auma®
Solutions for a world in motion

Multi-turn actuators
SAEx 07.2 – SAEx 16.2
SAREx 07.2 – SAREx 16.2
with actuator controls
AUMA MATIC BASIC AMBExC01.1

Operation instructions Assembly, operation, commissioning

Read operation instructions first.

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

Purpose of the document:

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

Reference documents:

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

Table of contents

1. Safety instructions

1.1 Basic information on safety

Standards/directives

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

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

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

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

Safety instructions/warnings

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

Qualification of staff

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

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

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

Commissioning

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

Operation

Prerequisites for safe and smooth operation:

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

Protective measures

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

Maintenance

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

Any device modification requires prior consent of the manufacturer.

1.2 Range of application

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

The devices described below are approved for use in the potentially explosive atmospheres of zones 1, 2, 21, and 22.

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

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

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

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

No liability can be assumed for inappropriate or unintended use.

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

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

1.3 Warnings and notes

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

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

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

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

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

Arrangement and typographic structure of the warnings

DANGER **Type of hazard and respective source!**

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

→ Measures to avoid the danger

→ Further measure(s)

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

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

1.4 References and symbols

The following references and symbols are used in these instructions:

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

 Symbol for CLOSED (valve closed)

 Symbol for OPEN (valve open)

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

< > **Reference to other sections**

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

2. Identification

2.1 Name plate

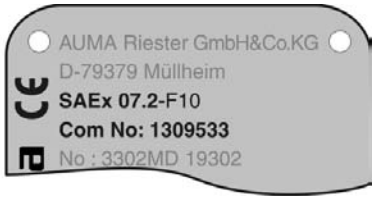
Each device component (actuator, controls, motor) is equipped with a name plate.

Figure 1: Arrangement of name plates

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

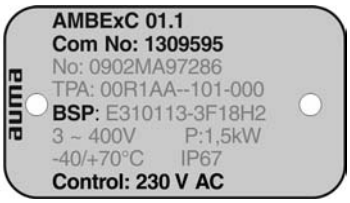
Data for identification

Figure 2: Actuator name plate



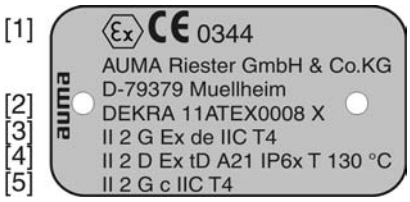
[1] Type and size of actuator
[2] Commission number

Figure 3: Controls name plate



[1] Type and size of the controls
[2] Commission number
[3] Wiring diagram
[4] Control

Figure 4: Explosion protection approval plate



[1] Ex symbol, CE mark, ID no.
[2] EC type examination certificate
[3] Explosion protection classification - electrical explosion protection
[4] Explosion protection classification - dust protection
[5] Explosion protection classification - non-electrical explosion protection

Type and size

These instructions apply to the following devices:

Multi-turn actuators for open-close duty: SAEx 07.2, 07.6, 10.2, 14.2, 14.6, 16.2

Multi-turn actuators for modulating duty: SA**R**Ex 07.2, 07.6, 10.2, 14.2, 14.6, 16.2

AMBExC 01.1/02.1 = actuator controls AUMA MATIC BASIC

Commission number

An order-specific commission number is assigned to each device. This commission number can be used to directly download the wiring diagram, inspection records and further information regarding the device from the Internet: **http://www.auma.com**.

Control

24 V DC = control voltage for digital inputs = 24 V DC.

115 V AC = control voltage for digital inputs = 115 V AC.

230 V AC = control voltage for digital inputs = 230 V AC.

2.2 Short description

Multi-turn actuator

Definition in compliance with EN ISO 5210:

A multi-turn actuator is an actuator which transmits to the valve a torque for at least one full revolution. It is capable of withstanding thrust.

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

Actuator controls

The AUMA MATIC actuator controls are used to operate AUMA actuators and are supplied ready for use. The controls can be mounted directly to the actuator but also separately on a wall bracket. The electro-mechanical version of the AUMA MATIC controls includes switchgear for control in OPEN - CLOSE duty and a logic for various indications via contacts

Local controls

Operation (via push buttons), setting and indication can be performed directly at the controls (contents of these instructions).

3. Transport, storage and packaging

3.1 Transport

For transport to place of installation, use sturdy packaging.

DANGER

Hovering load!

Risk of death or serious injury.

→ Do NOT stand below hovering load.

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

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

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

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

3.2 Storage

NOTICE

Danger of corrosion due to inappropriate storage!

→ Store in a well-ventilated, dry room.

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

→ Cover to protect against dust and dirt.

→ Apply suitable corrosion protection agent to uncoated surfaces.

Long-term storage

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

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

3.3 Packaging

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

4. Assembly

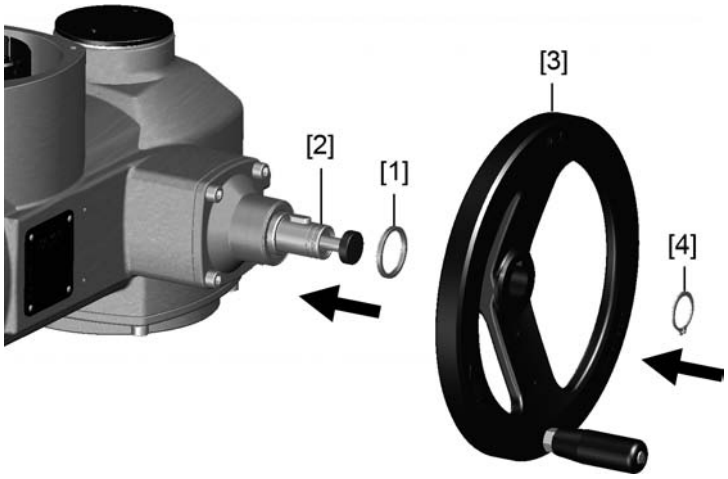
4.1 Mounting position

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

4.2 Handwheel fitting

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

Figure 5: Handwheel



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

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

4.3 Multi-turn actuator: mount to valve/gearbox

NOTICE

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

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

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

4.3.1 Output drive types B, B1 – B4 and E

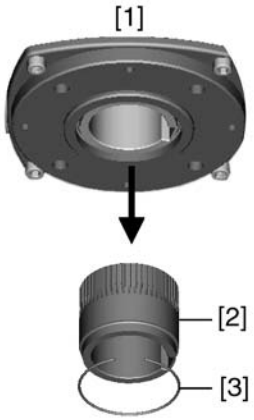
Application

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

Design Output drive bore with keyway:

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

Figure 6: Output drive



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

Information Spigot at flanges should be loose fit.

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

1. Check if mounting flanges fit together.
2. Check whether bore and keyway match the input shaft.
3. Apply a small quantity of grease to the input shaft.
4. Place multi-turn actuator.
   Information: Ensure that the spigot fits uniformly in the recess and that the mounting faces are in complete contact.
5. Fasten multi-turn actuator with screws according to table.
   Information: We recommend applying liquid thread sealing material to the screws to avoid contact corrosion.
6. Fasten screws crosswise to a torque according to table.

Table 1: Tightening torques for screws

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

4.3.2 Output drive type A

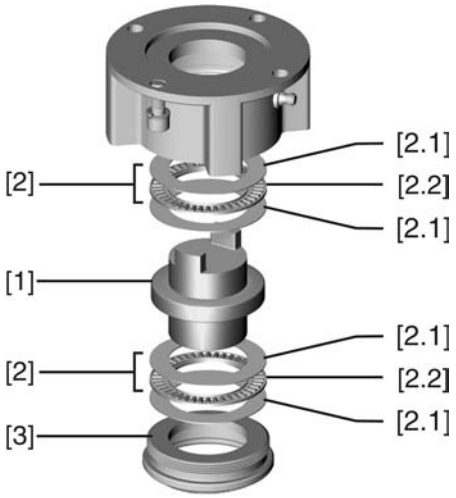
Application
- Output drive for rising, non-rotating valve stem
- Capable of withstanding thrust

Information To adapt the actuators to output drive types A available on site with flanges F10 and F14 (year of manufacture: 2009 and earlier), an adapter is required. The adapter can be ordered from AUMA.

4.3.2.1 Stem nut: finish machining

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

Figure 7: Design of output drive type A

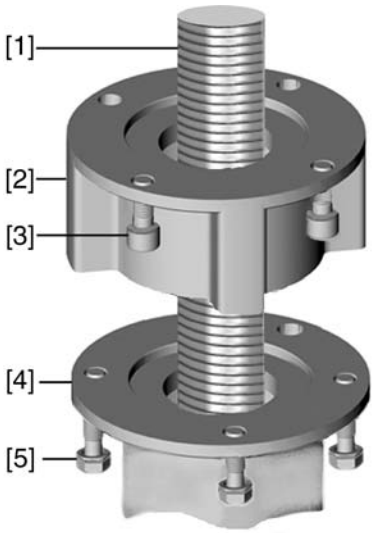


[1] Stem nut
[2] Bearing
[2.1] Bearing race
[2.2] Bearing rim
[3] Spigot ring

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

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

Figure 8: Assembly with output drive type A



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

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

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

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

Table 2: Tightening torques for screws

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

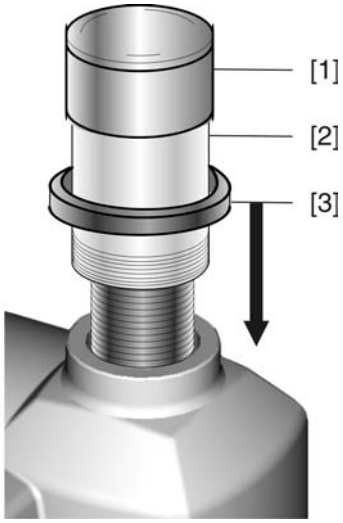
11. Turn multi-turn actuator with handwheel in direction OPEN until valve flange and output drive A are firmly placed together.
12. Tighten fastening screws [5] between valve and output drive type A crosswise applying a torque according to table.

4.4 Accessories for assembly

4.4.1 Stem protection tube for rising valve stem

— Option —

Figure 9: Assembly of the stem protection tube



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

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

4.5 Mounting positions of local controls

The mounting position of the local controls is selected according to the order. If, after mounting the actuator to the valve or the gearbox on site, the local controls are in an unfavourable position, the mounting position can be changed at a later date. Four mounting positions are possible.

Figure 10: Mounting positions A and B

Figure 11: Mounting positions C and D

4.5.1 Mounting positions: modify

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

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

Cable damage due to twisting or pinching!

Risk of functional failures.

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

5. Fasten screws evenly crosswise.

5. Electrical connection

5.1 Basic information

⚠ WARNING

Danger due to incorrect electrical connection

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

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

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

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

Wiring diagram/terminal plan

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

Protection on site

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

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

Table 3: Current consumption controls

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

Table 4: Maximum permissible protection

Switchgear	Rated power	max. protection
Reversing contactor	up to 1.5 kW	16 A (gL/gG)
Reversing contactor	up to 7.5 kW	32 A (gL/gG)
Reversing contactor	up to 11 kW	63 A (gL/gG)

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

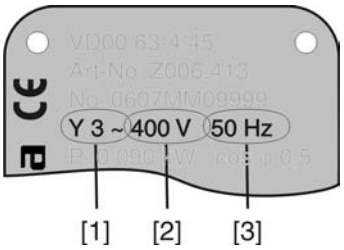
Power supply for the controls (electronics)

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

Type of current, mains voltage and mains frequency

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

Figure 12: Motor name plate (example)



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

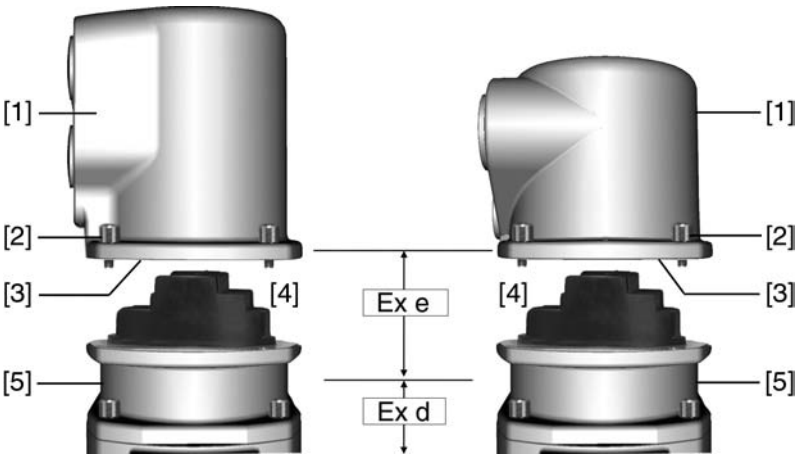
Connecting cables

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

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

5.2.1 Terminal compartment: open

Figure 13: Plug/socket connector KPH, KP



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

DANGER

Hazardous voltage!

Risk of electric shock.

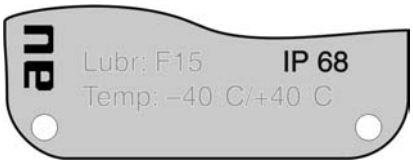
→ Disconnect device from the mains before opening.

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

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

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

➥ The enclosure protection IP… stated on the name plate is only ensured if suitable cable glands are used. Example: Name plate shows enclosure protection IP 68.



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

5.2.2 Cable connection

Table 5: Terminal cross sections and tightening torques

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

1) with small clamp washers

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

⚠ WARNING

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

Risk of electric shock.

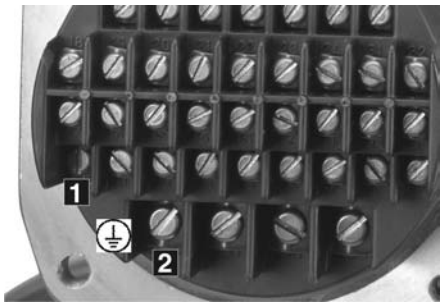
→ Connect all protective earth conductors.

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

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

5. Tighten protective earth firmly to PE connection

Figure 15: PE connection



[1] PE connection, control cable

[2] PE connection, motor cable

NOTICE

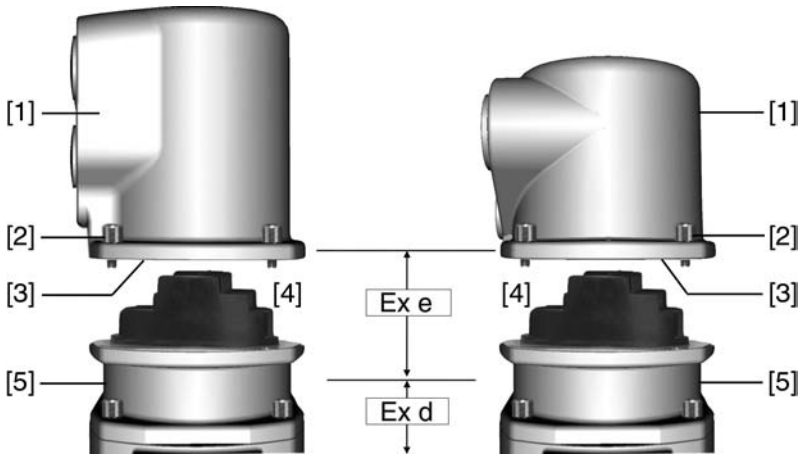
Danger of corrosion: Damage due to condensation!

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

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

5.2.3 Terminal compartment: close

Figure 16: Plug/socket connector KPH, KP



[1] Cover

[2] Screws for cover

[3] O-ring

[4] Terminal compartment

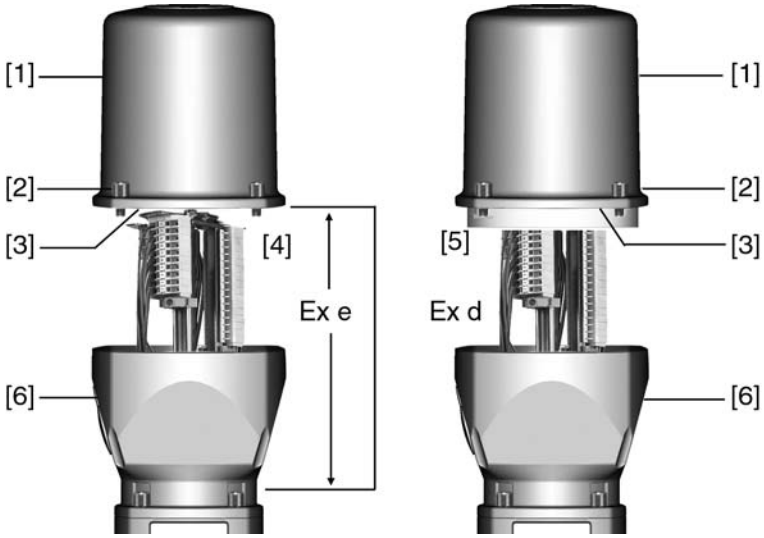
[5] Terminal board

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

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

5.3.1 Terminal compartment: open

Figure 17: Plug/socket connector: left KES, right KES flameproof



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

DANGER

Hazardous voltage!

Risk of electric shock.

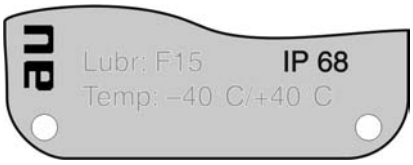
→ Disconnect device from the mains before opening.

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

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

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

➥ The enclosure protection IP… stated on the name plate is only ensured if suitable cable glands are used. Example: Name plate shows enclosure protection IP 68.



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

5.3.2 Cable connection

Table 6: Terminal cross sections and tightening torques

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

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

WARNING

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

Risk of electric shock.

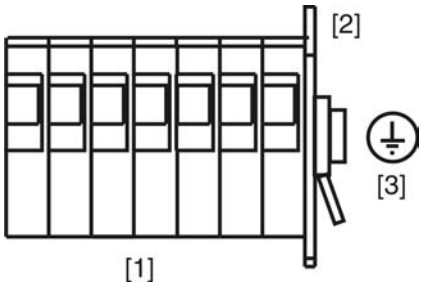
→ Connect all protective earth conductors.

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

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

4. Tighten protective earth firmly to PE connection

Figure 19: PE connection



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

NOTICE

Danger of corrosion: Damage due to condensation!

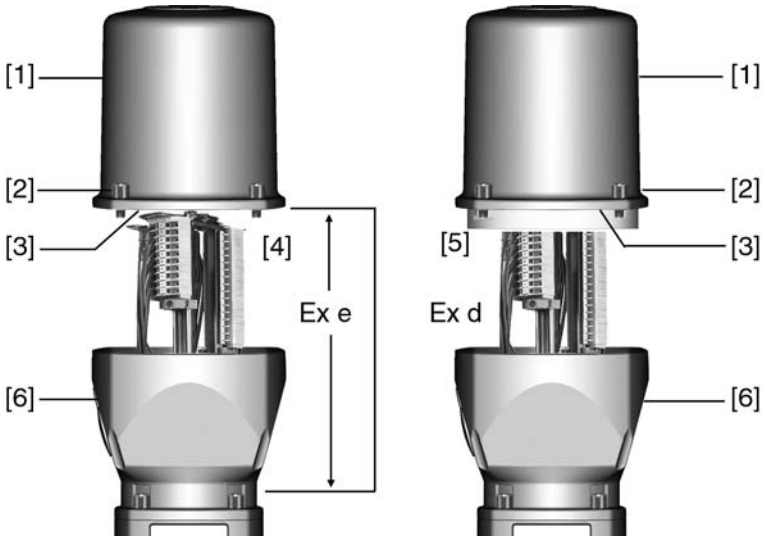
→ After mounting, commission the device immediately to ensure that heater minimises condensation.

Information

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

5.3.3 Terminal compartment: close

Figure 20: Plug/socket connector: left KES, right KES flameproof



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

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

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

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

5.4 Accessories for electrical connection

— Option —

5.4.1 Parking frame

Application

Parking frame for safe storage of a disconnected plug.

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

Figure 21: Parking frame and plug/socket connector with screw-type terminals (KP/KPH)

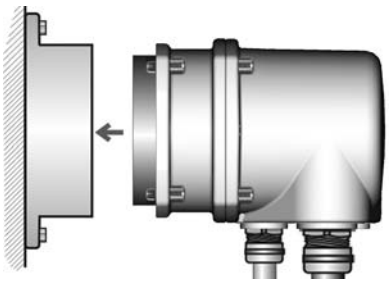
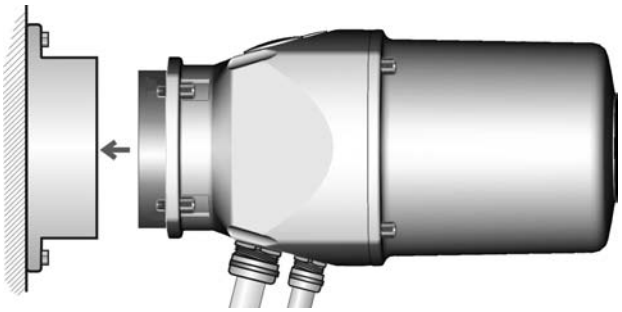


Figure 22: Parking frame and plug/socket connector with terminal blocks (KES)



5.4.2 Protection cover

Protection cover for plug compartment when plug is removed.

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

5.4.3 Earth connection, external

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

Figure 23: Earth connection

6. Operation

6.1 Manual operation

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

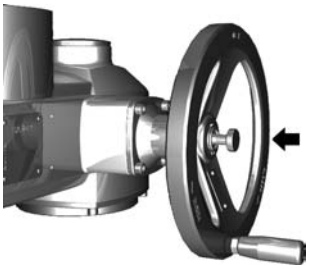
6.1.1 Manual operation: engage

NOTICE

Damage at the motor coupling due to faulty operation!

→ Engage manual operation only during motor standstill.

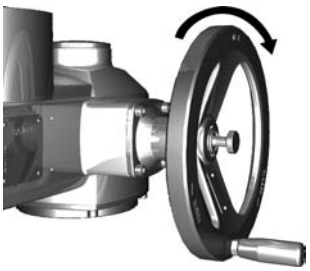
1. Press push button.



2. Turn handwheel in desired direction.

→ To close the valve, turn handwheel clockwise:

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



6.1.2 Manual operation: disengage

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

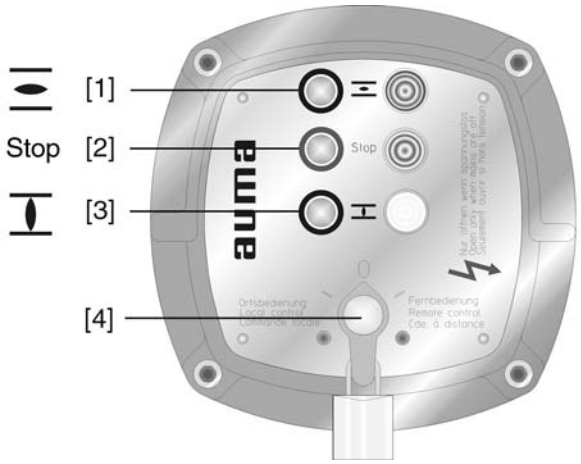
6.2 Motor operation

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

6.2.1 Local operation

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

Figure 26: Local controls



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

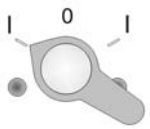
⚠ CAUTION

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

Danger of burns

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

→ Set selector switch [4] to position **Local control** (LOCAL).



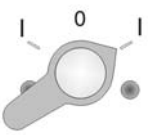
➥ The actuator can now be operated using the push buttons [1 – 3]:

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

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

6.2.2 Actuator operation from remote

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

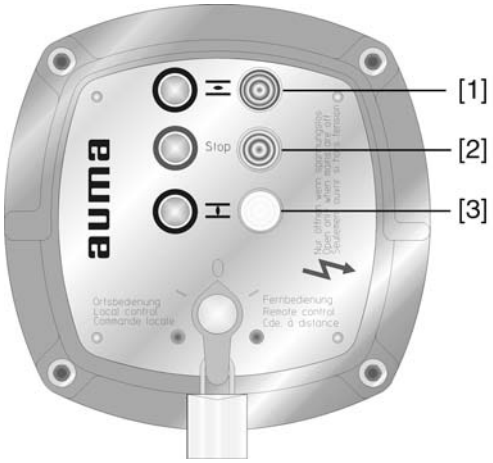


➥ Now, it is possible to operate the actuator via remote control, via operation commands (OPEN, STOP, CLOSE).

7. Indications

7.1 Indication lights

Figure 29: Local controls with indication lights



[1] illuminated (green): End position OPEN reached
[2] illuminated (red): Fault signal (option)
[3] illuminated (yellow): End position CLOSED reached

Fault signal (option)

The fault signal (red indication light) indicates the following events:

- Torque fault: The set torque was exceeded before reaching an end position.
- Thermal fault: Motor protection has tripped, i.e. the motor is overheated.

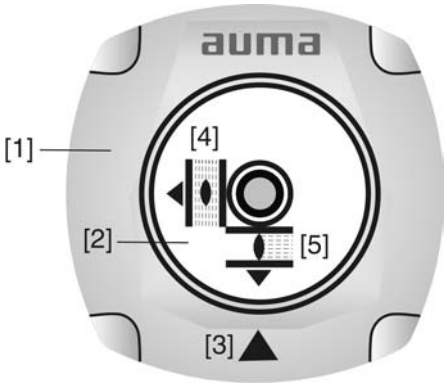
7.2 Mechanical position indicator/running indication

— Option —

Mechanical position indicator:

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

Figure 30: Mechanical position indicator



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

8. Signals

8.1 Feedback signals (binary)

Information The switches can be provided as single switches (1NC and 1 NO), as tandem switches (2 NC and 2 NO) or as triple switches (3 NC and 3 NO). The precise version is indicated in the terminal plan or on the order-related technical data sheet.

Feedback signal	Type and designation in wiring diagram	
End position OPEN/CLOSED reached	Signalling via limit switches (NO), non potential-free Value of the output signal depends on control voltage (refer to wiring diagram)	
	LSC	Limit switch, closing, clockwise rotation
	LSO	Limit switch, opening, counterclockwise rotation
	Option: Tandem switch with additional potential-free contacts LSC1 and LSO1	
Intermediate position reached (option)	Potential-free signal via switches (NC/NO) Condition: DUO limit switching in the actuator	
	LSA	DUO limit switch, clockwise rotation
	LSB	DUO limit switch, counterclockwise rotation
Torque o.k./ Torque fault	Potential-free signal via contacts, terminals XK 15 and XK 16 Condition: Relay board A5 within the controls Output contact XK 15 closed = no torque fault Output contact XK 16 = torque fault, i.e. the set torque was exceeded before reaching an end position.	
Torque OPEN/CLOSED reached (option)	Potential-free signal via switches (NC/NO) Condition: Torque switch in tandem arrangement with TSC/TSO	
	TSC1	Torque switch, closing, clockwise rotation
	TSO 1	Torque switch, opening, counterclockwise rotation
Motor protection tripped (option)	Potential-free signal via contacts, terminal XK 13 Condition: Relay board A5 within the controls Thermoswitch tripped (NO contact) = Output contact closed	
	F1, Th	Thermoswitches
	F7	Thermal overload relay
Selector switch position (option)	Potential-free signal via switches (2 x NC) Condition: Selector switch with 2 levels indicates selector switch position LOCAL/REMOTE	
Running indication (option)	Potential-free signal via switch (NC) Contact opens and closes (blinks) during an actuator operation	
	S5, BL	Blinker transmitter

8.2 Feedback signals (analogue)

Feedback signal	Type and designation in wiring diagram	
Valve position (option)	Via potentiometer or electronic position transmitter RWG, depending on the version	
	R2	Potentiometer
	R2/2	Potentiometer in tandem arrangement (option)
	B1/B2, RWG	3- or 4-wire system (0/4– 20 mA)
	B3/B4, RWG	2-wire system (4 – 20 mA)

9. Commissioning (basic settings)

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

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

2. Switch on the power supply.
   Information: Please consider the heat-up time for ambient temperatures below –20 °C.
3. Perform basic settings.

9.1 Switch compartment: open

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

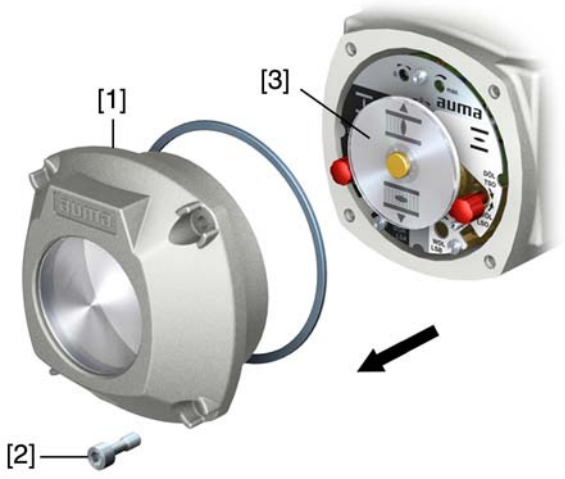
⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

1. Loosen screws [2] and remove cover [1] from the switch compartment.
   Figure 32:



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.

   Figure 33:

9.2 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.

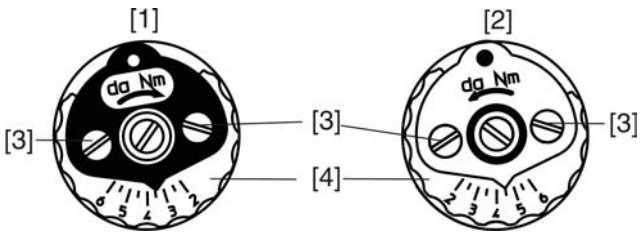
NOTICE

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 34: Torque switching heads



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

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

➥ The torque switch setting is complete.

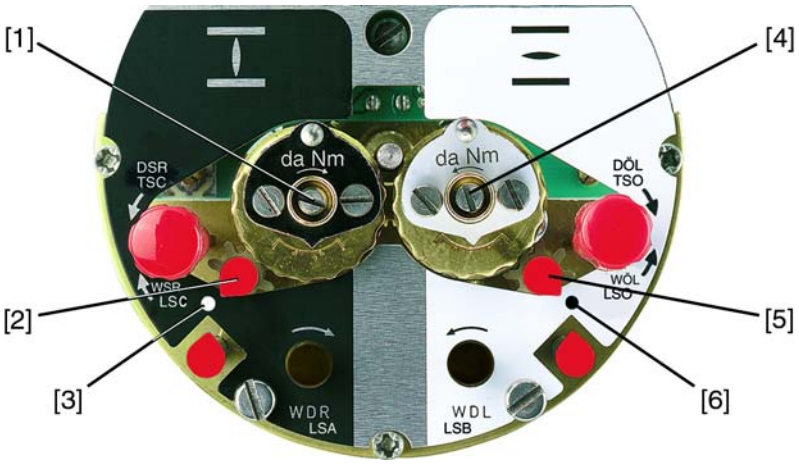
Example: The figure above shows the following settings:

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

9.3 Limit switching: set

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

Figure 35: 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

9.3.1 End position CLOSED (black section): set

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

➥ The end position CLOSED setting is complete.

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

9.3.2 End position OPEN (white section): set

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

➥ The end position OPEN setting is complete.

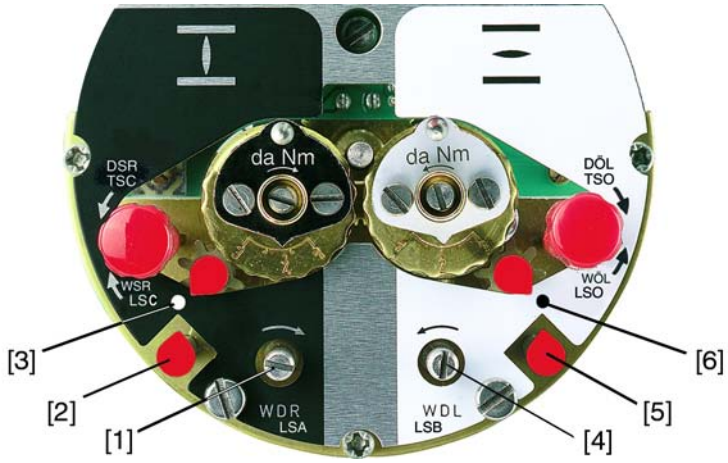
7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.4 Intermediate positions: set

— Option —

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

Figure 36: Setting elements for limit switching



Black section:

[1] Setting spindle: Running direction CLOSE

[2] Pointer: Running direction CLOSE

[3] Mark: Intermediate position CLOSED is set

White section:

[4] Setting spindle: Running direction OPEN

[5] Pointer: Running direction OPEN

[6] Mark: Intermediate position OPEN is set

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

9.4.1 Running direction CLOSE (black section): set

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

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

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

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

9.4.2 Running direction OPEN (white section): set

1. Move valve in direction OPEN to desired intermediate position.
2. If you override the tripping point inadvertently: Move valve in opposite direction and approach intermediate position again in direction OPEN (always approach the intermediate position in the same direction as in later electrical operation).

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

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

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

9.5 Test run

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

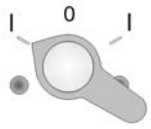
9.5.1 Direction of rotation: check

NOTICE

Valve damage due to incorrect direction of rotation!

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

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

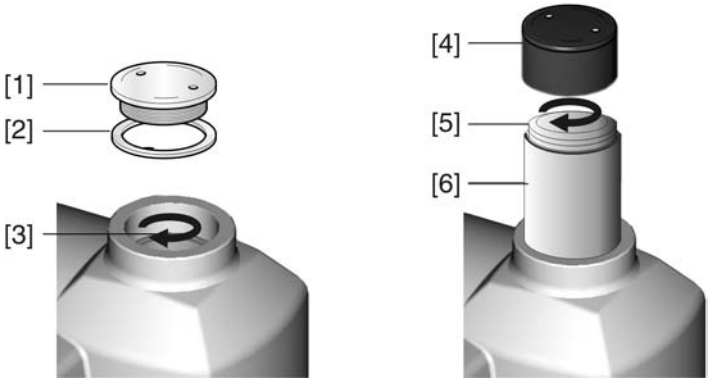


3. Switch on actuator in running direction CLOSE and observe the direction of rotation:
   with indicator disc: step 4
   without indicator disc: step 5 (hollow shaft)
   → Switch off before reaching the end position.
4. With indicator disc:
   → Observe direction of rotation.
   ➥ The direction of rotation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

5. Without the indicator disc:
   → Unscrew threaded plug [1] and seal [2] or cap for stem protection tube [4] and observe direction of rotation at hollow shaft [3] or the stem [5].

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

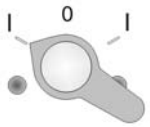
Figure 39: Hollow shaft/stem



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

9.5.2 Limit switching: check

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



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

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

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

➥ The limit switching is set incorrectly if:

- the actuator comes to a standstill before reaching the end position
- the red indication light is illuminated (torque fault).

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

9.6 Potentiometer setting

— Option —

The potentiometer as travel sensor records the valve position.

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

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

Figure 41: View of control unit

[1] Potentiometer

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

➥ End position CLOSED corresponds to 0 %

➥ End position OPEN corresponds to 100 %

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

9.7 Electronic position transmitter RWG: set

— Option —

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

Table 7: Technical data RWG 4020

Wiring		**3- or 4-wire system**
Terminal plan	KMS	TP_ _4/ _ _ _
Output current	I_A	0 – 20 mA, 4 – 20 mA
Power supply	U_V	24 V DC, ±15 % smoothed
Max. current consumption	I	24 mA at 20 mA output current
Max. load	R_B	600 Ω

Figure 42: View of control unit

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

1. Connect voltage to electronic position transmitter.
2. Move valve to end position CLOSED.
3. Connect ammeter for 0 – 20 mA to measuring points [4 and 5]. If no value can be measured:
   3.1 Check, whether external load is connected to customer connection XK (terminals 23/24) (observe max. load R_B), or
   3.2 Connect terminals 23/24 across customer connection XK (terminals 23/24).
4. Turn potentiometer [1] clockwise to the stop.
5. Turn potentiometer [1] slightly in opposite direction.
6. Turn potentiometer [2] clockwise until output current starts to increase.
7. Turn potentiometer [2] in opposite direction until the following value is reached:

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

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

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

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

9.8 Mechanical position indicator: set

— Option —

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

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

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

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

   7.1 Repeat setting procedure.

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

9.9 Switch compartment: close

NOTICE

Danger of corrosion due to damage to paint finish!

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

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

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

→ Handle cover and housing parts with care.

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

→ Do not jam cover during fitting.

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

10. Commissioning – controls settings

The controls are set in the factory according to the order. The settings only have to be changed if the device is used for applications other than those specified in the order.

The following settings are described in these operation instructions:

- Setting the type of seating (limit or torque seating)
- Setting push-to-run operation or self-retaining
- Feedback signals setting via output contacts (option)

10.1 Local controls: remove

WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

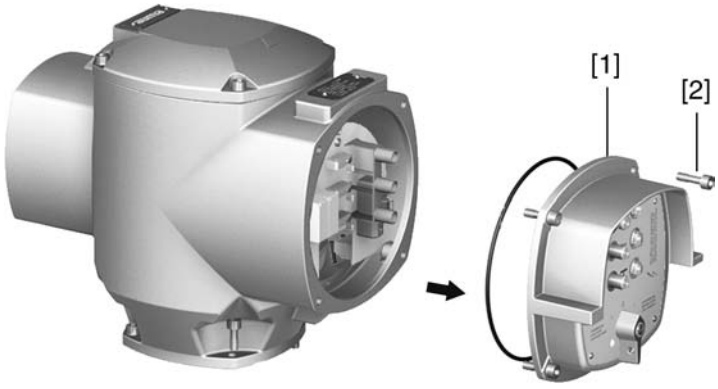
NOTICE

Electrostatic discharge ESD!

Risk of damage to electronic components.

→ Earth both operators and devices.

→ Loosen screws [2] and carefully remove local controls [1].



10.2 Type of seating: set

NOTICE

Valve damage due to incorrect setting!

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

The type of seating can be set via a toggle switch on the signal and control board.

Limit seating

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

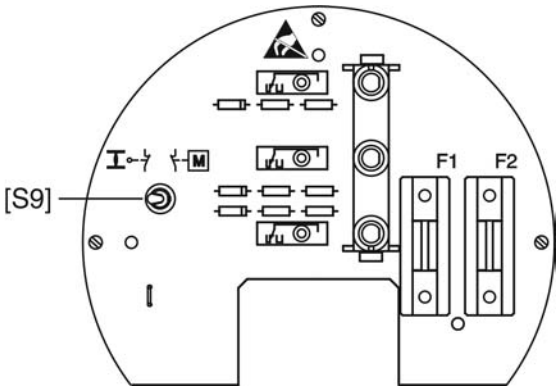
Torque seating

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

The limit switching is used for signalling and must be set to trip shortly **before** reaching the set tripping torque.

→ Set type of seating via toggle switch [S9].

Figure 47: Signal and control board



[S9] Toggle switch

in position = limit seating

in position = torque seating

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

The operation behaviour for operation commands (OPEN, STOP, CLOSE) can be set separately via the push buttons on the local controls or for operation commands from Remote.

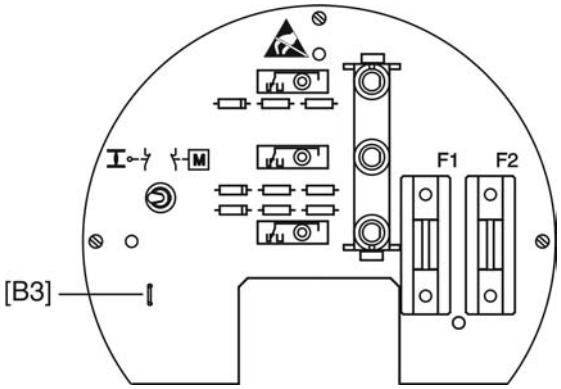
Push-to-run operation Actuator only runs in directions OPEN or CLOSE while an operation command is being received. The actuator stops if the operation command is cancelled.

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

10.3.1 Push-to-run operation or self-retaining for operation commands via push buttons

Push-to-run operation or self-retaining for operation commands is set in the factory and usually remains unchanged. Subsequent modification is however possible but by interrupting or soldering a link on the signal and control board.

Figure 48: Signal and control board



[B3] Soldering link closed = self-retaining LOCAL

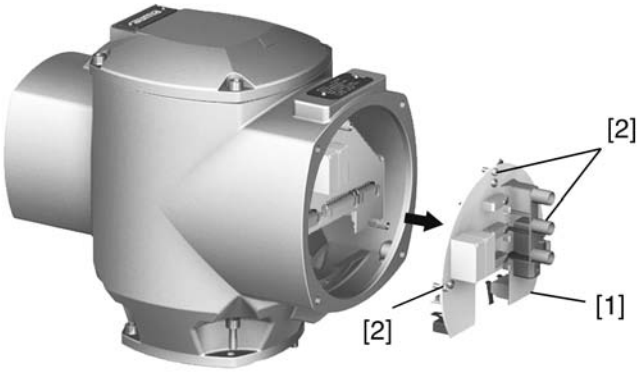
[B3] Soldering link interrupted = push-to-run operation LOCAL

10.3.2 Push-to-run operation or self-retaining for operation commands from Remote

The settings for push-to-run operation or self-retaining from Remote is made via a jumper on the wiring board.

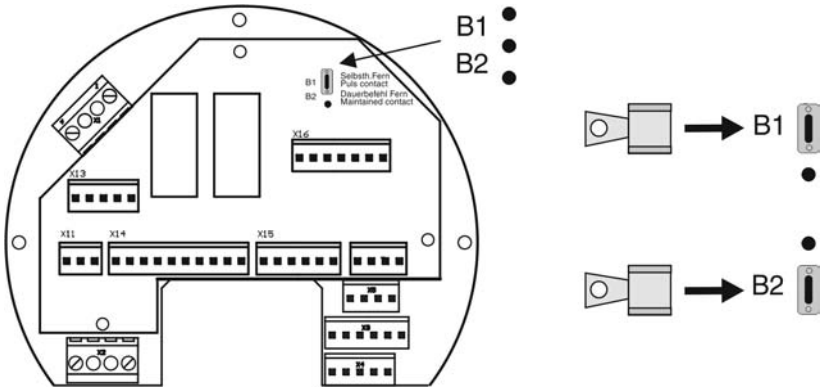
1. Loosen all 3 screws [2] on the signal and control board [1] and remove board.
   Information: Make sure not to disconnect the jumpers.

   Figure 49: Remove signal and control board



2. Set push-to-run operation or self-retaining via red jumper on wiring board.
   → Link via B1 = self-retaining REMOTE
   → Link via B2 = push-to-run operation REMOTE (continuous signal REMOTE)

   Figure 50: Wiring board

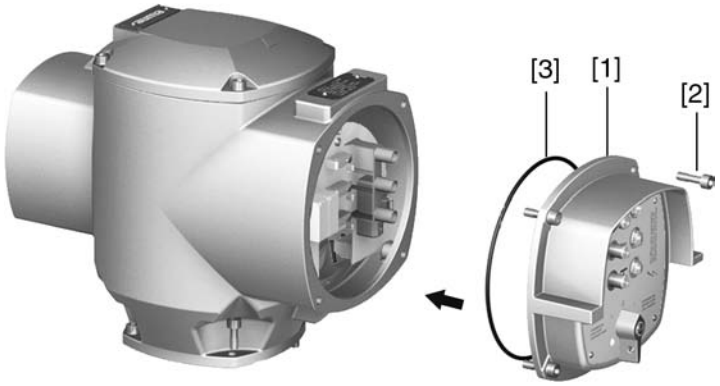


3. Fasten signal and control board [2] again.

10.4 Local controls: mount

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

   Figure 51:



5. Fit local controls [1].

NOTICE

Cable damage due to twisting or pinching!

Risk of functional failures.

→ Carefully mount local controls.

6. Fasten screws evenly crosswise.

10.5 Controls: open

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

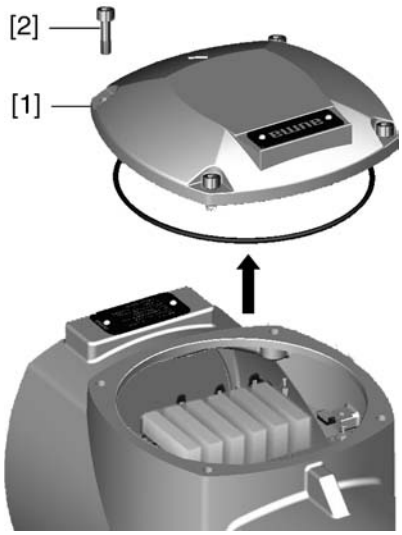
NOTICE

Electrostatic discharge ESD!

Risk of damage to electronic components.

→ Earth both operators and devices.

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

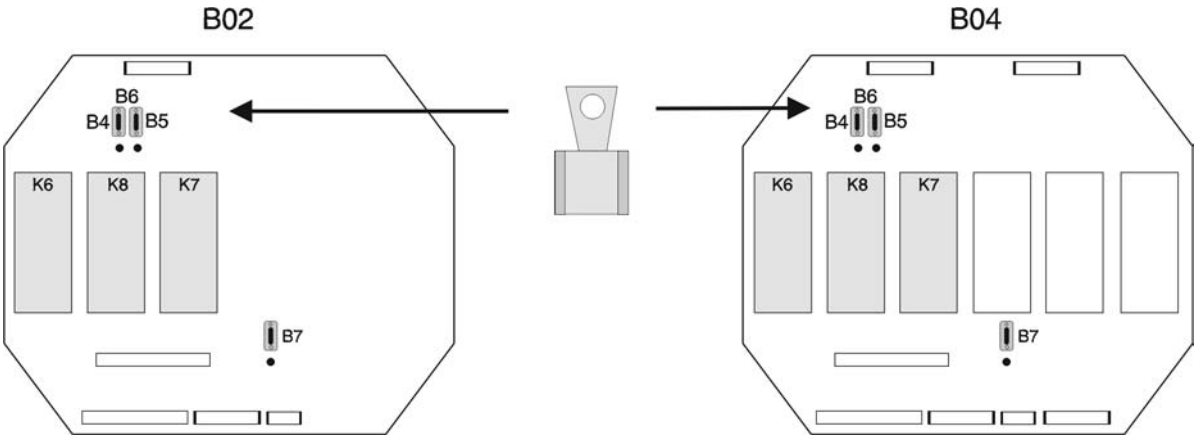


10.6 Feedback signals setting via output contacts

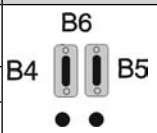
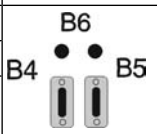
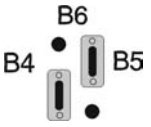
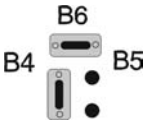
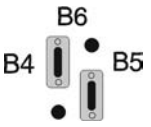
— (Option) —

Only valid for versions (B02 and B04) with relays K6, K7, K8 on relay board.

Figure 53: Relay board; left: version B02, right: version B04



→ Assign the required functions to the terminals XK ... of the customer connection (see wiring diagram) with the red jumpers.

Function (Signal at terminal XK .... [1] active, if function is correct)	Signal at terminal	Link
Torque switch tripped in mid-travel and/or Thermoswitch or thermal overload relay tripped	XK 16	
No torque switch tripped in mid-travel	XK 15	
No thermoswitch or no thermal overload relay tripped	XK 13	
Torque switch tripped in mid-travel	XK 16	
No torque switch tripped in mid-travel	XK 15	
No function	XK 13	
Torque switch tripped in mid-travel	XK 16	
No torque switch tripped in mid-travel	XK 15	
No thermoswitch or no thermal overload relay tripped	XK 13	
Torque switch tripped in mid-travel	XK 16	
No torque switch tripped in mid-travel	XK 15	
Thermoswitch or thermal overload relay tripped	XK 13	
Torque switch tripped in mid-travel	XK 16	
No torque switch tripped in mid-travel	XK 15	
No function	XK 13	
Common connection	XK 14	

1) Refer to order-related wiring diagram BSP ...

10.7 Controls: close

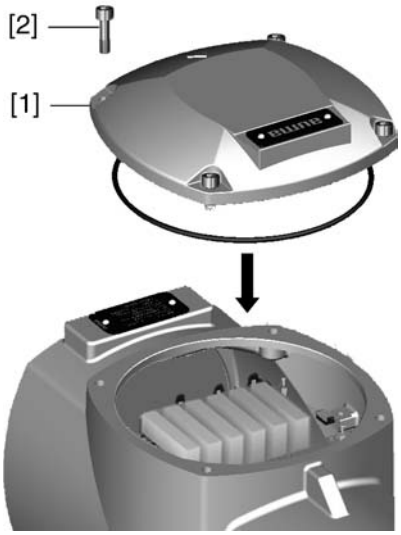
NOTICE

Danger of corrosion due to damage to paint finish!

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

1. Clean sealing faces of housing and cover.
2. Preserve joint surfaces with an acid-free corrosion protection agent.
3. Check whether O-ring [3] is in good condition, replace if damaged.

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



⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

→ Handle cover and housing parts with care.

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

→ Do not jam cover during fitting.

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

11. Corrective action

11.1 Faults during commissioning

Table 8: Faults during commissioning

Fault description	Possible causes	Remedy
Mechanical position indicator cannot be set.	Reduction gearing is not suitable for turns/stroke of the actuator.	Exchange reduction gearing.
Fault in end position Actuator runs to end stop although the limit switches work properly.	The overrun was not considered when setting the limit switching. The overrun is generated by the inertia of both the actuator and the valve and the delay time of the controls.	Determine overrun: Overrun = travel covered from switching off until complete standstill. Set limit switching again considering the overrun (turn handwheel back by the amount of the overrun).
Position transmitter RWG Measurement range 4 – 20 mA or maximum value 20 mA cannot be set.	Reduction gearing is not suitable for turns/stroke of the actuator.	Exchange reduction gearing.
Limit and/or torque switches do not trip.	Switch is defective or switch setting is incorrect.	Check setting, if required, reset end positions. → **Check switches** and replace them, if required.

Switch check

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

1. Turn test button [1] in direction of the TSC arrow: Torque switch CLOSED trips. The red indication light (fault) on the local controls is illuminated.
2. Turn test button [2] in direction of the TSO arrow: Torque switch OPEN trips. The red indication light (fault) on the local controls is illuminated.

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

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

11.2 Fuses

11.2.1 Fuses within the actuator controls

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

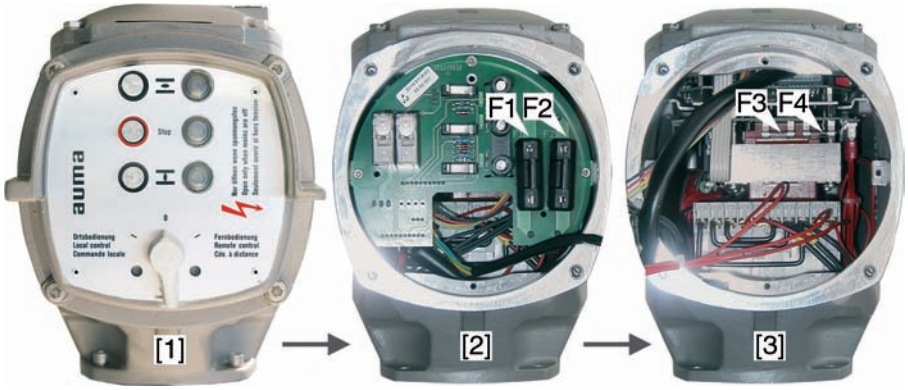
⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

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

Figure 56: Access to fuses



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

F1/F2 Primary fuses on power supply unit

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

F3 Internal 24 V DC supply

G fuse according to IEC 60127-2/III	F3	AUMA art. no.
Size	5 x 20 mm	
Voltage output (power supply unit) = 24 V	500 mA T; 250 V	K001.183
Voltage output (power supply unit) = 115 V	500 mA T; 250 V	K001.183

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

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

G fuse according to IEC 60127-2/III	F4	AUMA art. no.
Size	5 x 20 mm	
Voltage output (power supply unit) = 24 V	1.0 A T; 250 V 1.6 A T; 250 V	K004.831 K003.131
Voltage output (power supply unit) = 115 V	0.4 A T; 250 V	K003.021

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

Information Only use fuses of same type and value for replacement.

→ After replacing the fuses, fasten local controls again.

NOTICE

Cable damage due to twisting or pinching!

Risk of functional failures.

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

11.2.2 Motor protection (thermal monitoring)

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

The actuator is stopped and the red indication light (option) on the local controls is illuminated.

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

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

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

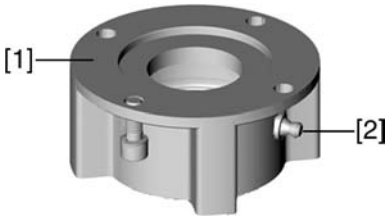
12.1 Preventive measures for servicing and safe operation

The following measures are required to ensure safe device operation:

6 months after commissioning and then every year

- Carry out visual inspection:
  Cable entries, cable glands, blanking plugs, etc. have to be checked for correct tightness and sealing.
  Respect torques according to manufacturer's details.
- Check fastening screws between actuator and gearbox/valve for tightness. If required, fasten screws while applying the tightening torques as indicated in chapter <Assembly>.
- When rarely operated: Perform test run.
- For devices with output drive A: Press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with a grease gun.
- Lubrication of the valve stem must be done separately.

Figure 57: Output drive type A



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

Table 9: Grease quantities for bearing of output drive type A

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

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

For enclosure protection IP 68

After continuous immersion:

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

12.2 Disconnection from the mains

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

⚠ WARNING

Flameproof enclosure, danger of explosion!

Risk of death or serious injury.

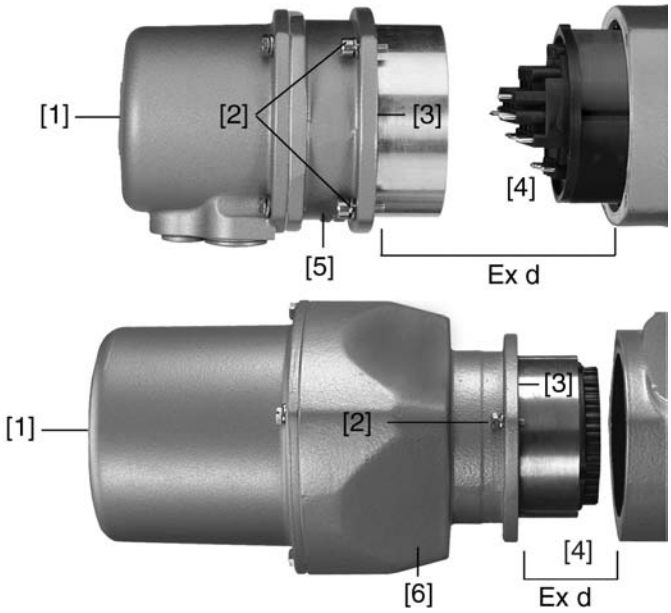
→ Before opening, ensure that there is no explosive gas and no voltage.

→ Handle cover and housing parts with care.

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

→ Do not jam cover during fitting.

Figure 58: top: KP/KPH, bottom: KES



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

Removing the plug:

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

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

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

Fitting the plug:

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

12.3 Maintenance

Maintenance intervals

After 3 years at the latest for Ex certified products.

Lubrication

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

Notes regarding the maintenance

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

12.4 Disposal and recycling

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

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

The following generally applies:

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

13. Technical data

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

13.1 Features and functions of actuator

Explosion protection	Standard version (ATEX): • II2G Ex de IIC (IIB, IIB+H_2) T4 (T3) Gb • II2D Ex tb IIIC T130°C (T190°C) Db IP68 • II2G c IIC T4 Standard version (IECEx): • Ex de IIC (IIB, IIB+H_2) T4 (T3) Gb • Ex tb IIIC T130°C (190°C) Db IP68 For actual version, refer to actuator name plate.
EC type examination certificate	DEKRA 11ATEX0008 X DEKRA 12ATEX0143 X IECEx DEK 12.0022 X
Protection type	• Ex **d** flameproof enclosure: - Motor compartment - Switch compartment - Controls housing - Terminal compartment (for electrical connection: KES-Exd) • Ex **e** increased safety: - Terminal compartment (for electrical connection: KP, KPH or KES) • Ex **i** Intrinsic safety: - Current circuit via electronic position transmitter RWG 5020.2 Ex (option) • **c** constructional safety: - Gear housing
Type of duty[1)]	Standard: • SAEx: Short-time duty S2 - 15 min • SAREx: Intermittent duty S4 - 25 % Options: • SAEx: Short-time duty S2 - 30 min • SAREx: Intermittent duty S4 - 50 %
Torque range	Refer to actuator name plate
Output speed	Refer to actuator name plate
Motor	Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC 60034
Motor voltage and frequency	Refer to motor name plate
Insulation class	Standard: F, tropicalized Option: H, tropicalized
Motor protection	Thermoswitches (NC) in the actuator and in the thermal overload relay of the controls
Self-locking	Self-locking: Output speeds up to 90 rpm (50 Hz), 108 rpm (60 Hz) NOT self-locking: Output speeds up to 125 rpm (50 Hz), 150 rpm (60 Hz) Multi-turn actuators are self-locking, if the valve position cannot be changed from standstill while torque acts upon the output drive.
Limit switching	Counter gear mechanism for end positions CLOSED and OPEN Turns per stroke: 2 to 500 (standard) or 2 to 5,000 (option) Standard: • Single switches (1 NC and 1 NO, not galvanically isolated) for each end position Options: • Tandem switches (2 NC and 2 NO) for each end position, switches galvanically isolated • Triple switches (3 NC and 3 NO) for each end position, switches galvanically isolated • Intermediate position switch (DUO limit switching), adjustable for any position

Torque switching	Torque switching adjustable for directions OPEN and CLOSE Standard: Single switch (1 NC and 1 NO; not galvanically isolated) for each direction Option: Tandem switches (2 NC and 2 NO) for each direction, switches galvanically isolated
Position feedback signal, analogue (option)	Potentiometer or 0/4 – 20 mA (RWG)
Mechanical position indicator (option)	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Running indication	Blinker transmitter (standard for SA, option for SAR)
Heater in switch compartment	Standard: Resistance type heater, 5 W, 24 V DC, (internal supply)
Motor heater (option)	Voltages: 110 – 120 V AC, 220 – 240 V AC or 400 V AC (externally supplied) Power depending on the size 12.5 – 25 W
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable
Connection to controls	AUMA plug/socket connector with screw-type connection
Valve attachment	Standard: B1 according to EN ISO 5210 Options: A, B2, B3, B4 according to EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drive types: AF, B3D, ED, DD, IB1, IB3 A prepared for stem lubrication
Sensor system	
Indication for manual operation (option)	Indication whether manual operation is active/not active via switch (1 change-over contact)

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

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

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

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

13.2 Features and functions of actuator controls

Power supply, mains frequency	For mains voltage and mains frequency, refer to name plates at the controls and the motor Permissible variation of the mains voltage: ±10 % Permissible variation of the mains frequency: ±5 % Option: Permissible variation of the mains voltage: –10 %
Current consumption	Motor current consumption: Refer to motor name plate Current consumption of the controls depending on mains voltage: 100 to 120 V AC = max. 575 mA 208 to 240 V AC = max. 275 mA 380 to 500 V AC = max. 160 mA
Rated power	The controls are designed for the rated motor power, refer to motor name plate
Overvoltage category	Category III according to IEC 60364-4-443
Switchgear[1) 2)]	Standard: Reversing contactors (mechanically and electrically interlocked) for motor power up to power class A1 Options: • Reversing contactors (mechanically and electrically interlocked) for motor power up to power class A2
Auxiliary voltage output	Standard: 230 V AC ±10 %, max. 2.5 W for supply of the control inputs., galvanically isolated from internal voltage supply Option: 24 V DC ±5 %, max. 10 mA for supply of the control inputs, galvanically isolated from internal voltage supply 115 V AC ±10 %, max. 30 mA for supply of the control inputs, galvanically isolated from internal voltage supply
Control	Standard: Control inputs OPEN - STOP - CLOSE, 230 V AC, internally supplied (non potential-free) EMERGENCY-STOP function from control room, independent of position of selector switch Options: Control inputs , OPEN - STOP - CLOSE, 24 V DC, externally supplied (with galvanic isolation via contact), current consumption: approx. 15 mA per input Control inputs OPEN - STOP - CLOSE, 24 V DC, internally supplied (non potential-free) Control inputs OPEN - STOP - CLOSE, 115 V AC, internally supplied (non potential-free)
Status signals	Standard: Output signals for end positions OPEN/CLOSED, 230 V AC, internally supplied (non potential-free) for external indication lights OPEN/CLOSE (P_{max} = 2.5 W) Options: • 5 potential-free output signals with one common, max. 250 V AC, 2 A (resistive load) - Motor protection tripped (thermal fault) - Torque fault - No torque fault • Selector switch position LOCAL/REMOTE
Position feedback signal (option)	Galvanically isolated analogue output E2 = 0/4 – 20 mA (load max. 300 Ω)

Local controls	Standard: • Selector switch LOCAL - OFF - REMOTE (lockable in all three positions) • Push buttons OPEN, STOP, CLOSE • 2 indication lights: - End position CLOSED (yellow), end position OPEN (green) Options: • 3 indication lights - End position CLOSED (yellow), fault (red), end position OPEN (green) • Special colours for the indication lights • Protection cover, lockable
Functions	Standard: • Switch-off mode adjustable - Limit or torque seating for end position OPEN and end position CLOSED • Overload protection against excessive torques over the whole travel • Phase failure monitoring with automatic phase correction • Push-to-run operation or self-retaining in REMOTE • Push-to-run operation or self-retaining in LOCAL
Motor protection evaluation	Standard: Thermal overload relay in combination with thermoswitches in the actuator motor
Electrical connection	Standard: Plug/socket connector with screw-type terminals (KP, KPH) Ex e (increased safety) and M-threads Options: • Plug/socket connector with terminal blocks (KES) Ex e (increased safety) • Plug/socket connector with terminal blocks (KES) Ex d (flameproof enclosure) • Pg-threads, NPT-threads, G-threads, special threads • Parking frame for wall mounting of the disconnected plug • Protection cover for plug compartment (when plug is removed)
Wiring diagram	Refer to name plate

1) The reversing contactors are designed for a lifetime of 2 million starts.
2) For the assignment of AUMA power classes, please refer to electrical data on actuator.

13.3 Service conditions

Use	Indoor and outdoor use permissible
Mounting position	Any position
Enclosure protection according to EN 60529	Standard: IP 68 with AUMA 3-ph AC motor/1-ph AC motor According to AUMA definition, enclosure protection IP 68 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 flooding. • Modulating duty is not possible during continuous immersion. For enclosure protection IP 68, the terminal compartment is additionally sealed against the interior – double sealed. For actual version, refer to actuator/controls name plate.
Corrosion protection	Standard: • KS: Suitable for installation in industrial units, in water or power plants with a low pollutant concentration as well as for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in wastewater treatment plants, chemical industry) Options: • KX: Suitable for installation in extremely aggressive atmospheres with high humidity and high pollutant concentration
Installation altitude	Standard: ≤ 2,000 m above sea level Option: > 2,000 m above sea level, please contact AUMA
Pollution degree	Pollution degree 4 (when closed) according to 50178

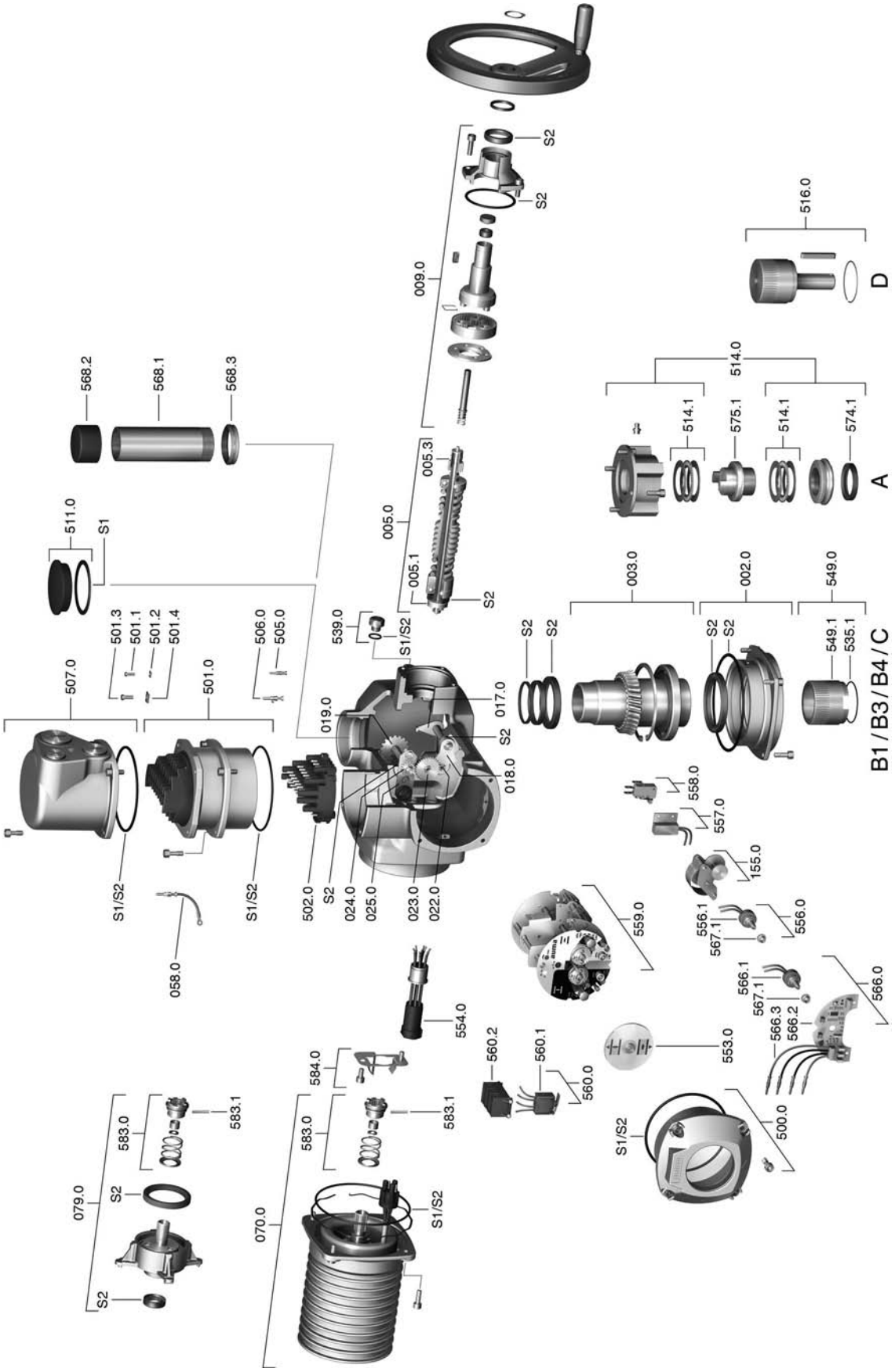
Finish coating	Standard: Paint based on polyurethane (powder coating)
Colour	Standard: AUMA silver-grey (similar to RAL 7037)
Ambient temperature	Standard: • –20 °C to +40/+60 °C For actual version, refer to actuator/controls name plate.
Vibration resistance according to IEC 60068-2-6	1 g, from 10 to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Not valid in combination with gearboxes.
Lifetime	AUMA multi-turn actuators meet or exceed the lifetime requirements of EN 15714-2. For further details, please contact AUMA
Weight	Refer to separate technical data

13.4 Further information

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

14. Spare parts

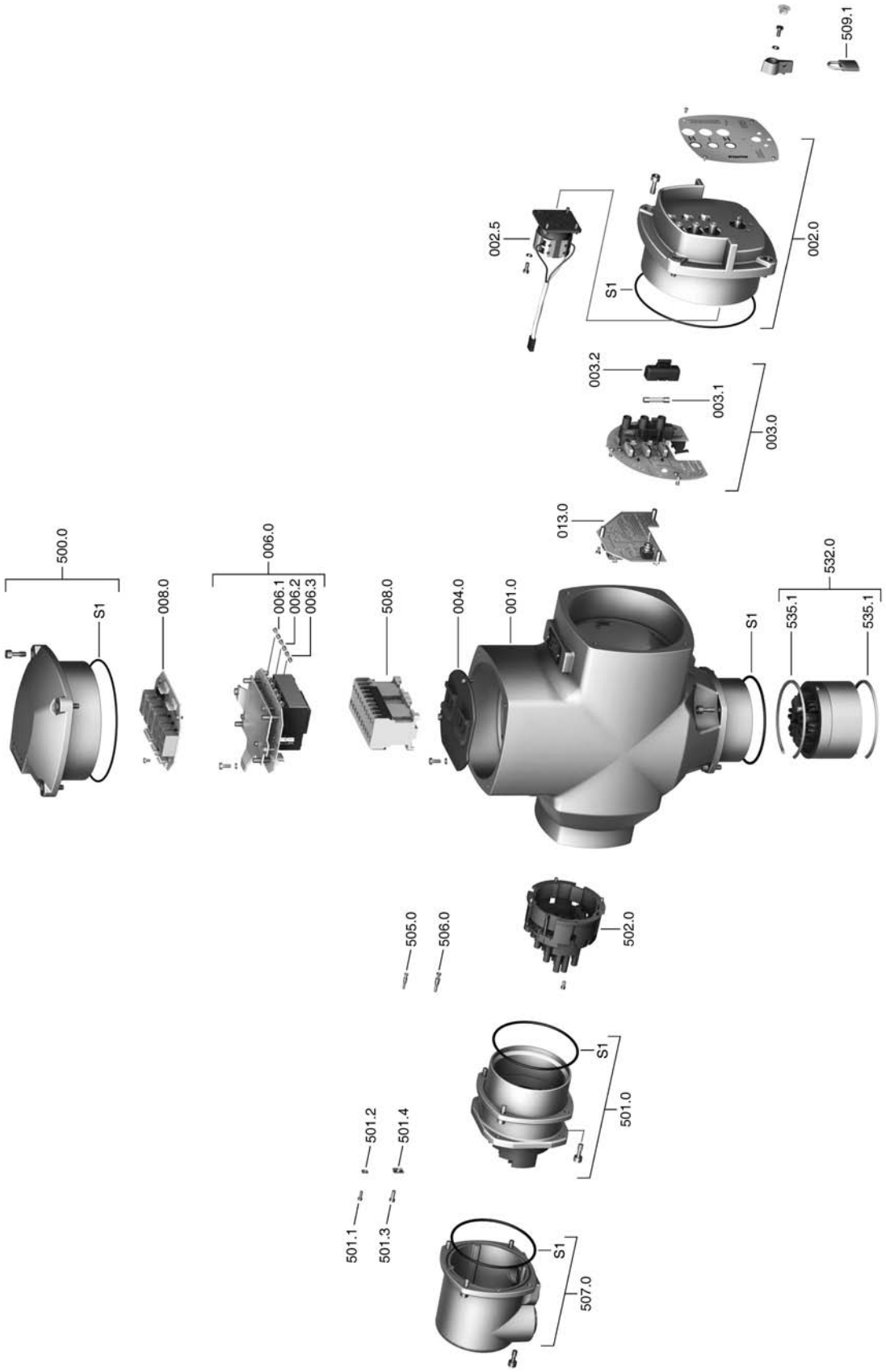
14.1 Multi-turn actuators SAEx 07.2 – SAEx 16.2/SAREx 07.2 – SAREx 16.2 with plug/socket connector and screw-type terminals (KP, KPH)



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

No.	Designation	Type	No.	Designation	Type
002.0	Bearing flange	Sub-assembly	535.1	Snap ring	
003.0	Hollow shaft with worm wheel	Sub-assembly	539.0	Screw plug	Sub-assembly
005.0	Drive shaft	Sub-assembly	542.0	Handwheel with ball handle	Sub-assembly
005.1	Motor coupling on output drive shaft		549.0	Output drive type B1/B3/B4/E	Sub-assembly
005.3	Manual drive coupling		549.1	Output drive sleeve B1/B3/B4/C	
009.0	Planetary gearing for manual drive	Sub-assembly	553.0	Mechanical position indicator	Sub-assembly
017.0	Torque lever	Sub-assembly	554.0	Socket carrier with motor cable harness	Sub-assembly
018.0	Gear segment		556.0	Potentiometer for position transmitter	Sub-assembly
019.0	Crown wheel	Sub-assembly	556.1	Potentiometer without slip clutch	
022.0	Drive pinion II for torque switching	Sub-assembly	557.0	Heater	Sub-assembly
023.0	Output drive wheel for limit switching	Sub-assembly	558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
024.0	Drive wheel for limit switching	Sub-assembly	559.0-1	Control unit without torque switching heads, without switches	Sub-assembly
025.0	Locking plate	Sub-assembly	559.0-2	Control unit with magnetic limit and torque transmitter (MWG) for Non-intrusive version in combination with AUMATIC integral controls	Sub-assembly
058.0	Wire for protective earth (pin)	Sub-assembly	560.0-1	Switch stack for direction OPEN	Sub-assembly
070.0	Motor (VD motor incl. no. 079.0)	Sub-assembly	560.0-2	Switch stack for direction CLOSE	Sub-assembly
079.0	Planetary gear for motor drive (SA/SAR 07.2 – 16.2 for VD motor)	Sub-assembly	560.1	Switch for limit/torque	
155.0	Reduction gearing	Sub-assembly	560.2	Switch case	
500.0	Cover for switch compartment	Sub-assembly	566.0	Position transmitter RWG	Sub-assembly
501.0	Terminal board	Sub-assembly	566.1	Potentiometer for RWG without slip clutch	Sub-assembly
501.1	Screw – Control terminal		566.2	Electronic board RWG	Sub-assembly
501.2	Washer – Control terminal		566.3	Wires for RWG	Sub-assembly
501.3	Screw – Power terminal		567.1	Slip clutch for potentiometer/RWG	Sub-assembly
501.4	Washer – Power terminal		568.1	Stem protection tube (without cap)	
502.1	Pin carrier (without pins)	Sub-assembly	568.2	Cap for stem protection tube	
505.0	Pin for controls	Sub-assembly	568.3	V-Seal	
506.0	Pin for motor	Sub-assembly	574.1	Radial seal output drive type A for ISO flange	
507.0	Plug cover	Sub-assembly	575.1	Stem nut type A	
511.0	Threaded plug		583.0	Motor coupling on motor shaft	Sub-assembly
514.0	Output drive type A (without stem nut)	Sub-assembly	583.1	Pin for motor coupling	
514.1	Axial needle roller bearing		584.0	Retaining spring for motor coupling	Sub-assembly
516.0	Output drive type D		S1	Seal kit, small	Set
			S2	Seal kit, large	Set

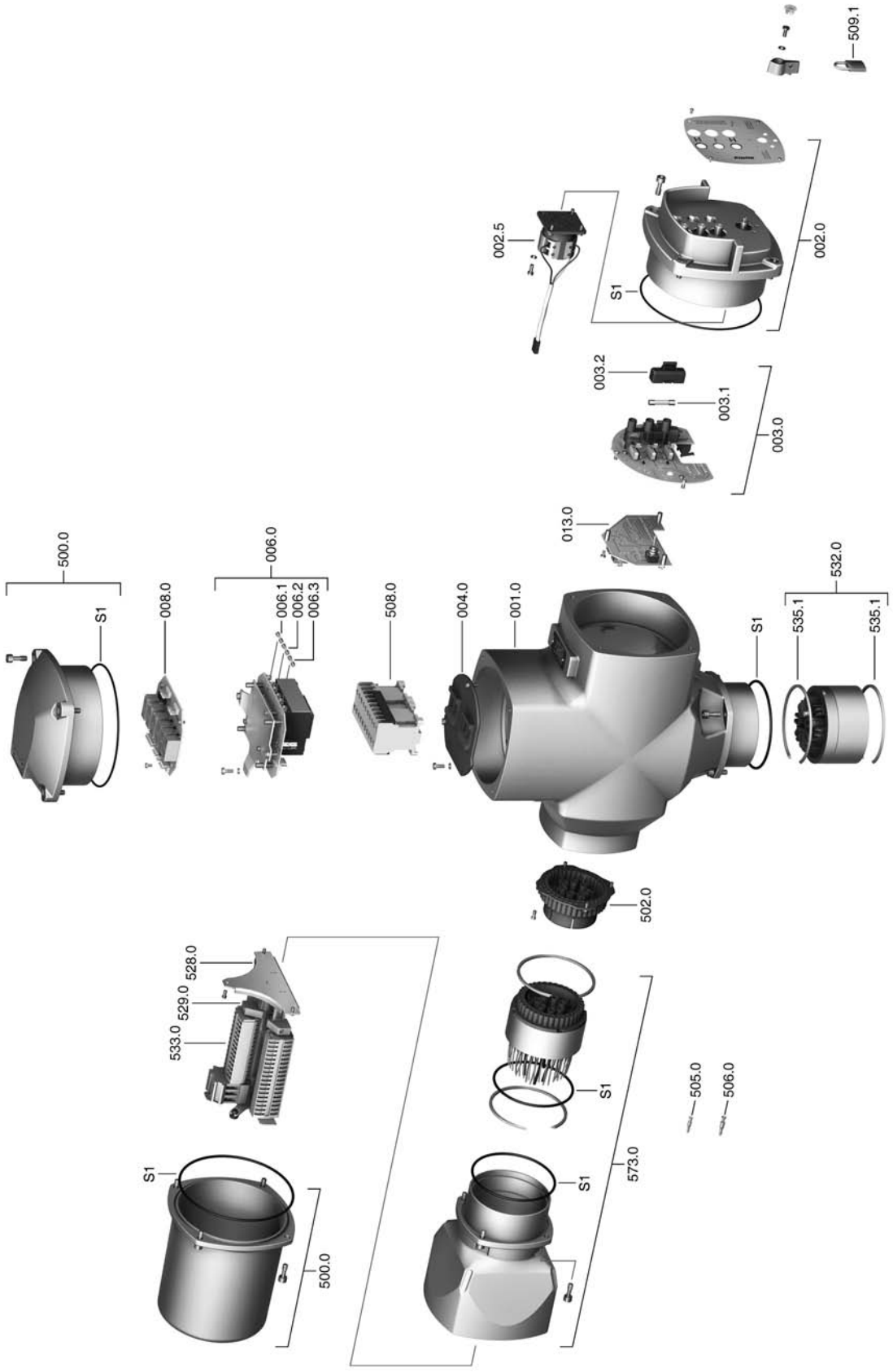
14.2 Actuator controls AUMA MATIC BASIC AMBExC 01.1 with plug/socket connector with screw-type connection (KP, KPH)



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

No.	Designation	Type
001.0	Housing	Sub-assembly
002.0	Local controls	Sub-assembly
002.5	Selector switch	Sub-assembly
003.0	Signal and control board	Sub-assembly
003.1	Primärsicherung F1/F2	Sub-assembly
003.2	Cover for fuse	Sub-assembly
004.0	Carrier for contactors	Sub-assembly
006.0	Power supply unit including mounting plate	Sub-assembly
006.1	Secondary fuse F3	
006.2	Secondary fuse F4	
006.3	Secondary fuse F5	
008.0	Relay board	Sub-assembly
013.0	Wiring board	Sub-assembly
500.0	Cover	Sub-assembly
501.0	Terminal board	Sub-assembly
501.1	Screw for control terminal	
501.2	Washer for control terminal	
501.3	Screw for power terminal	
501.4	Washer for power terminal	
502.0	Pin carrier without pins	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Plug cover	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
532.0	Line bushing (actuator connection)	Sub-assembly
535.1	Circlip	
S	Seal kit	Set

14.3 Actuator controls AUMA MATIC BASIC AMBExC 01.1 with plug/socket connector and terminal blocks (KES)



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

No.	Designation	Type
001.0	Housing	Sub-assembly
002.0	Local controls	Sub-assembly
002.5	Selector switch	Sub-assembly
003.0	Signal and control board	Sub-assembly
003.1	Primary fuse F1/F2	Sub-assembly
003.2	Cover for fuse	Sub-assembly
004.0	Carrier for contactors	Sub-assembly
006.0	Power supply unit including mounting plate	Sub-assembly
006.1	Secondary fuse F3	
006.2	Secondary fuse F4	
006.3	Secondary fuse F5	
008.0	Relay board	Sub-assembly
013.0	Wiring board	Sub-assembly
500.0	Cover	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Plug cover	Sub-assembly
508.0	Switchgear	Sub-assembly
509.1	Padlock	
528.0	Terminal frame (without terminals)	Sub-assembly
529.0	End piece	
532.0	Line bushing (actuator connection)	Sub-assembly
533.0	Terminals for motor/controls	
535.1	Circlip	
573.0	Plug-in electrical connection	Sub-assembly
S	Seal kit	Set

15. Certificates

15.1 Declaration of Incorporation and EC Declaration of Conformity

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Solutions for a world in motion

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

for electric AUMA multi-turn actuators of the type ranges **SAEx 07.2 – SAEx 16.2** and **SAREx 07.2 – SAREx 16.2** in version **AUMA NORM**, **AUMA SEMIPACT**, **AUMA MATIC** or **AUMATIC**.

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

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

EN 12100-1: 2003	ISO 5210: 1996
EN 12100-2: 2003	EN 60204-1: 2006

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

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

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

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

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

EN 60079-0: 2006	EN 60079-11: 2007	EN 1127-1: 2007
EN 60079-1: 2007	EN 13463-1: 2009	
EN 60079-7: 2007	EN 13463-5: 2003	

The EC type examination certificate DEKRA 11 ATEX 008 X issued by the DEKRA Certification B.V. is available for the multi-turn actuators mentioned above.

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

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

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

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

Muellheim, 2011-09-01

H. Newerla, General Management

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

Y005.176/002/en

15.2 ATEX certificate

CERTIFICATE

EC-Type Examination

(1)

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

(3) EC-Type Examination Certificate Number: **DEKRA 11ATEX0008 X** Issue Number: **1**

(4) Equipment: **Multi-Turn Actuator, Types SA.Ex 07.2 to SA.Ex 16.2 in version AUMA NORM, AUMA MATIC or AUMATIC**

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

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

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

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

The examination and test results are recorded in confidential test report number NL/DEK/ExTR11.0044/xx.

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

EN 60079-0 : 2009 **EN 60079-1 : 2007** **EN 60079-7 : 2007**
EN 61241-0 : 2006 **EN 61241-1 : 2004**

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

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

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

II 2 G Ex d IIC T4 or T3 Gb or **Ex d IIB T4 or T3 Gb**
II 2 G Ex de IIC T4 or T3 Gb or **Ex de IIB T4 or T3 Gb**
II 2 D Ex tD A21 IP6x T130 °C or T190 °C

This certificate is issued on 29 July 2011 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

DEKRA Certification B.V.

C.G. van Es
Certification Manager

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PRODUCTS RvA C 001

All testing, inspection, auditing and certification activities of the former KEMA Quality are an integral part of the DEKRA Certification Group

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DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 11ATEX0008 X** Issue No. 1

(15) **Description**

The Multi-turn actuator, types SA.Ex 07.2 to SA.Ex 16.2 in version AUMA NORM, AUMA MATIC or AUMATIC are in type of protection flameproof enclosure "d" for the motor, the controls and the switch compartment. The terminal compartment is in type of protection increased safety "e" or flameproof enclosures "d". In order to guarantee the temperature class, the 3-ph and 1-ph AC motor is equipped either with thermo switches and a thermal overload relay or with PTC's (three for 3-ph and one for 1-ph AC motor) integrated in each winding and a suitable electronics device for switching off in case of over temperature.

Ambient temperature range -20 °C to +60 °C.

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

Multi-turn actuators

The type designation of the multi-turn actuators is composed as follows:

SA.Ex 10.2-F10

- Multi-turn actuator SA
- Additional designation for the version without = standard, R = modulating duty
- explosion-proof version
- Sizes 07.2; 07.6; 10.2; 14.2; 14.6; 16.2
- Designation for mounting flange

Example:

SAREx 07.6 - F07 Multi-turn actuator for modulating duty in type of duty S4..% or S5..%

Integral controls

AMExC 01.1

- Type of controls: AC = AUMATIC, AM = AUMA MATIC, AMMC = AUMA MATIC MC, SEM = Semipact, AMB = AUMA MATIC Basic
- Explosion-proof version for group IIC
- Size 01.1, Size 01.2 (only Type ACExC01.2)

Example:

AMBExC 01.1 Integral controls type AUMA MATIC Basic (reversing contactors)

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 11ATEX0008 X** Issue No. 1

Electrical data

3-phase AC motor

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

1-phase AC motor

Actuator size	Motor size	Power [1]
SA.Ex 07.2	AEX / ACX / VEX 48	0.02 – 0.30 kW
SAEx 07.6	AEX / ACX / VEX 48	0.03 – 0.50 kW
SAEx 10.2	VEX 48 ACX 56	0.06 – 0.25 kW 0.04 – 1.00 kW
SA.Ex 14.2	ACX / VCX / VEX 56	0.12 – 0.75 kW
SA.Ex 14.6	VCX / VEX 56	0.20 – 0.80 kW

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

Motor type: 3-phase AC squirrel cage motor
Motor voltage: 690 V max.
Motor current: 25 A max.
Control voltage: 250 V max.
Control current: 5 A max.
Frequency: 50/60 Hz
Isolation class: F or H
Circuit type: star or delta circuit (voltage dependent)
Operation type: S2 - ... min
S4 - ... % ED
S5 - ... % ED

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate DEKRA 11ATEX0008 X** Issue No. 1

Motor type: 1-phase AC Asynchronous motor
Motor voltage: 240 V max.
Motor current: 25 A max.
Control voltage: 250 V max.
Control current: 5 A max.
Frequency: 50/60 Hz
Isolation class: F or H
Circuit type: single phase
Operation type: S2 - ... min
S4 - ... % ED
S5 - ... % ED

Installation instructions

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

(16) **Test Report**

No. NL/DEK/ExTR11.0044/xx.

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

The flame path length is other than required by EN 60079-1. Contact the manufacturer for information on the dimensions of the flameproof joints.

The apparatus shall not be used in applications where there is a high risk of mechanical danger.

The multi-turn actuators are provided with special fasteners of property class A2-70.

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

Covered by the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. NL/DEK/ExTR11.0044/xx.

Index

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