned.	Call service.
Limit and/or torque switches do not trip.	Switch is defective or switch setting is incorrect.	Check setting, if required, reset end positions. Refer to <Check switches> and replace the switches if required.
Handwheel rotates on the shaft without transmitting torque.	Actuator in version with overload protection for manual operation: Shear pin rupture due to excessive torque at handwheel.	Dismount handwheel. Replace overload protection and remount handwheel.

Switch check

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

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

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

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

11.2. Fault indications and warning indications

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

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

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

Table 33:

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 34:

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
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.

Warnings and Out of specification		
Indication on display	Description/cause	Remedy
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.	
FQM fail safe fault[2)]	FQM fault	Checking and fault remedy are required. Refer to FQM operation instructions.

1) For actuators controls in SIL version
2) For actuators with fail safe unit

Table 35:

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.

Faults and Failure		
Indication on display	Description/cause	Remedy
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 voltage 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.
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 36:

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	An interlock is active.	Check interlock signal.
Interlock by-pass	By-pass function is interlocked.	Check states of main and by-pass valve.
PVST active	Partial Valve Stroke Test (PVST) is active.	Wait until PVST function is complete.
SIL function active[1)]	SIL function is active	

1) For actuators controls in SIL version

11.3. Fuses

11.3.1. Fuses within the actuator controls

F1/F2

Table 37:

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 38:

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 39:

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)

11.3.2. Fuse replacement

11.3.2.1. Replace fuses F1/F2

DANGER

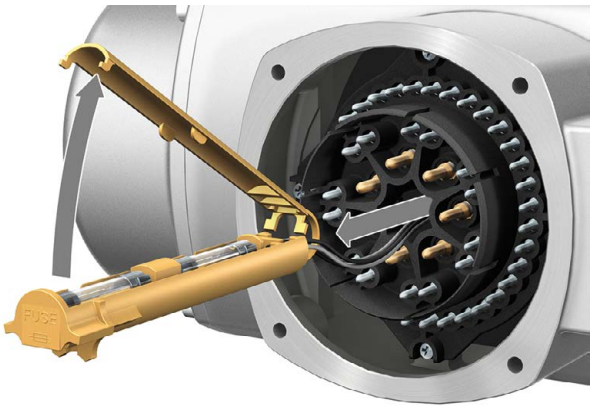
Hazardous voltage!

Risk of electric shock.

→ Disconnect device from the mains before opening.

1. Remove electrical connection from actuator controls.
   → Refer to <Disconnection from the mains> chapter.

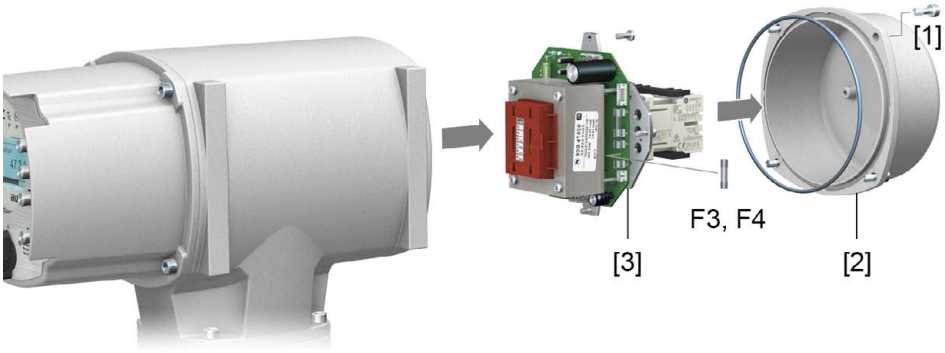
Figure 87:



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

11.3.2.2. Test/replace fuses F3/F4

1. Loosen screws [1] and remove cover [2] on the rear of the actuator controls.
   Figure 88:



Check fuses.

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

Table 40:

Checking	Measuring points
F3	MTP5 – MTP6
F4	MTP7 – MTP8

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

NOTICE

Cable damage due to pinching!

Risk of functional failures.

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

11.3.3. 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 indication S0007 or S0011 Failuredisplays 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 the fault signal has to be reset using **RESET** push button with selector switch position **Local operation** (LOCAL).

12. 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

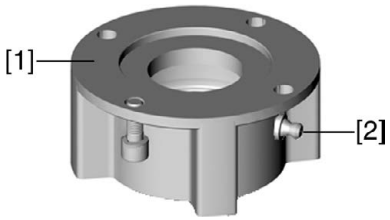
AUMA offers extensive service such as servicing and maintenance as well as customer product training. For the relevant contact addresses, please refer to <Addresses> in this document or to the Internet (www.auma.com)

12.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

6 months after commissioning and then once a year

- Carry out visual inspection:
  Check threaded plugs, cable entries, cable glands, blanking plugs, etc. 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.
- For devices with output drive type A: Press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with a grease gun.
  Figure 89: Output drive type A



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

- Lubrication of the valve stem must be done separately.
  Exception: For output drive type A in version with stem lubrication (option), the stem is lubricated together with the output drive.

Table 41:

Grease quantities for bearing of output drive type A					
Output drive type	A 25.2	A 30.2	A 35.2	A 40.2	A 48.2
Quantity [g] 1)	30	40	50	60	150

1) For grease with density r = 0.9 kg/dm³

For enclosure protection IP68

After submersion:

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

12.2. Maintenance

Lubrication

- In the factory, the gear housing is filled with grease.
- Grease change is performed during maintenance
  - Generally after 4 to 6 years for modulating duty.
  - Generally after 6 to 8 years if operated frequently (open-close duty).
  - Generally after 10 to 12 years if operated infrequently (open-close duty).
- We recommend replacing the seals when changing the grease.
- Additional lubrication of the gear housing is not required during operation.

12.3. 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
- plastics
- greases and oils

The following generally applies:

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

13. Technical data

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

13.1. Technical data 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 S5 - 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-phase asynchronous motor type IM B9 according to IEC 60034-7, IC410 cooling procedure 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 %	
Overvoltage category	Category III according to IEC 60364-4-443	
Insulation class	Standard:	F, tropicalized
	Option:	H, tropicalized
Motor protection	Standard:	Thermoswitches (NC)
	Option:	PTC thermistors (according to DIN 44082) PTC thermistors additionally require a suitable tripping device in the actuator controls.
Self-locking	Self-locking: Speeds up to 90 rpm (50 Hz) or 108 rpm (60 Hz) and from size SA 35.1 for output speeds up to 22 rpm (50 Hz) or 26 (60 Hz) NOT self-locking: SA 25.1 and SA 30.1 for output speeds from 125 rpm (50Hz) or 150 rpm (60Hz) and from size SA 35.1 for output speeds from 32 rpm (50Hz) or 38 (60Hz). 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	
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation	
	Option:	Handwheel lockable Handwheel stem extension Power tool for emergency operation with square 30 mm or 50 mm
Valve attachment	Standard:	B1 according to EN ISO 5210
	Options:	A, B2, B3, B4, C, D nach EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338
	Special valve attachments: AF, AK, AG, B3D, ED, DD (IB1 or IB3 for size 25.1 only, largest sizes on request) A prepared for permanent lubrication of stem	

Electromechanical control unit		
Limit switching	Counter gear mechanism for end positions OPEN and CLOSED Turns per stroke: 2 to 500 (standard) or 2 to 5,000 (option)	
	Standard:	Single switch (1 NC and 1 NO) for each end position, not galvanically isolated
	Options:	Tandem switch (2 NC and 2 NO) for each end position, switches galvanically isolated Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switches (DUO limit switching), adjustable for each direction of operation
Torque switching	Torque switching adjustable for directions OPEN and CLOSE	
	Standard:	Single switch (1 NC and 1 NO) for each direction, not galvanically isolated
	Option:	Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated
Switch contact materials	Standard:	Silver (Ag)
	Option:	Gold (Au), recommended for low voltage actuator controls
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA (electronic position transmitter)	
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED	
Running indication	Blinker transmitter (optional for modulating actuators)	
Heater in switch compartment	Standard:	Self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC
	Options:	24 – 48 V AC/DC (for actuators with 3-phase AC/1-phase AC/DC motors) or 380 – 400 V AC (for actuators with 3-phase AC motors)
	A resistance type heater of 5 W, 24 V AC is installed in the actuator in combination with AM or AC actuator controls.	

Service conditions		
Use	Indoor and outdoor use permissible	
Mounting position	Any position	
Installation altitude	≤ 2,000 m above sea level > 2,000 m above sea level on request	
Ambient temperature	Refer to actuator name plate	
Humidity	Up to 100 % relative humidity across the entire permissible temperature range	
Enclosure protection according to EN 60529	Standard:	IP67 with AUMA 3-phase AC motor For special motors, differing enclosure protection is possible
	Option:	• IP68 with AUMA 3-phase AC motor • DS terminal compartment additionally sealed against interior of actuator (double sealed)
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 8 m head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during continuous immersion • Modulating duty is not possible during continuous immersion.	
	For exact version, refer to actuator 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	2 g, from 10 to 200 Hz (for actuators in AUMA NORM version) 1 g, von 10 bis 200 Hz (for actuators with AM or AC integral controls) Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Indiations apply to actuators with AUMA 3-phase AC motor and AUMA plug/socket connector. They are not valid in combination with gearboxes.	
Corrosion protection	Standard:	KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
		KX-G : same as KX, however aluminium-free version (outer parts)
Coating	Double layer powder coating Two-component iron-mica combination	

Service conditions		
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.	

Further information	
EU Directives	Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)

Technical data for limit and torque switches		
Mechanical lifetime	2×10^6 starts	
Silver plated contacts:		
U min.	30 V AC/DC	
U max.	250 V AC/DC	
I min.	20 mA	
Rated voltage/current	AC-15:	5 A at 250 V AC
	DC-13:	0.15 A at 250 V DC
Gold plated contacts		
U min.	5 V	
U max.	30 V	
I min.	4 mA	
I max.	400 mA	

Technical data for blinker transmitter	
Mechanical life-time	10^7 starts
Silver plated contacts:	
U min.	10 V AC/DC
U max.	250 V AC/DC
I max. AC current	5 A at 250 V (resistive load) 5 A at 250 V (inductive load, cos phi ≈ 0.8)
I max. DC current	0.25 A at 250 V (resistive load)

13.2. 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 % (optional) 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 External power supply must have reinforced insulation against mains voltage in accordance with IEC 61010-1 and may only be supplied by a circuit limited to 150 VA in accordance with IEC 61010-1.	
Current consumption	Current consumption of the 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 to 690 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	
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 HART interface Device category: Actuator Analogue 4 – 20 mA setpoint with digital HART communication Device category: Current Output Analogue 4 – 20 mA position feedback signal with digital HART communication	
HART interface with additional input signals (option)	Device category: “Actuator”: • Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, (via opto-isolator thereof OPEN, STOP, CLOSE with one common and EMERGENCY, I/O interface respectively without common) - OPEN, STOP, CLOSE, EMERGENCY control inputs - I/O interface: Selection of control type (HART or additional input signals) Device category: “Current Output”: • 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 (HART or additional input signals) - MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint)	
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 HART interface	

Features and functions		
HART interface with additional output signals (option)	Additional, binary output signals (only available in combination with additional input signals (option) • 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. In combination with device category: “Actuator”: • Analogue output signal for position feedback - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)	
Voltage output	Standard:	Auxiliary voltage 24 V DC: max. 100 mA for supply of control inputs, galvanically isolated from internal voltage supply.
	Option:	Auxiliary voltage 115 V AC: max. 30 mA for supply of control inputs, galvanically isolated from internal voltage supply (Not possible in combination with PTC tripping device)
Analogue output (option)	2 analogue outputs: With position transmitter option: Output of travel and torque as continuous values between 0/4 and 20 mA	
Analogue input (option)	2 analogue inputs: With positioner/process controller option: Input of actual position value/actual process value as continuous values between 0/4 and 20 mA	
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 SPP Bluetooth profile (Serial Port Profile). Required accessories: • AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) • AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)	

Features and functions		
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 HART 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 HART 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) - Digital input: Low active (option) - 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:	• 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 HART 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
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 indication • Monitoring the heater within actuator: generates warning signal • Monitoring of permissible on-time and number of starts: adjustable, generates warning signal • Operation time monitoring: adjustable, generates warning signal • Phase failure monitoring: results in switching off and generates fault signal • Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current)	
Diagnostic functions	• Electronic device ID with order and product data • Logging of operating data: A resettable counter and a lifetime counter each for:: - Motor running time, number of starts, torque switch trippings in end 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.	

Features and functions		
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
AC 01.2 heating system (option)	Temperature versions below –30 °C incl. heating system for connection to external power supply 230 V AC or 115 V AC or internal version 400 V AC	
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 • Terminals or crimp-type connection
Wiring diagram	Refer to name plate	

Setting/programming the HART interface	
Setting the HART address	The HART address is set via HART command 6 or alternatively via the actuator controls (default value: 0)

General HART interface data	
Communication protocol	HART according to IEC 61158 and IEC 61784 (CPF 9)
Network topology	Point-to-point wiring
Communication signal	HART, baud rate 1.2 kbit/s Device class: "Actuator" • FSK (Frequency Shift Key) modulated to 4 – 20 mA setpoint signal • Input impedance: 250 Ω. The impedances of other HART devices connected (parallel or in series) must be within the HART specification • Point-to-point wiring • Signal range: 4 – 20 mA • Working range: 2 – 22 mA • Minimum operation voltage: 7 V (at 22 mA) • Integrated reverse polarity protection Device category: “Current Output”: • FSK (Frequency Shift Key) modulated to 4 – 20 mA position feedback signal • Input impedance: 40 kΩ. The impedances of other HART devices connected (parallel or in series) must be within the HART specification • Point-to-point or multidrop wiring • Current output active, short-circuit proof. No further external power supply permitted
HART cable specification	Refer to HART specification
Power supply	Internal power supply of HART interface via actuator controls (apart from HART supply voltage, no other supply required)
Device identification	Manufacturer name: AUMA Manufacturer ID: 0x607C HART protocol revision: 7.4 Number of device variables: 12 Model name: AUMATIC AC 01.2/ACExC 01.2 Device type code: 0xE1FD
Supported HART commands	• Universal Commands • Common Practice Commands: - Command 33 (Read Device Variables) - Command 40 (Enter/Exit Fixed Current Mode) - Command 42 (Perform Device Reset) - Command 45 (Trim Loop Current Zero) - Command 46 (Trim Loop Current Gain) - Command 50 (Read Dynamic Variable Assignments) - Command 79 (Write Device Variable) - Command 95 (Read Device Communication Statistics) • Device Specific Commands: - Command 128 (Write Operation Command) - Command 131 (Read Software Version) - Command 132 (Reset to Factory Default) - Command 133 (Reset Operational Data) - Command 134 (Reset HART Configuration) - Command 160 (Read Parameter) - Command 161 (Write Parameter) - Command 162 (Read Process Data)

Commands and signals of the HART interface	
Output data	Device class: "Actuator" Supported control types: • Loop Current Mode activated: Analogue 4 – 20 mA control signal for position setpoint • Loop Current Mode deactivated: Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE Device category: “Current Output”: • Loop Current Mode activated: Analogue 4 – 20 mA output signal for position feedback signal (point-to-point wiring) Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE • Loop Current Mode deactivated: Analogue output signal for position feedback fixed to 4 mA (multidrop wiring) Digital HART commands for position setpoint (0 – 100.0 %) or for discrete operation in directions OPEN and CLOSE
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 Device Status Informationen • Field Device Status • Device Specific Status • Extended Device Status Information • Standardized Status • Analog Channel Saturated • Analog Channel Fixed
Fehlermeldungen	Motor protection tripped Torque switch tripped in mid-travel One phase missing Failure of analogue customer inputs

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	
Enclosure protection according to EN 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 • Duration of continuous immersion in water: Maximum 96 hours • Up to 10 operations during continuous immersion • Modulating duty is not possible during continuous immersion. For 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	1 g, from 10 Hz to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. (Not valid in combination with gearboxes)	

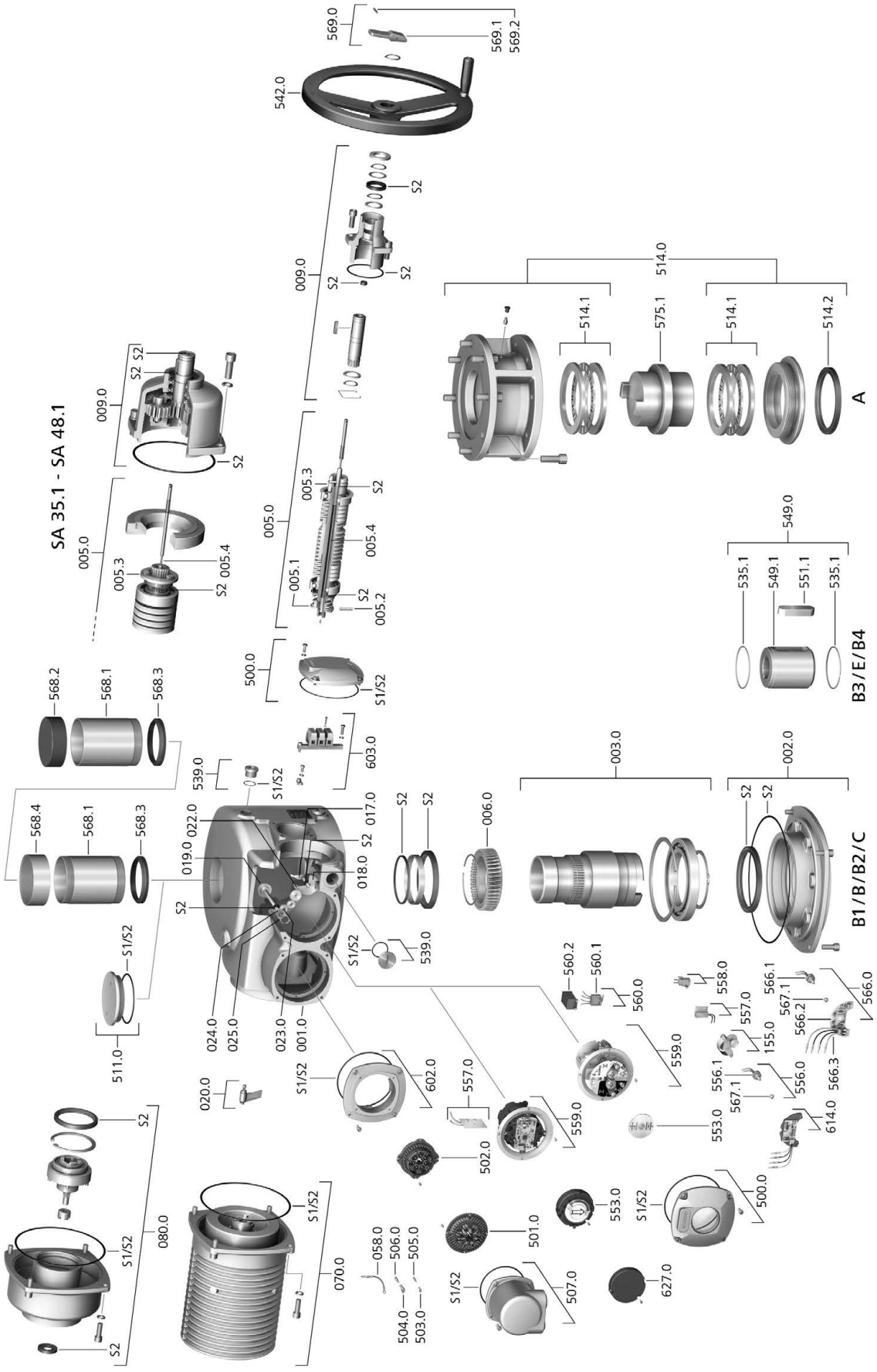
Service conditions		
Corrosion protection	Standard:	KS: Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.
	Option:	KX: Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.
Coating	Double layer powder coating Two-component iron-mica combination	
Colour	Standard:	AUMA silver-grey (similar to RAL 7037)
	Option:	Available colours on request

Accessories	
Wall bracket	For actuator controls mounted separately from the actuator, including plug/socket connector. Connecting cable on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service. Cable length between actuator and actuator controls is max. 100 m (not suitable for version with potentiometer in the actuator). Instead of the potentiometer, an MWG has to be used. (MWG requires separate data cable.)
Programming software	AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC) AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)
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	Electromagnetic Compatibility (EMC): (2014/30/EU) Low Voltage Directive: (2014/35/EU) Machinery Directive: (2006/42/EC)

14. Spare parts

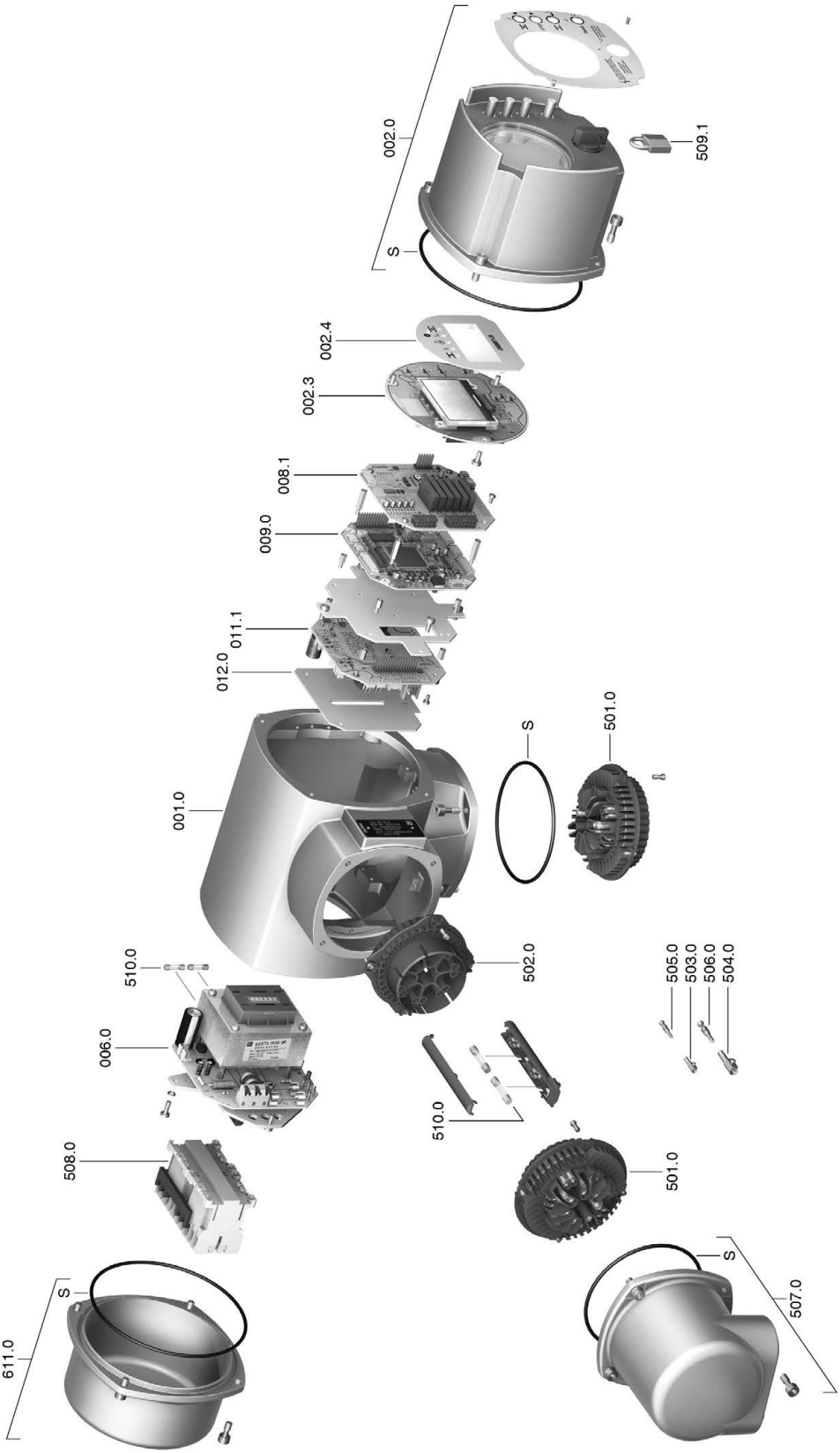
14.1. Multi-turn actuators SA 25.1 – SA 48.1/SAR 25.1 – SAR 30.1



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	542.0	Handwheel with ball handle	Sub-assembly
002.0	Bearing flange	Sub-assembly	549.0	Output drive type B3/E/B4	Sub-assembly
003.0	Hollow shaft	Sub-assembly	549.1	Output drive sleeve B3/E/B4	Sub-assembly
005.0	Drive shaft		551.1	Parallel key	
005.1	Motor coupling		553.0	Mechanical position indicator	
005.2	Coupling pin	Sub-assembly	556.0	Potentiometer as position transmitter	Sub-assembly
005.3	Manual drive coupling		556.1	Potentiometer without slip clutch	Sub-assembly
005.4	Pull rope	Sub-assembly	557.0	Heater	
006.0	Worm wheel		558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
009.0	Manual gearing	Sub-assembly	559.0–1	Electromechanical control unit with switches, including torque switching heads	Sub-assembly
017.0	Torque lever	Sub-assembly	559.0–2	Electronic control unit with magnetic limit and torque transmitter (MWG)	Sub-assembly
018.0	Antriebsrad Drehmomentschaltung		560.0–1	Switch stack for direction OPEN	Sub-assembly
019.0	Crown wheel		560.0-2	Switch stack for direction CLOSE	Sub-assembly
020.0	Swing lever		560.1	Switch for limit/torque	Sub-assembly
022.0	Drive pinion II for torque switching		560.2–1	Switch case for direction OPEN	
023.0	Output drive wheel for limit switching	Sub-assembly	560.2-2	Switch case for direction CLOSE	
024.0	Drive wheel for limit switching	Sub-assembly	566.0	RWG position transmitter	Sub-assembly
025.0	Locking plate	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	
058.0	Cable for protective earth	Sub-assembly	566.2	Position transmitter board for RWG	Sub-assembly
070.0	Motor	Sub-assembly	566.3	Cable set for RWG	Sub-assembly
080.0	Planetary gearing for motor drive (for A... motor)	Sub-assembly	567.1	Slip clutch for potentiometer	
155.0	Reduction gearing	Sub-assembly	568.1	Stem protection tube (without cap)	
500.0	Cover	Sub-assembly	568.2	Protective cap for stem protection tube	
501.0	Socket carrier (complete with sockets)	Sub-assembly	568.3	V-seal	
502.0	Pin carrier without pins	Sub-assembly	568.4	Threaded sleeve (for SA/SAR 25.1 and 30.1)	
503.0	Socket for controls	Sub-assembly	569.0	Change-over lever assy	Sub-assembly
504.0	Socket for motor	Sub-assembly	569.1	Change-over lever	
505.0	Pin for controls	Sub-assembly	569.2	Notched pin	
506.0	Pin for motor	Sub-assembly	575.1	Stem nut (without thread)	
507.0	Cover for electrical connection	Sub-assembly	602.0	Reduction frame	
511.0	Threaded plug	Sub-assembly	603.0	Motor connection	Sub-assembly
514.0	Output drive type A (without stem nut)	Sub-assembly	614.0	EWG position transmitter	Sub-assembly
514.1	Axial needle roller bearing	Sub-assembly	627.0	MWG 05.03 cover	
514.2	Radial seal for output drive type A		S1	Seal kit, small	Set
535.1	Snap ring		S2	Seal kit, large	Set
539.0	Screw plug				

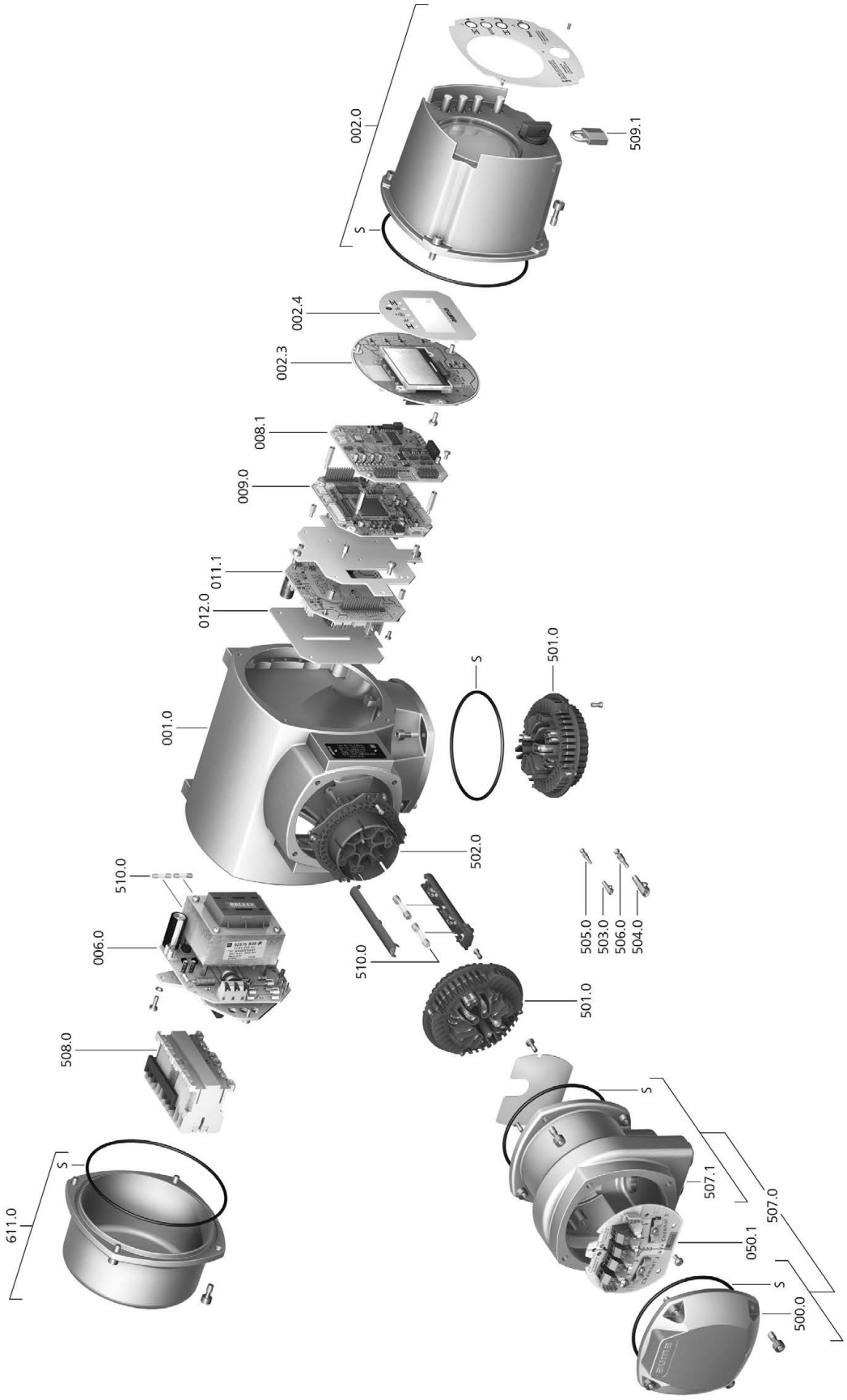
14.2. AC 01.2 actuator controls with S electrical connection



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	
050.1	Fieldbus connection board	Sub-assembly
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	Kit
611.0	Cover	Sub-assembly
S	Seal kit	Set

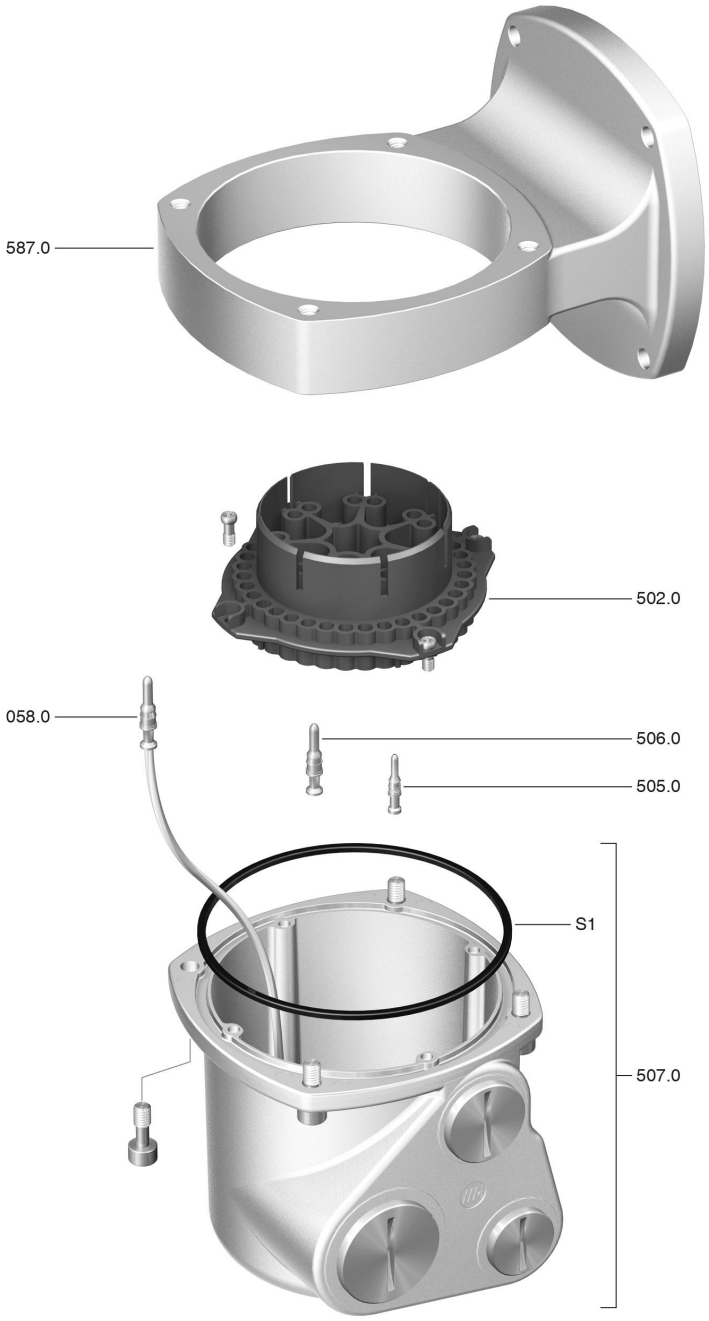
14.3. AC 01.2 actuator controls with SD electrical connection



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	
050.1	Fieldbus connection board	Sub-assembly
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	Kit
611.0	Cover	Sub-assembly
S	Seal kit	Set

14.4. 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	

15. Certificates

Information Certificates are valid as from the indicated date of issue. Subject to changes without notice. The latest versions are attached to the device upon delivery and also available for download at http://www.auma.com.

15.1. EU Declaration of Incorporation / Declaration of Conformity

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auma®
Solutions for a world in motion

EU Declaration of Conformity / Declaration of Incorporation in compliance with Machinery Directive

for electric actuators of the following types:

SA 25.1, SA 30.1, SA 35.1, SA 40.1, SA 48.1
SAR 25.1, SAR 30.1

in versions:

AUMA NORM
AUMA SEMIPACT SEM 01.1, SEM 02.1
AUMA MATIC AM 01.1, AM 02.1
AUMATIC AC 01.2

AUMA Riester GmbH & Co. KG as manufacturer declare herewith, that the above mentioned actuators meet the basic requirements of the following Directives:

2014/30/EU (EMC Directive)
2006/42/EC (Machinery Directive)

The following harmonised standards in terms of the specified directives have been applied:

Directive 2014/30/EU

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

Directive 2006/42/EC

EN ISO 12100:2010
EN ISO 5210:1996
EN 60204-1:2006 / A1:2009 / AC:2010

AUMA actuators are designed for the operation of industrial valves. Putting into service is prohibited until the final machinery has been declared in conformity with the provisions of Directive 2006/42/EC.

The following basic requirements in compliance with Annex I of the Directive are respected:

Appendix I, articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4

The manufacturer shall be obligated to electronically submit the documents for the partly completed machinery to national authorities on request. The relevant technical documentation pertaining to the machinery described in Annex VII, part B has been prepared.

Authorised person for documentation: Peter Malus, Aumastr. 1, 79379 Muellheim, Germany

Furthermore, the essential health and safety requirements in compliance with Directive 2014/35/EU (Low Voltage Directive) are fulfilled by applying the following harmonised standards, as far as applicable for the products:

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

Muellheim, 2017-10-01

Dr J. Hoffmann, Managing Director

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

Y008.042/003/en/1.17

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