Multi-turn actuators
SAEx 07.2 – SAEx 16.2
SAREx 07.2 – SAREx 16.2
Control unit - electromechanical with actuator controls
ACExC 01.2 Intrusive

Control
Parallel
ProfiBus DP
Profinet
Modbus RTU
→ Modbus TCP/IP
Foundation Fieldbus
HART
Read operation instructions first.

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

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

Reference documents:
- Manual (Operation and setting) of actuator controls ACExC 01.2 Modbus
- Manual (Fieldbus device integration) of actuator controls ACExC 01.2 Modbus

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

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1. Safety instructions

1.1. Basic information on safety

**Standards/directives**

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

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

- Standards and directives such as IEC 60079 “Explosive atmospheres”.
  - Part 14: Electrical installations design, selection and erection.
  - Part 17: Electrical installations inspection and maintenance.
- Applicable configuration guidelines for network applications.

**Safety instructions/warnings**

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

**Qualification of staff**

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

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

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 national regulations.
- During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature using an appropriate thermometer and wearing protective gloves, if required, prior to working on the device.

**Protective measures**

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

**Maintenance**

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

Any device modification requires prior written consent of the manufacturer.
1.2. Range of application

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

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

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

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

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

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

No liability can be assumed for inappropriate or unintended use.

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

Information

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

1.3. Warnings and notes

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

⚠️ DANGER

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

⚠️ WARNING

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

⚠️ CAUTION

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

🌿 NOTICE

Potentially hazardous situation. Failure to observe this warning could result in property damage. Is not used for personal injury.
Arrangement and typographic structure of the warnings

**DANGER**

Type of hazard and respective source!

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

→ Measures to avoid the danger
→ Further measure(s)

Safety alert symbol ! warns of a potential personal injury hazard.
The signal word (here: DANGER) indicates the level of hazard.

1.4. References and symbols

The following references and symbols are used in these instructions:

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

- Symbol for CLOSED (valve closed)
- Symbol for OPEN (valve open)
- Important information before the next step. This symbol indicates what is required for the next step or what has to be prepared or observed.

**M ▶**  **Via the menu to parameter**

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

**< >**  **Reference to other sections**

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

2.1. Name plate

Figure 1: Arrangement of name plates

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

**Actuator name plate**

Figure 2: Actuator name plate (example)

1. AUMA Riester GmbH & Co. KG
2. D-79379 Mülheim, Germany
3. SAEx 07.2-F07/- a 3 b 1
4. Order No.: 12345678
5. No.: 0516MD12345
6. n: 32 1/min
7. T close: 10-30 Nm
8. T open: 10-30 Nm
9. Lubr: F15
10. Temp: -30°C/+40°C
11. Data Matrix code

AUMA (= manufacturer logo); CEC (= CE mark)

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

Figure 3: Actuator controls name plate

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

<table>
<thead>
<tr>
<th>AUMA (= manufacturer logo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type designation</td>
</tr>
<tr>
<td>2. Order number</td>
</tr>
<tr>
<td>3. Serial number</td>
</tr>
<tr>
<td>4. Actuator terminal plan</td>
</tr>
<tr>
<td>5. Actuator controls terminal plan</td>
</tr>
<tr>
<td>6. Mains voltage</td>
</tr>
<tr>
<td>7. AUMA power class for switchgear</td>
</tr>
<tr>
<td>8. Permissible ambient temperature</td>
</tr>
<tr>
<td>9. Enclosure protection</td>
</tr>
<tr>
<td>10. Control</td>
</tr>
<tr>
<td>11. DataMatrix-Code</td>
</tr>
</tbody>
</table>

### Motor name plate

Figure 4: Motor name plate (example)

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

<table>
<thead>
<tr>
<th>AUMA (= manufacturer logo)</th>
<th>CE (= CE mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Motor type</td>
<td></td>
</tr>
<tr>
<td>2. Motor article number</td>
<td></td>
</tr>
<tr>
<td>3. Serial number</td>
<td></td>
</tr>
<tr>
<td>4. Current type, mains voltage</td>
<td></td>
</tr>
<tr>
<td>5. Rated power</td>
<td></td>
</tr>
<tr>
<td>6. Rated current</td>
<td></td>
</tr>
<tr>
<td>7. Type of duty</td>
<td></td>
</tr>
<tr>
<td>8. Enclosure protection</td>
<td></td>
</tr>
<tr>
<td>9. Motor protection (temperature protection)</td>
<td></td>
</tr>
<tr>
<td>10. Insulation class</td>
<td></td>
</tr>
<tr>
<td>11. Speed</td>
<td></td>
</tr>
<tr>
<td>12. Power factor cos phi</td>
<td></td>
</tr>
<tr>
<td>13. Mains frequency</td>
<td></td>
</tr>
<tr>
<td>14. Data Matrix code</td>
<td></td>
</tr>
</tbody>
</table>
Approval plate in explosion-proof version

Figure 5: Approval plates in explosion-proof version (examples)

[Image of approval plates]

<table>
<thead>
<tr>
<th></th>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ex symbol, CE mark, number of test authority</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ex certificate (number)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Electrical gas explosion protection</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Electrical dust explosion protection</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Non-electrical explosion protection</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Threads for line bushings at electrical connection</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Not used</td>
<td></td>
</tr>
</tbody>
</table>

**Classification:**

- Electrical gas explosion protection
- Electrical dust explosion protection
- Non-electrical explosion protection
- Threads for line bushings at electrical connection
- Not used

**Description referring to name plate indications**

**Type designation**

Figure 6: Type designation (example)

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAEx 07.2</td>
<td>F10</td>
</tr>
<tr>
<td>SAEx 16.2</td>
<td></td>
</tr>
<tr>
<td>SAREx 07.2</td>
<td></td>
</tr>
<tr>
<td>SAREx 16.2</td>
<td></td>
</tr>
</tbody>
</table>

1. Type and size of actuator
2. Flange size
3. Ex marking

**Type and size**

These instructions apply to the following devices types and sizes:

- **Type SAEx:** Multi-turn actuators for open-close duty
  Sizes: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
- **Type SAREx:** Multi-turn actuators for modulating duty
  Sizes: 07.2, 07.6, 10.2, 14.2, 14.6, 16.2
- **Type ACExC:** AUMATIC actuator controls
  Sizes: 01.2
Ex marking

Table 1:
Marking for explosion protection (example of /-a3b1)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3</td>
<td>b</td>
<td>1</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Not used

**Motor type**
- a = ADX or VDX: 3-phase AC motor
- b = AEX, ACX, VEX, VCX: 1-phase AC motor

**Protection type of electrical connection**
- 3 = Terminal compartment Ex e increased safety
- 4 = Terminal compartment Ex d flameproof enclosure

**Protection type of position transmitter**
- a = Without intrinsically safe electric circuit
- b = Electric circuit Ex I Intrinsic safety (RWG 5020.2Ex)

**Protection type of fieldbus**
- 1 = Without Ex fieldbus connection
- 2 = Ex nL non-incendive fieldbus connection
- 3= Ex ic intrinsically safe fieldbus connection

Order number

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

Please always state this number for any product inquiries.

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

Actuator serial number

Table 2:
Description of serial number (with example 0516MD12345)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>16</td>
<td>MD12345</td>
<td></td>
</tr>
</tbody>
</table>

- 05 Positions 1+2: Assembly in week = week 05
- 16 Positions 3+4: Year of manufacture = 2016
- MD12345 Internal number for unambiguous product identification

Actuator terminal plan

Position 9 following TPA: Position transmitter version

- 0 = Without position transmitter
- A, B, J, K, L, N, R, T = Potentiometer
- C, D, E, G, H, M, P, S, U = Electronic position transmitter

AUMA power class for switchgear

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

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

Control

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

<table>
<thead>
<tr>
<th>Input signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus TCP/IP</td>
<td>Control via Modbus TCP/IP interface</td>
</tr>
</tbody>
</table>
When registered as authorised user, you may use our AUMA Assistant App to scan the Data Matrix code and directly access the order-related product documents without having to enter order number or serial number.

Figure 7: Link to AUMA Assistant App:

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

2.2. Short description

Multi-turn actuator
Definition in compliance with EN 15714-2/EN ISO 5210:
A multi-turn actuator is an actuator which transmits torque to a valve for at least one full revolution. It is capable of withstanding thrust.

AUMA multi-turn actuators SAEx 07.2 – SAEx 16.2/SAREx 07.2 – SAREx 16.2 are driven by an electric motor and are capable of withstanding thrust in combination with output drive type A. For manual operation, a handwheel is provided. Switching off in end positions may be either by limit or torque seating. Actuator controls are required to operate or process the actuator signals.

Actuator controls
AEMC 01.2 actuator controls are used to operate AUMA actuators and are supplied ready for use. The actuator controls may be mounted directly to the actuator or separately on a wall bracket.

The functions of the AEMC 01.2 actuator controls include standard valve control in OPEN-CLOSE duty, positioning, process control, logging of operating data, diagnostic functions right through control via various interfaces (e.g. Fieldbus, Ethernet and HART).

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

When set to local control, it is possible to

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

Intrusive - Non-Intrusive

- Intrusive version (control unit: electromechanical):
  Limit and torque setting is performed via switches in the actuator.
- Non-Intrusive version (control unit: electronic):
  Limit and torque setting is performed via the controls, without removal of actuator or actuator controls covers. For this purpose, the actuator is equipped with an MWG (magnetic limit and torque transmitter), also capable to supply analogue torque feedback signals/torque indication and analogue position feedback signals/position indication at the actuator controls output.
3. Transport, storage and packaging

3.1. Transport

For transport to place of installation, use sturdy packaging.

**Hovering load!**

*Risk of death or serious injury.*

→ Do NOT stand below hovering load.
→ Attach ropes or hooks for the purpose of lifting by hoist only to housing and NOT to handwheel.
→ Actuators mounted on valves: Attach ropes or hooks for the purpose of lifting by hoist to valve and NOT to actuator.
→ Actuators mounted to gearboxes: Attach ropes or hooks for the purpose of lifting by hoist only to the gearbox using eyebolts and NOT to the actuator.
→ Actuators mounted to controls: Attach ropes or hooks for the purpose of lifting by hoist only to the actuator and NOT to the controls.
→ Respect total weight of combination (actuator, actuator controls, gearbox, valve)
→ Secure load against falling down, sliding or tilting.
→ Perform lift trial at low height to eliminate any potential danger e.g. by tilting.

Figure 8: Example: Lifting the actuator

<table>
<thead>
<tr>
<th>Type designation Actuator</th>
<th>Motor type1)</th>
<th>Weight2) approx. [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAEx 07.2/ SAREx 07.2</td>
<td>VDX...</td>
<td>22</td>
</tr>
<tr>
<td>SAREx 07.2</td>
<td>ADX...</td>
<td>23</td>
</tr>
<tr>
<td>SAEx 07.6/ SAREx 07.6</td>
<td>VDX...</td>
<td>22</td>
</tr>
<tr>
<td>SAREx 07.6</td>
<td>ADX...</td>
<td>24</td>
</tr>
<tr>
<td>SAEx 10.2/ SAREx 10.2</td>
<td>VDX...</td>
<td>26</td>
</tr>
<tr>
<td>SAREx 10.2</td>
<td>ADX...</td>
<td>28</td>
</tr>
<tr>
<td>SAEx 14.2/ SAREx 14.2</td>
<td>VDX...</td>
<td>48</td>
</tr>
<tr>
<td>SAREx 14.2</td>
<td>ADX...</td>
<td>52</td>
</tr>
</tbody>
</table>
Weights of multi-turn actuators SAEx 07.2 – SAEx 16.2 / SAREx 07.2 – SAREx 16.2 with 3-phase AC motors

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Motor type</th>
<th>Weight (approx.) [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAEx 14.6/ SAREx 14.6</td>
<td>VDX...</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>ADX...</td>
<td>56</td>
</tr>
<tr>
<td>SAEx 16.2/ SAREx 16.2</td>
<td>VDX...</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>ADX...</td>
<td>88</td>
</tr>
</tbody>
</table>

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

Table 5:
Weights of multi-turn actuators SAEx 07.2 – SAEx 16.2 / SAREx 07.2 – SAREx 16.2 With 1-phase AC motors

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Motor type</th>
<th>Weight (approx.) [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAEx 07.2/ SAREx 07.2</td>
<td>VEX...</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>AEX...</td>
<td>31</td>
</tr>
<tr>
<td>SAEx 07.6/ SAREx 07.6</td>
<td>VEX...</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>AEX...</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>ACX...</td>
<td>40</td>
</tr>
<tr>
<td>SAEx 10.2/ SAREx 10.2</td>
<td>VEX...48-4...</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>VEX...48-2...</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>ACX...56-4...</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>ACX...56-2...</td>
<td>47</td>
</tr>
<tr>
<td>SAEx 14.2/ SAREx 14.2</td>
<td>VEX...</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>VCX...</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>ACX...</td>
<td>67</td>
</tr>
<tr>
<td>SAEx 14.6/ SAREx 14.6</td>
<td>VEX...</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>VCX...</td>
<td>70</td>
</tr>
</tbody>
</table>

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

Table 6:
Weights for output drive type A 07.2 – A 16.2

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Flange size</th>
<th>[kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 07.2</td>
<td>F07</td>
<td>1.1</td>
</tr>
<tr>
<td>A 10.2</td>
<td>F10</td>
<td>2.8</td>
</tr>
<tr>
<td>A 14.2</td>
<td>F14</td>
<td>6.8</td>
</tr>
<tr>
<td>A 16.2</td>
<td>F16</td>
<td>11.7</td>
</tr>
</tbody>
</table>

Table 7:
Weights for output drive type AF 07.2 – AF 16.2

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Flange size</th>
<th>[kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF 07.2</td>
<td>F10</td>
<td>5.2</td>
</tr>
<tr>
<td>AF 07.6</td>
<td>F10</td>
<td>5.2</td>
</tr>
<tr>
<td>AF 10.2</td>
<td>F10</td>
<td>5.5</td>
</tr>
<tr>
<td>AF 14.2</td>
<td>F14</td>
<td>13.7</td>
</tr>
<tr>
<td>AF 16.2</td>
<td>F16</td>
<td>23</td>
</tr>
</tbody>
</table>
3.2. Storage

**NOTICE**

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

**NOTICE**

**Damage on display caused by temperatures below permissible level!**
- AC actuator controls MUST NOT be stored below –30 °C.

**Long-term storage**

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

1. **Prior to storage:**
   - Protect uncoated surfaces, in particular the output drive parts and mounting surface, with long-term corrosion protection agent.

2. **At an interval of approx. 6 months:**
   - Check for corrosion. If first signs of corrosion show, apply new corrosion protection.

3.3. Packaging

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

4.1. Mounting position

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

4.2. Handwheel fitting

Information

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

Figure 9: Handwheel

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

1. If required, fit spacer [1] on input shaft [2].

Information

The retaining ring [4] (together with these operation instructions) is stored in a weatherproof bag, which is attached to the device prior to delivery.

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

NOTICE

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

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

4.3.1. Output drive type A

Application

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


Figure 10: Design of output drive type A

---

**Information**

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

---

**4.3.1.1. Stem nut: finish machining**

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

Figure 11: Output drive type A

---

3. Remove axial bearing washers [2.1] and axial needle roller and cage assemblies [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 axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1], ensuring that all hollow spaces are filled with grease.
7. Place greased axial needle roller and cage assemblies [2.2] and axial bearing washers [2.1] onto stem nut [1].
   **Information:** Ensure that dogs or splines are placed correctly in the keyway of the hollow shaft.
9. Screw in spigot ring [3] until it is firm against the shoulder.

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

Figure 12: Assembly of output drive type A

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].

Table 8:

<table>
<thead>
<tr>
<th>Threads</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>10</td>
</tr>
<tr>
<td>M8</td>
<td>24</td>
</tr>
<tr>
<td>M10</td>
<td>48</td>
</tr>
<tr>
<td>M12</td>
<td>82</td>
</tr>
<tr>
<td>M16</td>
<td>200</td>
</tr>
<tr>
<td>M20</td>
<td>392</td>
</tr>
</tbody>
</table>

Strength class A2-80/A4–80

11. Turn multi-turn actuator with handwheel in direction OPEN until valve flange and output drive A are firmly placed together.

12. Tighten fastening screws [5] between valve and output drive type A crosswise applying a torque according to table.

4.3.2. Output drive types B and E

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

Design
Connection between hollow shaft and valve or gearbox via output drive sleeve fixed to the hollow shaft of the multi-turn actuator via retaining ring.

When exchanging the output drive sleeve, later retrofitting to a different output drive type is possible
- Output drive types B and E: Output drive sleeve with bore according to DIN 3210
- Output drive types B1 – B4: Output drive sleeve with bore according to EN ISO 5210
4.3.2.1. Multi-turn actuator with output drive types B: mount to valve/gearbox

1. Check if mounting flanges fit together.
2. Check if output drive of multi-turn actuator [1] matches the output drive of valve/gearbox or valve/gearbox valve shaft [2/3].
3. Apply a small quantity of grease to the valve or gearbox shaft [3].
4. Fit multi-turn actuator [1].

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

6. Fasten screws crosswise to a torque according to table.

<table>
<thead>
<tr>
<th>Threads</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>10</td>
</tr>
<tr>
<td>M8</td>
<td>24</td>
</tr>
<tr>
<td>M10</td>
<td>48</td>
</tr>
<tr>
<td>M12</td>
<td>82</td>
</tr>
<tr>
<td>M16</td>
<td>200</td>
</tr>
<tr>
<td>M20</td>
<td>392</td>
</tr>
</tbody>
</table>

### 4.4. Accessories for assembly

#### 4.4.1. Stem protection tube for rising valve stem

Figure 15: Assembly of the stem protection tube

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

**Information:** For stem protection tubes made of two or more segments, all parts have to be thoroughly screwed together.

Figure 16: Protection tube made of segments with threaded sleeves (>900 mm)

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


**Information:** For mounting segments, push down seals of segments down to the sleeve (connecting piece).

4. Check whether protective cap [1] for stem protection tube is available, in perfect condition and tightly placed on or screwed to the tube.

**NOTICE**

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

**Risk of damage at stem and/or protection tube.**

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

4.5. **Mounting positions of local controls**

Figure 17: Mounting positions

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

**WARNING**

Flameproof enclosure, danger of explosion!

*Risk of death or serious injury.*

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

**NOTICE**

Electrostatic discharge ESD!

*Risk of damage to electronic components.*

→ Earth both operators and devices.

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

**NOTICE**

Cable damage due to twisting or pinching!

*Risk of functional failures.*

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

4. Fasten screws evenly crosswise.
5. Electrical connection

5.1. Basic information

**Danger due to incorrect electrical connection**

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

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

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

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

### Wiring diagram/terminal plan

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

### Permissible networks (supply networks)

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

### Current type, mains voltage, mains frequency

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

Figure 18: Motor name plate (example)

![Motor name plate example](image)

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

### External supply of the electronics

For external electronics supply with 24 V DC and simultaneous use of DC motors (24 V DC, 48 V DC, 60 V DC, 110 V DC, 220 V DC), the 24 V DC controls' voltage supply should be ensured via the XK25/26 terminals, separately from the power supply (U1, V1). In case of common supply using a single cable (links from U1, V1 with XK25/26, for 24 V DC only !!), short-term excess or falling below the permissible voltage limits can be the consequence during switching (24 V DC +10 %/-10 %). Any possibly incoming operation commands are not executed outside the admissible limit values. The actuator controls briefly signal a fault condition.

### Protection and sizing on site

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

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

We recommend adapting the switchgear sizing to the max. current ($I_{max}$) and selecting and setting the overcurrent protection device in compliance with the indications in the electrical data sheet.
Table 10:
Current consumption of actuator controls

<table>
<thead>
<tr>
<th>Mains voltage</th>
<th>Max. current consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible variation of the mains voltage</td>
<td>±10 %</td>
</tr>
<tr>
<td>100 to 120 V AC</td>
<td>750 mA</td>
</tr>
<tr>
<td>208 to 240 V AC</td>
<td>400 mA</td>
</tr>
<tr>
<td>380 to 500 V AC</td>
<td>250 mA</td>
</tr>
<tr>
<td>515 to 690 V AC</td>
<td>200 mA</td>
</tr>
</tbody>
</table>

Table 11:
Maximum permissible protection

<table>
<thead>
<tr>
<th>Switchgear (switchgear with power class)</th>
<th>Rated power</th>
<th>Max. protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversing contactor A1</td>
<td>up to 1.5 kW</td>
<td>16 A (gL/gG)</td>
</tr>
<tr>
<td>Reversing contactor A2</td>
<td>up to 7.5 kW</td>
<td>32 A (gL/gG)</td>
</tr>
<tr>
<td>Reversing contactor A3</td>
<td>up to 15 kW</td>
<td>63 A (gL/gG)</td>
</tr>
<tr>
<td>Thyristor B1</td>
<td>up to 1.5 kW</td>
<td>16 A (g/R) $I^2t &lt; 1,500\text{A}^2$</td>
</tr>
<tr>
<td>Thyristor B2</td>
<td>up to 3 kW</td>
<td>32 A (g/R) $I^2t &lt; 1,500\text{A}^2$</td>
</tr>
<tr>
<td>Thyristor B3</td>
<td>up to 5.5 kW</td>
<td>63 A (g/R) $I^2t &lt; 5,000\text{A}^2$</td>
</tr>
</tbody>
</table>

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

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

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

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

Table 12:
Fuse for heating system

<table>
<thead>
<tr>
<th>Designation in wiring diagram = F4 ext.</th>
<th>230 V AC</th>
<th>115 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>External power supply</td>
<td>2 A T</td>
<td>1 A T</td>
</tr>
</tbody>
</table>

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

Potential of customer connections

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

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

Safety standards

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

Connecting cables

- We recommend using connecting cables and connecting terminals according to rated current ($I_N$) (refer to motor name plate or electrical data sheet).
- For device insulation, appropriate (voltage-proof) cables must be used. Specify cables for the highest occurring rated voltage.
- Use connecting cables with a minimum temperature range of +80 °C.
- For connecting cables exposed to UV radiation (outdoor installation), use UV resistant cables.
- For the connection of position transmitters, screened cables must be used.
Network cables

This device is equipped with a network port.

Table 13: Cable recommendation

<table>
<thead>
<tr>
<th>Minimum requirement</th>
<th>Cat.5e for fixed installation, 2x2xAWG22 structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable recommendation</td>
<td>Cat.6e for fixed installation, 2x2xAWG22 structure</td>
</tr>
</tbody>
</table>

Prior to installation, please note:

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

Table 14: Transmission rate/cable length for star topology or point-to-point wiring

<table>
<thead>
<tr>
<th>Baud rate (kbit/s)</th>
<th>Maximum cable length: between two network participants for copper cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100 Mbits/s</td>
<td>100 m</td>
</tr>
</tbody>
</table>

5.2. KES electrical connection

Figure 19: KES electrical connection

[1] Terminal blocks
[2] Connection frame

Short description KES plug-in electrical connection with terminal blocks for power and control contacts.
Cable entry via the connection frame. Cover in KES-e version for terminal compartment in type of protection Ex e (increased safety). Cover in KES-Ex d version for terminal compartment in type of protection Ex d (flameproof enclosure).

Plug-in connection is made via the connection frame. For cable connection, simply remove the cover. The connection frame remains within the device. The flameproof interior of the connected devices remains sealed.

### Technical data

Table 15: KES electrical connection

<table>
<thead>
<tr>
<th>KES electrical connection</th>
<th>Power contacts</th>
<th>Control contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of contacts max.</td>
<td>3 + protective earth connection at frame</td>
<td>50</td>
</tr>
<tr>
<td>Designation</td>
<td>U, V, W, (PE)</td>
<td>1 to 50</td>
</tr>
<tr>
<td>Connection voltage max.</td>
<td>750 V</td>
<td>250 V</td>
</tr>
<tr>
<td>Rated current max.</td>
<td>25 A</td>
<td>10 A</td>
</tr>
<tr>
<td>Type of customer connection</td>
<td>Screw connection, PE = Ring lug/U-bracket</td>
<td>Cage clamp, screw-type connection as an option</td>
</tr>
<tr>
<td>Connection diameter max.</td>
<td>6 mm²/10 mm²</td>
<td>2.5 mm² flexible, 4 mm² solid</td>
</tr>
</tbody>
</table>

#### 5.2.1. Terminal compartment: open

Figure 20: Open terminal compartment

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

**Information:** Terminal compartment is designed either in type of protection Ex e (increased safety) or in type of protection Ex d (flameproof enclosure) (refer to Ex marking on name plate). The flameproof interior of the connected device remains closed when removing the cover [1].

**Hazardous voltage!**

*Risk of electric shock.*

→ Disconnect device from the mains before opening.
2. Insert cable glands suitable for connecting cables.  
   **Information:** When selecting cable glands observe type of protection (with Ex e or Ex d approval) and enclosure protection IP (refer to name plate). The type of protection stated on the name plate IP is only ensured if suitable cable glands are used.  
   Figure 21: Name plate, example with enclosure protection IP68

Information: For shielded cables: Use EMC cable glands.

3. Seal unused cable entries with approved plugs suitable for the required protection type.

### 5.2.2. Cable connection

<table>
<thead>
<tr>
<th>Terminal cross sections and terminal tightening torques</th>
<th>Terminal cross sections</th>
<th>Tightening torques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power contacts (U, V, W)</td>
<td>max. 10 mm² (flexible or solid)</td>
<td>1.5 – 1.8 Nm</td>
</tr>
<tr>
<td>PE connection</td>
<td>max. 10 mm² (flexible or solid)</td>
<td>3.0 – 4.0 Nm</td>
</tr>
<tr>
<td>Control contacts (1 to 50)</td>
<td>max. 2.5 mm² flexible, or max. 4 mm² solid</td>
<td>0.6 – 0.8 Nm</td>
</tr>
</tbody>
</table>

1. Remove cable sheathing and insert the wires into the cable glands.  
2. Fasten cable glands with the specified torque to ensure required enclosure protection.  
   **Information:** For shielded cables: Link the cable shield end via the cable gland to the housing (earthing).

3. Strip wires.
4. For flexible cables: Use end sleeves according to DIN 46228.
5. Connect cables according to order-related wiring diagram.
In case of a fault: Hazardous voltage while protective earth conductor is NOT connected!

*Risk of electric shock.*

→ Connect all protective earth conductors.
→ Connect PE connection to external protective earth conductor of connecting cables.
→ Start running the device only after having connected the protective earth conductor.

6. Firmly tighten protective earth to PE connection (symbol: ⚡).  
   Figure 22: Protective earth (PE)

5.2.3. Industrial Ethernet cable: connect

**Information**  
This description applies to the connection via CAT 6A Ethernet cables.

Figure 23: TCP/IP-RTU gateway

[C1] RJ-45 plug-in socket for connecting the Industrial Ethernet cable
[C2] Power supply

**Cable connection**

1. For connecting cables to RJ-45 connectors, proceed in compliance with the connector manufacturer specifications.

 ➤ When using the RJ-45 connector supplied by AUMA, please heed the assembly instructions provided.

2. Connect RJ-45 connector to port for Ethernet cable [1].
5.2.4. Terminal compartment: close

Figure 24: Close terminal compartment

1. Clean sealing faces of cover [1] and connection frame [6].
2. For Ex plug/socket connector designed as KES flameproof: Preserve joint surfaces with an acid-free corrosion protection agent.
3. Check whether O-ring [3] is in good condition, replace if damaged.
4. Apply a thin film of non-acidic grease 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.


5.3. External earth connection

Figure 25: Earth connection for multi-turn actuator
Figure 26: Earth connection for wall bracket

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

Table 17: Terminal cross sections and earth connection tightening torques

<table>
<thead>
<tr>
<th>Conductor type</th>
<th>Terminal cross sections</th>
<th>Tightening torques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid wire and stranded</td>
<td>2.5 mm² to 6 mm²</td>
<td>3 – 4 Nm</td>
</tr>
<tr>
<td>Fine stranded</td>
<td>1.5 mm² to 4 mm²</td>
<td>3 – 4 Nm</td>
</tr>
</tbody>
</table>

For fine stranded (flexible) wires, connection is made via cable lugs/ring terminals. When connecting two individual wires with a U-bracket, cross sections have to be identical.

5.4. Accessories for electrical connection

5.4.1. Actuator controls on wall bracket

Design
Figure 27: Design principle with wall bracket

Application
The wall bracket allows separate mounting of actuator controls and actuator.
- If the actuator cannot be accessed safely.
5.4.2. Parking frame

Figure 28: Parking frame, example with Ex plug/socket connector and cover

Application
Parking frame for safe storage of a disconnected plug or cover.
For protection against touching the bare contacts and against environmental influences.

⚠️ WARNING

Explosion hazard!
Risk of death or serious injury.

→ Prior to opening the device (removing the plug) ensure that the device is free of gas and voltage!
→ Do NOT switch on voltage in potentially explosive atmospheres.
6. Operation

6.1. Manual operation

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

6.1.1. Engage manual operation

**NOTICE**

Damage at the motor coupling due to faulty operation!

→ Engage manual operation only during motor standstill.

1. Press push button.
   
   Figure 29: Engage manual operation

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

**Information**

To protect the valve, an overload protection is available as option for manual operation. If the torque applied at the handwheel exceeds a certain value (refer to order-related technical data sheet), the shear pins will rupture and thus protect the valve from damage. The handwheel can no longer transmit the torque (= handwheel is spinning). Motor operation is still possible. In case of shear pin rupture due to overload, we recommend replacing the safety hub.

Figure 30: Handwheel without/with overload protection

| [1] Handwheel without overload protection (standard) |
| [2] Handwheel with overload protection/safety hub (option) |


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

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

**NOTICE**

Valve damage due to incorrect basic setting!

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

6.2.1. Local actuator operation

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

Figure 31: Local controls

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

**CAUTION**

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

Danger of burns

→ Verify surface temperature and wear protective gloves.

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

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

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

**Information**

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

**Risk of immediate actuator operation when switching on!**

_Risk of personal injuries or damage to the valve_

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

→ Check input signals and functions.

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

[Diagram]

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

**Information**

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

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

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

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

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

Figure 32:
### Table 18: Important push button functions for menu navigation

<table>
<thead>
<tr>
<th>Push buttons</th>
<th>Navigation support on display</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] ▲</td>
<td>Up ▲</td>
<td>Change screen/selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter figures from 0 to 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter figures from 0 to 9</td>
</tr>
<tr>
<td>[3] ◀◀</td>
<td>Ok</td>
<td>Confirm selection</td>
</tr>
<tr>
<td></td>
<td>Save</td>
<td>Save</td>
</tr>
<tr>
<td></td>
<td>Edit</td>
<td>Enter &lt;Edit&gt; menu</td>
</tr>
<tr>
<td></td>
<td>Details</td>
<td>Display more details</td>
</tr>
<tr>
<td>[4] C</td>
<td>Setup</td>
<td>Enter Main menu</td>
</tr>
<tr>
<td></td>
<td>Esc</td>
<td>Cancel process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return to previous display</td>
</tr>
</tbody>
</table>

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

#### 6.3.1. Menu layout and navigation

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

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

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

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

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

You return to the status menu if:
the push buttons on the local controls have not been operated within 10 minutes
or by briefly pressing C

**Direct display via ID**

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

Figure 36: Direct display (example)

Display indicates in the bottom row: Go to

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

**6.4. User level, password**

**User level**

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

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

Figure 37: User level display (example)

**Password**

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

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

Table 19: User levels and authorisations

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

**6.4.1. Password entry**

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

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

6.4.2. Password change

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

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

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

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

**Select main menu**
1. Set selector switch to position 0 (OFF).
2. Press push button C Setup and hold it down for approx. 3 seconds.
   ➤ Display goes to main menu and indicates: ▶ Display

**Change passwords**
3. Select parameter Change passwords either:
   → click via the menu M ▶ to parameter, or
   → via direct display: press ▲ and enter ID M0229
   - Display indicates: ▶ Change passwords
   - The user level is indicated in the top row (1 – 6), e.g.:
   - For user level 1 (view only), passwords cannot be changed. To change passwords, you must change to a higher user level. For this, enter a password via a parameter.
4. For a user level between 2 and 6: Press push button Ok.
   ➤ The display indicates the highest user level, e.g.: For user 4
5. Select user level via push buttons ▲ Up ▼ Down and confirm with Ok.
   ➤ Display indicates: ▶ Change passwords Password 0***
6. Enter current password (→ enter password).
   ➤ Display indicates: ▶ Change passwords Password (new) 0***
7. Enter new password (→ enter password).
   ➤ Display indicates: ▶ Change passwords For user 4 (example)
8. Select next user level via push buttons ▲ Up ▼ Down or cancel the process via Esc.

6.5. Language in the display

The AUMATIC actuator controls display is multilingual.
6.5.1. Language change

Select main menu

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

2. Press push button \(C\) Setup and hold it down for approx. 3 seconds.
   ➥ Display goes to main menu and indicates: ▶ Display

Change language

3. Press \(\leftarrow\) Ok.
   ➥ Display indicates: ▶ Language

4. Press \(\leftarrow\) Ok.
   ➥ Display indicates the selected language, e.g.: ▶ Deutsch

5. The bottom row of the display indicates:
   → \(\text{Save}\) → continue with step 10
   → \(\text{Edit}\) → continue with step 6

6. Press \(\leftrightarrow\) Edit.
   ➥ Display indicates: ▶ Observer (1)

7. Select user level via \(\uparrow\downarrow\) Up \(\downarrow\downarrow\) Down resulting in the following significations:
   → black triangle: \(\star\) = current setting
   → white triangle: \(\triangleright\) = selection (not saved yet)

8. Press \(\leftrightarrow\) Ok.
   ➥ Display indicates: Password 0***

9. Enter password (→ enter password).
   ➥ Display indicates: ▶ Language and Save (bottom row)

Language selection

10. Select new language via \(\uparrow\downarrow\) Up \(\downarrow\downarrow\) Down resulting in the following significations:
    → black triangle: \(\star\) = current setting
    → white triangle: \(\triangleright\) = selection (not saved yet)

11. Confirm selection via \(\leftrightarrow\) Save.
    ➥ The display changes to the new language. The new language selection is saved.
7. Indications

7.1. Indications during commissioning

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

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

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

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

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

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

7.2. Indications in the display

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

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

- **Details** shows list with detailed indications
- **More** shows further available information

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

### 7.2.1. Feedback indications from actuator and valve

Display indications depend on the actuator version.

**Valve position (S0001)**

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

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

Figure 44: Valve position and direction of operation

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

Figure 45: End position CLOSED/OPEN reached

<table>
<thead>
<tr>
<th>Position</th>
<th>50.0 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0001</td>
<td></td>
</tr>
<tr>
<td>Up</td>
<td>⊞</td>
</tr>
<tr>
<td>Down</td>
<td>⊞</td>
</tr>
<tr>
<td>Setup</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position</th>
<th>50.0 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0001</td>
<td></td>
</tr>
<tr>
<td>⊞</td>
<td>⊞</td>
</tr>
</tbody>
</table>

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

**Torque (S0002)**

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

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

Figure 46: Torque

<table>
<thead>
<tr>
<th>Torque</th>
<th>30 Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td>3s</td>
<td></td>
</tr>
</tbody>
</table>

**Select unit**

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

Figure 47: Units of torque

<table>
<thead>
<tr>
<th>Torque</th>
<th>50 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 ft-lb</td>
<td></td>
</tr>
<tr>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td></td>
<td>30 Nm</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Display in percent**

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

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

**Operation commands (S0003)**

The display S0003 indicates:

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

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

**OPEN - CLOSE control**

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

Figure 48: Display for OPEN - CLOSE control

<table>
<thead>
<tr>
<th>Active op. command</th>
<th>49.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN</td>
<td></td>
</tr>
<tr>
<td>E2</td>
<td></td>
</tr>
<tr>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Active op. command</th>
<th>49.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSE</td>
<td></td>
</tr>
<tr>
<td>E2</td>
<td></td>
</tr>
<tr>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Setpoint control

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

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

Figure 49: Indication for setpoint control (positioner)

Pivot point axis

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

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

- Operation profile M0294
- Timer CLOSE M0156
- Timer OPEN M0206

Figure 50: Examples: on the left pivot points (intermediate positions); on the right stepping mode

Table 20: Symbols along the pivot point axis

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pivot point (intermediate position) with operation profile</th>
<th>Stepping mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pivot point without reaction</td>
<td>End of stepping mode</td>
</tr>
<tr>
<td>▼</td>
<td>Stop during operation in direction CLOSE</td>
<td>Start of stepping mode in direction CLOSE</td>
</tr>
<tr>
<td>▶</td>
<td>Stop during operation in direction OPEN</td>
<td>Start of stepping mode in direction OPEN</td>
</tr>
<tr>
<td>◆</td>
<td>Stop during operation in directions OPEN and CLOSE</td>
<td>–</td>
</tr>
<tr>
<td>▽</td>
<td>Pause for operation in direction CLOSE</td>
<td>–</td>
</tr>
<tr>
<td>▼</td>
<td>Pause for operation in direction OPEN</td>
<td>–</td>
</tr>
<tr>
<td>◇</td>
<td>Pause for operation in directions OPEN and CLOSE</td>
<td>–</td>
</tr>
</tbody>
</table>

7.2.2. Status indications according to AUMA classification

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

Warnings (S0005)

If a warning has occurred, the display shows S0005:

- the number of warnings occurred
- a blinking question mark after approx. 3 seconds
Figure 51: Warnings

Not ready REMOTE (S0006)
The S0006 display shows indications of the Not ready REMOTE group.
If such an indication has occurred, the display shows S0006:
- the number of indications occurred
- a blinking crossbar after approx. 3 seconds

Fault (S0007)
If a fault has occurred, the display shows S0007:
- the number of faults occurred
- a blinking exclamation mark after approx. 3 seconds

7.2.3. Status indications according to NAMUR recommendation

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

Out of Specification (S0008)
The S0008 indication shows out of specification indications according to NAMUR recommendation NE 107.
If such an indication has occurred, the display shows S0008:
- the number of indications occurred
- a blinking triangle with question mark after approx. 3 seconds
For further information, please also refer to <Corrective action>.

**Function check (S0009)**

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

If an indication has occurred via the function check, the display shows S0009:
- the number of indications occurred
- a blinking triangle with a spanner after approx. 3 seconds

Figure 55: Function check

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

**Maintenance required (S0010)**

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

If such an indication has occurred, the display shows S0010:
- the number of indications occurred
- a blinking square with an oilcan after approx. 3 seconds

Figure 56: Maintenance required

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

**Failure (S0011)**

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

If such an indication has occurred, the display shows S0011:
- the number of indications occurred
- a blinking circle with a cross after approx. 3 seconds

Figure 57: Failure

For further information, please also refer to <Corrective action>. 
7.3. Indication lights of local controls

Figure 58: Arrangement and signification of indication lights

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

1 T End position CLOSED reached (blinking: operation in direction CLOSE)
2 Tc Torque fault CLOSE
3 Motor protection tripped
4 To Torque fault OPEN
5 End position OPEN reached (blinking: operation in direction OPEN)
6 Bluetooth connection

Modify indication light assignment (indications)

Different indications can be assigned to LEDs 1 – 5.

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

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

Further setting values:
Refer to Manual (Operation and setting).
7.4. Optional indications

7.4.1. Mechanical position indication via indicator mark

Figure 59: Mechanical position indicator

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

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

8.1. Status signals via output contacts (digital outputs)

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

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

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

8.1.1. Assignment of outputs

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

Required user level: Specialist (4) or higher.

<table>
<thead>
<tr>
<th>Device configuration</th>
<th>I/O Interface</th>
<th>Digital outputs</th>
<th>Signal DOUT 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0053</td>
<td>M0139</td>
<td>M0110</td>
<td>M0109</td>
</tr>
</tbody>
</table>

Default values:

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

8.1.2. Coding the outputs

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

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

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

Required user level: Specialist (4) or higher.

<table>
<thead>
<tr>
<th>Device configuration</th>
<th>I/O Interface</th>
<th>Digital outputs</th>
<th>Coding DOUT 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0053</td>
<td>M0139</td>
<td>M0110</td>
<td>M0102</td>
</tr>
</tbody>
</table>

Default values:

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

8.2. Analogue signals (analogue outputs)

**Requirements** Analogue signals are only available if the following conditions are met:

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

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

Designation in the wiring diagram: AOUT1 (position)

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

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

   ![Selector Switch]

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

2. Switch on the power supply.

   **Information:** Observe heat-up time for ambient temperatures below –30 °C.

3. Perform basic settings.

9.1. Type of seating: set

---

**NOTICE**

Valve damage due to incorrect setting!

→ The type of seating must suit the valve.

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

---

<table>
<thead>
<tr>
<th>M</th>
<th>Customer settings</th>
<th>M0041</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type of seating</td>
<td>M0012</td>
</tr>
<tr>
<td></td>
<td>End position CLOSED</td>
<td>M0086</td>
</tr>
<tr>
<td></td>
<td>End position OPEN</td>
<td>M0087</td>
</tr>
</tbody>
</table>

**Default value:** Limit

**Setting values:**

- **Limit**
  - Seating in end positions via limit switching.

- **Torque**
  - Seating in end positions via torque switching.

**Select main menu**

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

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

   - Display goes to main menu and indicates: ✶ Display

**Select parameter**

3. Select parameter either:

   - click via the menu M ▶ to parameter, or
   - via direct display: Press ▲ and enter ID M0086 or M0087

   - Display indicates: End position CLOSED

**CLOSE or OPEN**

4. Use ▲▼ Up ▼ Down ▼ to select:

   → ✶ End position CLOSED
   → ✶ End position OPEN

   - The black triangle ▶ indicates the current selection.

5. Press ✶ Ok.

   - Display indicates the current setting: Limit or Torque


   - Display indicates: ✶ Specialist (4)
Use ▲▼ Up ▼ Down ▼ to select user:

**Information:** Required user level: Specialist (4) or higher

- The symbols have the following meaning:
  - black triangle: ▶ = current setting
  - white triangle: ▷ = selection (not saved yet)

Press ← Ok.

- Display indicates: Password 0***

Enter password (→ enter password).

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

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

- The symbols have the following meaning:
  - black triangle: ▶ = current setting
  - white triangle: ▷ = selection (not saved yet)

Confirm selection via ← Save.

The setting for the type of seating is complete.

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

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

**Customer settings**

- **Modbus** M0341
  - MD1 slave address M0247
  - MD2 slave address M0409
  - Baud rate M0343
  - Parity/stop bit M0782
  - Monitoring time M0781

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

**Information**

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

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

### 9.2.1. Modbus TCP/IP-RTU gateway: set

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

Login password (default setting in the factory): admin

**Table 21: Default setting of the IP interface:**

<table>
<thead>
<tr>
<th>Address Type</th>
<th>Static IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static IP Address</td>
<td>192.168.255.1</td>
</tr>
<tr>
<td>Subnet Mask</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>192.168.0.1</td>
</tr>
</tbody>
</table>

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

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

**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.


![Image of switch compartment with screws and cover]

2. If indicator disc [3] is available:

   Remove indicator disc [3] using a spanner (as lever).

   **Information:** To avoid damage to paint finish, use spanner in combination with soft object, e.g. fabric.

9.4. Torque switching: set

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

**Information**

The torque switches may also trip during manual operation.

**NOTICE**

Valve damage due to excessive tripping torque limit setting!

→ The tripping torque must suit the valve.
→ Only change the setting with the consent of the valve manufacturer.
1. Loosen both lock screws [3] at the indicator disc.
2. Turn torque dial [4] to set the required torque (1 da Nm = 10 Nm). Example:
   - Black torque switching head set to approx. 25 da Nm ≈ 250 Nm for direction CLOSE
   - White torque switching head set to approx. 20 da Nm ≈ 200 Nm for direction OPEN

   **Information:** Maximum tightening torque: 0.3 – 0.4 Nm
   ➡️ The torque switch setting is complete.

### 9.5. Limit switching: set

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

#### Figure 61: 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

#### 9.5.1. End position CLOSED (black section): set

1. Engage manual operation.
2. Turn handwheel clockwise until valve is closed.
3. Turn handwheel by approximately half a turn (overrun) in the opposite direction.
4. **Press down** and turn setting spindle [1] with screwdriver in direction of the arrow and observe the pointer [2]: While a ratchet click is felt and heard, the pointer [2] moves 90° every time.
5. As soon as the pointer [2] is 90° from mark [3]: Continue turning slowly.
6. As soon as the pointer [2] moves to mark [3]: Stop turning and release setting spindle.
   ➡️ The end position CLOSED setting is complete.
7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.5.2. **End position OPEN (white section): set**

1. Engage manual operation.
2. Turn handwheel counterclockwise until valve is open.
3. Turn handwheel by approximately half a turn (overrun) in the opposite direction.
4. **Press down** and turn setting spindle [4] with screwdriver in direction of the arrow and observe the pointer [5]: While a ratchet click is felt and heard, the pointer [5] moves 90° every time.
5. As soon as the pointer [5] is 90° from mark [6]: Continue turning slowly.
6. As soon as the pointer [5] moves to mark [6]: Stop turning and release setting spindle.
   ➡️ The end position OPEN setting is complete.
7. If you override the tripping point inadvertently (ratchet click is heard after the pointer has snapped): Continue turning the setting spindle in the same direction and repeat setting process.

9.6. **Intermediate positions: set**

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

Figure 62: Setting elements for limit switching

Black section:

[1] Setting spindle: Running direction CLOSE
[2] Pointer: Running direction CLOSE

White section:

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

### 9.6.1. Running direction CLOSE (black section): set

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

### 9.6.2. Running direction OPEN (white section): set

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

### 9.7. Test run

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

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

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

### 9.7.1. Direction of rotation at mechanical position indicator: check

**NOTICE**

Valve damage due to incorrect direction of rotation!

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

**Information**

Switch off before reaching the end position.

1. Move actuator manually to intermediate position or to sufficient distance from end position.
2. Switch on actuator in direction CLOSE and observe the direction of rotation on the mechanical position indication:
   
   → **For mechanical position indication via indicator mark:** (not self-adjusting)
   
   ➤ The direction of rotation is correct if the actuator operation in direction CLOSE and the symbols \(\text{\(\Longleftarrow\)}\) turn \textbf{counterclockwise}:
   
   Figure 63: Direction of rotation \(\text{\(\Longleftarrow\)}\) (for “clockwise closing version”)

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

### NOTICE

Valve damage due to incorrect direction of rotation!

→ If the direction of rotation is wrong, switch off immediately (press STOP).

→ Eliminate cause, i.e. correct phase sequence for cable set wall bracket.

→ Repeat test run.

### Information

Switch off before reaching the end position.

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

3. Switch on actuator in direction CLOSE and observe direction of rotation at hollow shaft [3] or stem [5]:
   ➤ The direction of rotation is correct if the actuator moves in direction CLOSE and the hollow shaft in clockwise direction, or the stem moves downward.

Figure 64: Hollow shaft/stem movement (for “clockwise closing”)


9.7.3. Limit switching: check

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

2. Operate actuator using push buttons OPEN, STOP, CLOSE.
   ➤ The limit switching is set correctly if (default indication):
     - the yellow indication light/LED1 is illuminated in end position CLOSED
     - the green indication light/LED5 is illuminated in end position OPEN
     - the indication lights go out after travelling into opposite direction.
   ➤ The limit switching is set incorrectly if:
     - the actuator comes to a standstill before reaching the end position
     - one of the red indication lights/LEDs is illuminated (torque fault)
     - the status indication S0007 in the display signals a fault.

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

9.7.4. Reference operation position feedback: perform

For actuators with position feedback (RWG, potentiometer), a reference operation has to be performed once the limit switching setting was changed to ensure that the position feedback (0/4 – 20 mA) supplies correct values:
Operate actuator electrically (via the push buttons OPEN and CLOSE of the local controls) once to end position OPEN and once to end position CLOSED.

9.8. Switch compartment: close

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

** Dangerous 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.

Figure 65:

![Image of a device with labels [1], [2], and [3].]

**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.
10. Commissioning (optional equipment settings)

10.1. EWG 01.1 electronic position transmitter

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

**Technical data**

<table>
<thead>
<tr>
<th>Data</th>
<th>3-wire and 4-wire systems</th>
<th>2-wire system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current $I_a$</td>
<td>0 – 20 mA, 4 – 20 mA</td>
<td>4 – 20 mA</td>
</tr>
<tr>
<td>Power supply $U_V$</td>
<td>24 V DC (18 – 32 V)</td>
<td>24 V DC (18 – 32 V)</td>
</tr>
<tr>
<td>Max. current consumption</td>
<td>LED off = 26 mA, LED on = 27 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>Max. load $R_B$</td>
<td>600 Ω</td>
<td></td>
</tr>
<tr>
<td>Impact of power supply</td>
<td>0.1 %</td>
<td></td>
</tr>
<tr>
<td>Load influence</td>
<td>0.1 %</td>
<td></td>
</tr>
<tr>
<td>Temperature impact</td>
<td>&lt; 0.1 %/K</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-60 °C to +80 °C</td>
<td></td>
</tr>
</tbody>
</table>

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

**Setting elements**

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

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

Figure 66: View on control unit when switch compartment is open

[S1] -- [S2]

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

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

**Table 23:** Short overview on push button functions

<table>
<thead>
<tr>
<th>Push buttons</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[S1] + [S2]</td>
<td>→ press simultaneously for 5 s: Activate setting mode</td>
</tr>
</tbody>
</table>
| [S1]         | → press in setting mode for 3 s: Set 4 mA
|              | → press in setting mode for 6 s: Set 0 mA
|              | → press in operation for 3 s: Switch on/off LED end position signalling.
|              | → touch in end position: Reduce current value by 0.02 mA |
| [S2]         | → press in setting mode for 3 s: Set 20 mA
|              | → press in operation for 3 s: Switch on/off LED end position signalling.
|              | → touch in end position: Increase current value by 0.02 mA |
10.1.1. Measuring range: set

For measuring range setting, voltage must be applied at the position transmitter. For output current verification, connect a test device for 0 – 20 mA to measurement points (+/−) (for 2-wire systems, connecting a test device is imperatively required).

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

Activate setting mode

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

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

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

Set measuring range

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

   - Information: For 2-wire systems read current values at test device.
4. Operate valve into opposite end position.
   - The value set in end position (0/4 mA or 20 mA) does not change during travel in setting mode.
5. Perform setting in the second end position following the same steps.
6. Approach both end positions again to check the setting.
   - If the measuring range cannot be set: Refer to <Faults during commissioning>.
   - If the current values (0/4/20 mA) are incorrect: Refer to <Current values: adjust>.
   - If the current value fluctuates (e.g., Between 4.0 – 4.2 mA): Switch off LED end position signalling. Refer to <LED end position signalling: switch on/off>.

10.1.2. Current values: adjust

The current values (0/4/20 mA) set in end positions can be adjusted at any time. Common values are e.g. 0.1 mA (instead of 0 mA) or 4.1 mA (instead 4 mA).
10.1.3. LED end position signalling: switch on/off

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

**Switching on and off**

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

<table>
<thead>
<tr>
<th>Set output current</th>
<th>LED behaviour in end position</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mA</td>
<td>LED is blinking slowly</td>
</tr>
<tr>
<td>0 mA</td>
<td>LED is blinking fast</td>
</tr>
<tr>
<td>20 mA</td>
<td>LED is illuminated</td>
</tr>
</tbody>
</table>

10.2. Potentiometer

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

**Setting elements**

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

Setting is made via potentiometer [1].

Figure 67: View on control unit

10.2.1. Potentiometer: set

**Information**

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

1. Move valve to end position CLOSED.
   - End position CLOSED corresponds to 0 %
   - End position OPEN corresponds to 100 %


4. Perform fine-tuning of the zero point at external setting potentiometer (for remote indication).

10.3. **RWG electronic position transmitter**

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

### Technical data

<table>
<thead>
<tr>
<th>Data</th>
<th>3-wire and 4-wire systems</th>
<th>2-wire system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current I&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0 – 20 mA, 4 – 20 mA</td>
<td>4 – 20 mA</td>
</tr>
<tr>
<td>Power supply U&lt;sub&gt;Y&lt;/sub&gt;</td>
<td>24 V DC (18 – 32 V)</td>
<td>14 V DC + (I x R&lt;sub&gt;B&lt;/sub&gt;), max. 30 V</td>
</tr>
<tr>
<td>Max. current consumption</td>
<td>24 mA at 20 mA output current</td>
<td>20 mA</td>
</tr>
<tr>
<td>Max. load R&lt;sub&gt;B&lt;/sub&gt;</td>
<td>600 Ω</td>
<td>(U&lt;sub&gt;Y&lt;/sub&gt; – 14 V)/20 mA</td>
</tr>
<tr>
<td>Impact of power supply</td>
<td>0.1 %/V</td>
<td>0.1 %/V</td>
</tr>
<tr>
<td>Load influence</td>
<td>0.1 %/(0 – 600 Ω)</td>
<td>0.1 %/100 Ω</td>
</tr>
<tr>
<td>Temperature impact</td>
<td>&lt; 0.3 %/K</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>–60 °C to +80 °C</td>
<td></td>
</tr>
<tr>
<td>Transmitter potentiometer</td>
<td>5 kΩ</td>
<td></td>
</tr>
</tbody>
</table>

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

### Setting elements

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

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

Figure 68: View on control unit when switch compartment is open

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

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

10.3.1. **Measuring range: set**

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

1. Move valve to end position CLOSED.
2. Connect ammeter for 0 – 20 mA to measuring points [4 and 5].
5. Turn potentiometer [2] clockwise until output current starts to increase.
6. Turn potentiometer [2] in opposite direction until the following value is reached:
   - for 0 – 20 mA approx. 0.1 mA
   - for 4 – 20 mA approx. 4.1 mA
   ➤ This ensures that the signal remains above the dead and live zero point.
7. Move valve to end position OPEN.
8. Set potentiometer [3] to end value 20 mA.
9. Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.

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

### 10.4. Mechanical position indicator: set

1. Fit indicator disc onto shaft.
2. Move valve to end position CLOSED.
3. Turn lower indicator disc until symbol \( \text{CLOSED} \) 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 \( \text{OPEN} \) 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 \( \text{CLOSED} \) 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.
11. Corrective action

11.1. Faults during commissioning

Table 26: Faults during operation/commissioning

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical position indicator cannot be set.</td>
<td>Reduction gearing is not suitable for turns/stroke of the actuator.</td>
<td>Set gear stage of the reduction gearing.</td>
</tr>
<tr>
<td>In spite of correct setting of mechanical limit switching, actuator operates into the valve or actuator end position.</td>
<td>The overrun was not considered when setting the limit switching.</td>
<td>Determine overrun: Overrun = travel covered from switching off until complete standstill.</td>
</tr>
<tr>
<td></td>
<td>The overrun is generated by the inertia of both the actuator and the valve and the delay time of the actuator controls.</td>
<td>Set limit switching again considering the overrun. (Turn handwheel back by the amount of the overrun)</td>
</tr>
<tr>
<td>Measuring range 0/4 – 20 mA or maximum value 20 mA at position transmitter cannot be set or supplies an incorrect value.</td>
<td>Reduction gearing is not suitable for turns/stroke of the actuator.</td>
<td>Set gear stage of the reduction gearing.</td>
</tr>
<tr>
<td>The measuring range 0/4 – 20 mA at EWG position transmitter cannot be set.</td>
<td>The LED on the EWG either flashes in setting mode a) single flash or b) triple flash:</td>
<td>Call service.</td>
</tr>
<tr>
<td></td>
<td>a) EWG is not calibrated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Magnet positions of EWG are not aligned.</td>
<td></td>
</tr>
<tr>
<td>Limit and/or torque switches do not trip.</td>
<td>Switch is defective or switch setting is incorrect.</td>
<td>Check setting, if required, reset end positions. Refer to &lt;Check switches&gt; and replace the switches if required.</td>
</tr>
<tr>
<td>Handwheel rotates on the shaft without transmitting torque.</td>
<td>Actuator in version with overload protection for manual operation: Shear pin rupture due to excessive torque at handwheel.</td>
<td>Dismount handwheel. Replace overload protection and remount handwheel.</td>
</tr>
</tbody>
</table>

Switch check

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


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.


11.2. Fault indications and warning indications

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

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

Collective signals include further indications. They can be displayed via the Details push button. The display remains white.
### Table 27: Faults and warnings via status indications in the display

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

### Table 28: Warnings and Out of specification

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Config. warning</td>
<td>Collective signal 06: Possible cause: Configuration setting is incorrect. The device can still be operated with restrictions.</td>
<td>Press push button (\rightarrow) Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
<tr>
<td>Internal warning</td>
<td>Collective signal 15: Device warnings The device can still be operated with restrictions.</td>
<td>Press push button (\rightarrow) Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
<tr>
<td>24 V DC external</td>
<td>The external 24 V DC voltage supply of the controls has exceeded the power supply limits.</td>
<td>Check 24 V DC voltage supply.</td>
</tr>
<tr>
<td>Wrm op.mode run time</td>
<td>Warning on time max. running time/h exceeded</td>
<td>• Check modulating behaviour of actuator. • Check parameter Perm.run time M0356, re-set if required.</td>
</tr>
<tr>
<td>Wrm op.mode starts</td>
<td>Warning on time max. number of motor starts (starts) exceeded</td>
<td>• Check modulating behaviour of actuator. • Check parameter Permissible starts M0357, re-set if required.</td>
</tr>
<tr>
<td>Failure behav. active</td>
<td>The failure behaviour is active since all required setpoints and actual values are incorrect.</td>
<td>Verify signals: • Setpoint E1 • Actual value E2 • Actual process value E4 • Check connection to master.</td>
</tr>
<tr>
<td>Wrm input AIN 1</td>
<td>Warning: Loss of signal analogue input 1</td>
<td>Check wiring.</td>
</tr>
</tbody>
</table>
Warnings and Out of specification

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrn input AIN 2</td>
<td>Warning: Loss of signal analogue input 2</td>
<td>Check wiring.</td>
</tr>
<tr>
<td>Wrn setpoint position</td>
<td>Warning: Loss of signal setpoint position Possible causes: For an adjusted setpoint range of e.g. 4 – 20 mA, the input signal is 0 (signal loss). For a setpoint range of 0 – 20 mA, monitoring is not possible.</td>
<td>Check setpoint signal.</td>
</tr>
<tr>
<td>Op. time warning</td>
<td>The set time (parameter Perm.op. time, manual M0570) has been exceeded. The preset operating time is exceeded for a complete travel from end position OPEN to end position CLOSED.</td>
<td>The warning indications are automatically cleared once a new operation command is executed. ● Check valve. ● Check parameter Perm.op. time, manual M0570.</td>
</tr>
<tr>
<td>Wrn controls temp.</td>
<td>Temperature within controls housing too high.</td>
<td>Measure/reduce ambient temperature.</td>
</tr>
<tr>
<td>Time not set</td>
<td>Real time clock has not yet been set.</td>
<td>Set time.</td>
</tr>
<tr>
<td>RTC voltage</td>
<td>Voltage of the RTC button cell is too low.</td>
<td>Replace button cell.</td>
</tr>
<tr>
<td>PVST fault</td>
<td>Partial Valve Stroke Test (PVST) could not be successfully completed.</td>
<td>Check actuator (PVST settings).</td>
</tr>
<tr>
<td>PVST abort</td>
<td>Partial Valve Stroke Test (PVST) was aborted or could not be started.</td>
<td>Perform RESET or restart PVST.</td>
</tr>
<tr>
<td>Wrn no reaction</td>
<td>No actuator reaction to operation commands within the set reaction time.</td>
<td>● Check movement at actuator. ● Check parameter Reaction time M0634.</td>
</tr>
<tr>
<td>Torque wrn OPEN</td>
<td>Limit value for torque warning in direction OPEN exceeded.</td>
<td>Check parameter Wrn torque OPEN M0768, re-set if required.</td>
</tr>
<tr>
<td>Torque wrn CLOSE</td>
<td>Limit value for torque warning in direction CLOSE exceeded.</td>
<td>Check parameter Wrn torque CLOSE M0769, re-set if required.</td>
</tr>
<tr>
<td>SIL fault 1)</td>
<td>SIL sub-assembly fault has occurred.</td>
<td>Refer to separate Manual Functional Safety.</td>
</tr>
<tr>
<td>PVST required</td>
<td>Execution of PVST (Partial Valve Stroke Tests) is required.</td>
<td></td>
</tr>
<tr>
<td>Maintenance required</td>
<td>Maintenance is required.</td>
<td></td>
</tr>
<tr>
<td>FQM fail safe fault 2)</td>
<td>FQM fault</td>
<td>Checking and fault remedy are required. Refer to FQM operation instructions.</td>
</tr>
</tbody>
</table>

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

Table 29: Faults and Failure

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration error</td>
<td>Collective signal 11: Configuration error has occurred.</td>
<td>Press push button ✧ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
<tr>
<td>Config. error REMOTE</td>
<td>Collective signal 22: Configuration error has occurred.</td>
<td>Press push button ✧ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
<tr>
<td>Internal error</td>
<td>Collective signal 14: Internal error has occurred.</td>
<td>AUMA service Press push button ✧ Details to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
<tr>
<td>Torque fault CLOSE</td>
<td>Torque fault in direction CLOSE</td>
<td>Perform one of the following measures: ● Issue operation command in direction OPEN. ● Set selector switch to position Local control (LOCAL) and reset fault indication via push button RESET. ● Execute reset command via fieldbus.</td>
</tr>
</tbody>
</table>
## Faults and Failure

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| **Torque fault OPEN** | Torque fault in direction OPEN | Perform one of the following measures:  
  - Issue operation command in direction CLOSE.  
  - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.  
  - Execute reset command via fieldbus. |
| **Phase fault** |  
  - When connecting to a 3-ph AC system and with internal 24 V DC supply of the electronics:  
    Phase 2 is missing.  
  - When connecting to a 3-ph or 1-ph AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing. | Test/connect phases. |
| **Incorrect phase seq** | The phase conductors L1, L2 and L3 are connected in the wrong sequence. Only applicable if connected to a 3-ph AC system. | Correct the sequence of the phase conductors L1, L2 and L3 by exchanging two phases. |
| **Mains quality** | Due to insufficient mains quality, the controls cannot detect the phase sequence (sequence of phase conductors L1, L2 and L3) within the pre-set time frame provided for monitoring. |  
  - Check mains voltage.  
  - For 3-phase/1-phase AC current, the permissible variation of the mains voltage is ±10 % (option ±30 %). The permissible variation of the mains voltage is ±5 %.  
  - Check parameter **Tripping time M0172**, extend time frame if required. |
| **Thermal fault** | Motor protection tripped |  
  - Cool down, wait.  
  - If the fault indication display persists after cooling down:  
    - Set selector switch to position **Local control** (LOCAL) and reset fault indication via push button **RESET**.  
    - Execute reset command via fieldbus.  
  - Check fuses. |
| **Fault no reaction** | No actuator reaction to operation commands within the set reaction time. | Check movement at actuator. |
| **Poti Out of Range** | Potentiometer is outside the permissible range. | Check device configuration:  
  Parameter **Low limit Uspan M0832** must be less than parameter **Volt.leveldiff.potent.M0833**. |
| **LPV not ready** | LPV: Lift Plug Valve function  
The master actuator signals a fault | Check wiring. |
| **Wm input AIN 1** | Loss of signal analogue input 1 | Check wiring. |
| **Wm input AIN 2** | Loss of signal analogue input 2 | Check wiring. |
| **Incorrect rotary direct.** | Contrary to the configured direction of rotation and the active operation command, the motor turns into the wrong direction. | Check operation command control.  
For 3-phase AC current mains, activate phase monitoring (parameter **Adapt rotary dir. M0171**).  
Check device configuration setting (parameter **Closing rotation M0176**).  
To delete the fault indication: Disconnect actuator controls from the mains and perform reboot. |
| **Syn. link deviation** | Synchronous link function: Actual position values of master actuator and slave actuator are not synchronous (excessive deviation). | Check **Deviation MA/SA [%]** parameter. |
| **Syn. link NotReady** | Synchronous link function: Slave actuator is not ready. | Check **Deviation MA/SA [%]** parameter. |
| **Syn. link wire break SA** | Synchronous link function: Signal loss of actual position value from master actuator or slave actuator. | Check wiring. |
### Faults and Failure

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMF fault OPEN (^1)</td>
<td>The torque in direction OPEN, measured at the output drive shaft using the torque measurement flange, is too high.</td>
<td>Check DMF trip torque OP parameter. Check DMF fault level parameter.</td>
</tr>
<tr>
<td>DMF fault CLOSE (^1)</td>
<td>The torque in direction CLOSE, measured at the output drive shaft using the torque measurement flange, is too high.</td>
<td>Check DMF trip torque CL parameter. Check DMF fault level parameter.</td>
</tr>
<tr>
<td>FQM collective fault (^2)</td>
<td>Collective signal 25:</td>
<td>Press push button [Details] to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting).</td>
</tr>
</tbody>
</table>

1) For actuators equipped with torque measurement flange (DMF)  
2) For actuators equipped with fail safe unit

Table 30:  
**Not ready REMOTE and Function check (collective signal 04)**

<table>
<thead>
<tr>
<th>Indication on display</th>
<th>Description/cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Wrong oper. cmd | Collective signal 13: Possible causes:  
  - Several operation commands (e.g. OPEN and CLOSE simultaneously, or OPEN and SET-POINT operation simultaneously)  
  - A setpoint is present and the positioner is not active | Check operation commands (reset/clear all operation commands and send one operation command only).  
Set parameter Positioner to Function active.  
Check setpoint.  
Press push button [Details] to display a list of individual indications. For a description of the individual signals, refer to Manual (Operation and setting). |
| Sel. sw. not REMOTE | Selector switch is not in position REMOTE. | Set selector switch to position REMOTE. |
| Service active | Operation via service interface (Bluetooth) and AUMA CDT service software. | Exit service software. |
| Disabled | Actuator is in operation mode Disabled. | Check setting and status of function <Local controls enable>. |
| EMCY stop active | The EMERGENCY stop switch has been operated.  
The motor control power supply (contactors or thyristors) is disconnected. | Enable EMERGENCY stop switch.  
Reset EMERGENCY stop state by means of Reset command. |
| EMCY behav. active | Operation mode EMERGENCY is active (EMERGENCY signal was sent).  
0 V are applied at the EMERGENCY input. | Detect cause for EMERGENCY signal.  
Verify failure source.  
Apply +24 V DC at EMERGENCY input. |
| I/O interface | The actuator is controlled via the I/O interface (parallel). | Check I/O interface. |
| Handwheel active | Manual operation is activated. | Start motor operation. |
| FailState fieldbus | Fieldbus connection available, however no process data transmission by the master. | Verify master configuration |
| Local STOP | A local STOP is active. Push button STOP of local controls is operated. | Release push button STOP. |
| Interlock | An interlock is active. | Check interlock signal. |
| Interlock by-pass | By-pass function is interlocked. | Check states of main and by-pass valve. |
| PVST active | Partial Valve Stroke Test (PVST) is active. | Wait until PVST function is complete. |
| SIL function active \(^1\) | SIL function is active | |
11.3. Fuses

11.3.1. Fuses within the actuator controls

Fuses used

<table>
<thead>
<tr>
<th>F1/F2</th>
<th>Table 31: Primary fuses F1/F2 (for power supply unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G fuse</td>
<td>F1/F2</td>
</tr>
<tr>
<td>Size</td>
<td>6.3 x 32 mm</td>
</tr>
<tr>
<td>Reversing contactors</td>
<td>Power supply ≤ 500 V</td>
</tr>
<tr>
<td>Reversing contactors</td>
<td>Power supply &gt; 500 V</td>
</tr>
<tr>
<td>Thyristor units for motor power up to 1.5 kW</td>
<td>1 A T; 500 V</td>
</tr>
<tr>
<td>Thyristor units for motor power up to 3.0 kW</td>
<td></td>
</tr>
<tr>
<td>Thyristor units for motor power up to 5.5 kW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F3</th>
<th>Internal 24 V DC supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 32: Secondary fuses F3 (internal 24 V DC supply)</td>
<td></td>
</tr>
<tr>
<td>G fuse according to IEC 60127-2/III</td>
<td>F3</td>
</tr>
<tr>
<td>Size</td>
<td>5 x 20 mm</td>
</tr>
<tr>
<td>Voltage output (power supply unit) = 24 V</td>
<td>2.0 A T; 250 V</td>
</tr>
<tr>
<td>Voltage output (power supply unit) = 115 V</td>
<td>2.0 A T; 250 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F4</th>
<th>Table 33: Secondary fuses F4 (internal AC supply)1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-fuse according to IEC 60127-2/III</td>
<td>F4</td>
</tr>
<tr>
<td>Size</td>
<td>5 x 20 mm</td>
</tr>
<tr>
<td>Voltage output (power supply unit) = 24 V</td>
<td>1.25 A T; 250 V</td>
</tr>
<tr>
<td>Voltage output (power supply unit) = 115 V</td>
<td>—</td>
</tr>
</tbody>
</table>

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

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

Replace fuses F1/F2

Information

Only valid for version with electrical connection of KES type.

DANGER

Hazardous voltage!
Risk of electric shock.
→ Disconnect device from the mains before opening.
1. Loosen screws [1] and remove plug/socket connector [2].

Figure 69:

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

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

1. Loosen screws [1] and remove cover [2] on the rear of the actuator controls. The power supply unit has measurement points (solder pins) allowing to perform a resistance (continuity) measurement:

<table>
<thead>
<tr>
<th>Measuring points</th>
<th>Verifying</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTP5 – MTP6</td>
<td>F3</td>
</tr>
<tr>
<td>MTP7 – MTP8</td>
<td>F4</td>
</tr>
</tbody>
</table>

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

NOTICE

Cable damage due to pinching!

Risk of functional failures.

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

11.3.2. Motor protection (thermal monitoring)

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

The actuator is switched off and the following signals are given:
- LED 3 (motor protection tripped) on the local controls is illuminated.
- Status indication S0007 displays a fault. The fault Details is displayed when selecting Thermal fault.

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

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

The acknowledgement is made:
- in selector switch position Local control (LOCAL) via push button RESET.
- In selector switch position Remote control (REMOTE) with Reset command via fieldbus.
Proof-test motor protection

Test correct functioning of the motor protection as described hereafter. Perform the functional test at the latest within the framework of maintenance (refer to chapter <Servicing and maintenance>).

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

Required user level: Specialist (4) or higher.

**Test procedure:**

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

**Damage caused by inappropriate maintenance!**

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

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

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

12.1. Preventive measures for servicing and safe operation

The following actions are required to ensure safe device operation:

**6 months after commissioning and then once a year**

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

[Figure 70: Output drive type A]

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

<table>
<thead>
<tr>
<th>Output drive type</th>
<th>A 07.2</th>
<th>A 10.2</th>
<th>A 14.2</th>
<th>A 16.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity [g] 1)</td>
<td>1.5</td>
<td>3</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

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

**For enclosure protection IP68**

After submersion:
- Check actuator.
- In case of ingress of water, locate leaks and repair. Dry device correctly and check for proper function.
12.2. Disconnection from the mains

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

12.2.1. Disconnection from the mains with KP/KPH and KES electrical connection

**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 71: KP/KPH and KES electrical connection

![Diagram of KP/KPH and KES electrical connection]

1. Loosen the screws [2].
2. Remove electrical connection.
3. Seal open plug/socket connection, e.g. using AUMA protection cover and parking frame.

**Fitting the plug/socket connector:**

4. Clean sealing faces of plug/socket connector and housing.
5. Preserve joint surfaces with an acid-free corrosion protection agent.
7. Apply a thin film of non-acidic grease (e.g. petroleum jelly) to the O-ring and insert it correctly.
8. Replace electrical connection and fasten screws evenly crosswise.

12.3. Maintenance

**Maintenance intervals** In compliance with EN 60079-17, Ex certified products either require repeated testing at an interval of 3 years or continuous monitoring by trained personnel.
Lubrication

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

Notes regarding the maintenance

- Perform visual inspection of actuator. Ensure that no outside damage or changes are visible.
- Electrical connection cables must be placed properly and in perfect condition.
- Thoroughly touch up any possible damage to painting 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 own 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-Varso).
- 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 replacing parts, sealing elements, 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.:

- various metals
- plastics
- greases and oils

The following generally applies:

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

Information

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

13.1. Technical data Multi-turn actuators

Features and functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion protection</td>
<td>Refer to name plate</td>
</tr>
<tr>
<td>Certificates and standards</td>
<td>Certificates are attached to the device. All standards applied and their respective issues are indicated on these certificates.</td>
</tr>
<tr>
<td>Specific conditions of use</td>
<td>The specific conditions of use are listed on the certificates supplied.</td>
</tr>
<tr>
<td>Type of duty (Multi-turn actuators for open-close duty)</td>
<td>Standard: Short-time duty S2 - 15 min, classes A and B according to EN 15714-2 Option: Short-time duty S2 - 30 min, classes A and B according to EN 15714-2 For nominal voltage and +40 °C ambient temperature and at run torque load.</td>
</tr>
<tr>
<td>Type of duty (Multi-turn actuators for modulating duty)</td>
<td>Standard: Intermittent duty S4 - 25 %, class C according to EN 15714-2 Option: Intermittent duty S4 - 50 %, class C according to EN 15714-2 For nominal voltage and +40 °C ambient temperature and at modulating torque load.</td>
</tr>
<tr>
<td>Motors</td>
<td>Standard: 3-phase AC asynchronous motor, type IM B9 according to IEC 60034-7, IC410 cooling procedure according to IEC 60034-6 Option: 1-phase AC motor with permanent split capacitor (PSC), type IM B9 according to IEC 60034-7, IC410 cooling procedure according to IEC 60034-6 1-phase AC motor with integral starting capacitor and solid state switch (CSIR), type IM B9 according to IEC 60034-7, IC410 cooling procedure according to IEC 60034-6</td>
</tr>
<tr>
<td>Mains voltage, mains frequency</td>
<td>Refer to motor name plate</td>
</tr>
<tr>
<td></td>
<td>Permissible variation of mains voltage: ±10 %</td>
</tr>
<tr>
<td></td>
<td>Permissible variation of mains frequency: ±5 % (for 3-phase and 1-phase AC current)</td>
</tr>
<tr>
<td>Overvoltge category</td>
<td>Category III according to IEC 60364-4-443</td>
</tr>
<tr>
<td>Insulation class</td>
<td>Standard: F, tropicalized</td>
</tr>
<tr>
<td></td>
<td>Option: H, tropicalized (with 3-phase AC motor)</td>
</tr>
<tr>
<td>Motor protection</td>
<td>Standard: PTC thermistors (according to DIN 44082)</td>
</tr>
<tr>
<td></td>
<td>Option: Thermostwitches (NC) in the actuator and thermal overload relay in actuator controls</td>
</tr>
<tr>
<td>Self-locking</td>
<td>Self-locking: Output speeds up to 90 rpm (50 Hz), 108 rpm (60 Hz) NOT self-locking: Output speeds from 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.</td>
</tr>
<tr>
<td>Motor heater (option)</td>
<td>Voltages: 110 – 120 V AC, 220 – 240 V AC or 380 – 480 V AC (3-phase AC motors) Power depending on the size 12.5 – 25 W</td>
</tr>
<tr>
<td>Manual operation</td>
<td>Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation.</td>
</tr>
<tr>
<td></td>
<td>Option: Handwheel lockable</td>
</tr>
<tr>
<td></td>
<td>Handwheel stem extension</td>
</tr>
<tr>
<td></td>
<td>Power tool for emergency operation with square 30 mm or 50 mm</td>
</tr>
<tr>
<td>Indication for manual operation (option)</td>
<td>Indication whether manual operation is active/not active via single switch (1 change-over contact)</td>
</tr>
<tr>
<td>Valve attachment</td>
<td>Standard: B1 according to EN ISO 5210</td>
</tr>
<tr>
<td></td>
<td>Option: A, B2, B3, B4, C, D according to EN ISO 5210</td>
</tr>
<tr>
<td></td>
<td>A, B, D, E according to DIN 3210</td>
</tr>
<tr>
<td></td>
<td>C according to DIN 3338</td>
</tr>
<tr>
<td></td>
<td>Special valve attachments: AF, AK, AG, B3D, ED, DD, IB1, IB3</td>
</tr>
<tr>
<td></td>
<td>A prepared for permanent lubrication of stem</td>
</tr>
</tbody>
</table>
## Electromechanical control unit

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

## Service conditions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use</strong></td>
<td>Indoor and outdoor use permissible</td>
</tr>
<tr>
<td><strong>Mounting position</strong></td>
<td>Any position</td>
</tr>
<tr>
<td><strong>Installation altitude</strong></td>
<td>≤ 2,000 m above sea level</td>
</tr>
<tr>
<td></td>
<td>&gt; 2,000 m above sea level on request</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>Refer to actuator name plate</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>Up to 100 % relative humidity across the entire permissible temperature range</td>
</tr>
<tr>
<td><strong>Enclosure protection according to EN 60529</strong></td>
<td>IP68</td>
</tr>
<tr>
<td></td>
<td>Terminal compartment additionally sealed against interior (double sealed)</td>
</tr>
<tr>
<td></td>
<td>According to AUMA definition, enclosure protection IP68 meets the following requirements:</td>
</tr>
<tr>
<td></td>
<td>• Depth of water: maximum 8 m head of water</td>
</tr>
<tr>
<td></td>
<td>• Duration of continuous immersion in water: Max. 96 hours</td>
</tr>
<tr>
<td></td>
<td>• Up to 10 operations during continuous immersion</td>
</tr>
<tr>
<td></td>
<td>• Modulating duty is not possible during continuous immersion.</td>
</tr>
<tr>
<td></td>
<td>For exact version, refer to actuator controls name plate.</td>
</tr>
<tr>
<td><strong>Pollution degree according to IEC 60664-1</strong></td>
<td>Pollution degree 4 (when closed), pollution degree 2 (internal)</td>
</tr>
<tr>
<td><strong>Vibration resistance according to IEC 60068-2-6</strong></td>
<td>2 g, from 10 to 200 Hz (AUMA NORM actuator), 1g, 10 to 200 Hz (for actuators with AMExC or ACExC integral controls)</td>
</tr>
<tr>
<td></td>
<td>Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid with KP or KT plug/socket connector, not valid in combination with gearboxes.</td>
</tr>
<tr>
<td><strong>Corrosion protection</strong></td>
<td>KX-G: Suitable for use in freshwater (lm1), seawater (lm2) and on seafloor (lm3), aluminium-free version (outer parts)</td>
</tr>
<tr>
<td><strong>Coating</strong></td>
<td>Two-layer powder coating with additional wet painting</td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>Standard: AUMA silver-grey (similar to RAL 7037)</td>
</tr>
<tr>
<td></td>
<td>Option: Available colours on request</td>
</tr>
<tr>
<td><strong>Lifetime</strong></td>
<td>AUMA multi-turn actuators meet or exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.</td>
</tr>
<tr>
<td><strong>Noise level</strong></td>
<td>&lt; 72 dB (A)</td>
</tr>
</tbody>
</table>
Further information

EU Directives

<table>
<thead>
<tr>
<th>Directive</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX Directive</td>
<td>(2014/34/EU)</td>
</tr>
<tr>
<td>Electromagnetic Compatibility (EMC)</td>
<td>(2014/30/EU)</td>
</tr>
<tr>
<td>Low Voltage Directive</td>
<td>(2014/35/EU)</td>
</tr>
<tr>
<td>Machinery Directive</td>
<td>(2006/42/EC)</td>
</tr>
</tbody>
</table>

Technical data for limit and torque switches

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical lifetime</td>
<td>$2 \times 10^6$ starts</td>
</tr>
</tbody>
</table>

**Silver plated contacts:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>U min.</td>
<td>24 V AC/DC</td>
</tr>
<tr>
<td>U max.</td>
<td>250 V AC/DC</td>
</tr>
<tr>
<td>I min.</td>
<td>20 mA</td>
</tr>
<tr>
<td>I max. AC current</td>
<td>5 A at 250 V (resistive load)</td>
</tr>
<tr>
<td></td>
<td>3 A at 250 V (inductive load, cos phi = 0.6)</td>
</tr>
<tr>
<td>I max. DC current</td>
<td>0.4 A at 250 V (resistive load)</td>
</tr>
<tr>
<td></td>
<td>0.03 A at 250 V (inductive load, L/R = 3 µs)</td>
</tr>
<tr>
<td></td>
<td>7 A at 30 V (resistive load)</td>
</tr>
<tr>
<td></td>
<td>5 A at 30 V (inductive load, L/R = 3 µs)</td>
</tr>
</tbody>
</table>

**Gold plated contacts**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>U min.</td>
<td>5 V</td>
</tr>
<tr>
<td>U max.</td>
<td>50 V</td>
</tr>
<tr>
<td>I min.</td>
<td>4 mA</td>
</tr>
<tr>
<td>I max.</td>
<td>400 mA</td>
</tr>
</tbody>
</table>

Technical data for blinker transmitter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical lifetime</td>
<td>$10^7$ starts</td>
</tr>
</tbody>
</table>

**Silver plated contacts:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>U min.</td>
<td>10 V AC/DC</td>
</tr>
<tr>
<td>U max.</td>
<td>250 V AC/DC</td>
</tr>
<tr>
<td>I max. AC current</td>
<td>3 A at 250 V (resistive load)</td>
</tr>
<tr>
<td></td>
<td>2 A at 250 V (inductive load, cos phi = 0.8)</td>
</tr>
<tr>
<td>I max. DC current</td>
<td>0.25 A at 250 V (resistive load)</td>
</tr>
</tbody>
</table>
## 13.2. Technical data Actuator controls

### Features and functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion protection</td>
<td>Refer to name plate</td>
</tr>
<tr>
<td>Power supply</td>
<td>Refer to name plates at actuator controls and motor</td>
</tr>
<tr>
<td>Permissible variation of mains voltage: ±10 %</td>
<td>Permissible variation of mains voltage: ±30 % (option)</td>
</tr>
<tr>
<td>Permissible variation of mains frequency: ±5 %</td>
<td>Permissible variation of mains frequency: ±5 %</td>
</tr>
<tr>
<td>External supply of the electronics (option)</td>
<td>24 V DC, +20 %–15 %, Current consumption: Basic version approx. 250 mA, with options up to 500 mA</td>
</tr>
<tr>
<td></td>
<td>External power supply must have reinforced insulation against mains voltage in accordance with IEC 61010-1.</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Current consumption of controls depending on mains voltage:</td>
</tr>
<tr>
<td></td>
<td>For permissible variation of mains voltage of ±10 %:</td>
</tr>
<tr>
<td></td>
<td>● 100 to 120 V AC = max. 740 mA</td>
</tr>
<tr>
<td></td>
<td>● 208 to 240 V AC = max. 400 mA</td>
</tr>
<tr>
<td></td>
<td>● 380 to 500 V AC = max. 250 mA</td>
</tr>
<tr>
<td></td>
<td>● 515 to 690 V AC = max. 200 mA</td>
</tr>
<tr>
<td></td>
<td>For permissible variation of mains voltage of ±30 %:</td>
</tr>
<tr>
<td></td>
<td>● 100 to 120 V AC = max. 1,200 mA</td>
</tr>
<tr>
<td></td>
<td>● 208 to 240 V AC = max. 750 mA</td>
</tr>
<tr>
<td></td>
<td>● 380 to 500 V AC = max. 400 mA</td>
</tr>
<tr>
<td></td>
<td>● 515 to 690 V AC = max. 400 mA</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>Category III according to IEC 60364-4-443</td>
</tr>
<tr>
<td>Rated power</td>
<td>The actuator controls are designed for the nominal motor power, refer to motor name plate</td>
</tr>
<tr>
<td>Switchgear</td>
<td>Standard: Reversing contactors (mechanically and electrically interlocked) for AUMA power classes A1/A2</td>
</tr>
<tr>
<td></td>
<td>Options: Reversing contactors (mechanically and electrically interlocked) for AUMA power class A3</td>
</tr>
<tr>
<td></td>
<td>Thyristor unit for mains voltage up to 500 V AC (recommended for modulating actuators) for AUMA power classes B1, B2 and B3</td>
</tr>
<tr>
<td></td>
<td>The reversing contactors are designed for a lifetime of 2 million starts. For applications requiring a high number of starts, we recommend the use of thyristor units.</td>
</tr>
<tr>
<td></td>
<td>For the assignment of AUMA power classes, please refer to electrical data on actuator.</td>
</tr>
<tr>
<td>Control and feedback signals</td>
<td>Via Modbus TCP/IP interface</td>
</tr>
<tr>
<td>Modbus TCP/IP interface with additional input signals (option)</td>
<td>2 free analogue inputs (0/4 – 20 mA), 4 free digital inputs</td>
</tr>
<tr>
<td></td>
<td>- Signal transmission is made via fieldbus interface</td>
</tr>
<tr>
<td></td>
<td>- Inputs OPEN, STOP, CLOSE, EMERGENCY, I/O interface, MODE (via opto-isolator thereof OPEN, STOP, CLOSE, MODE with one common and EMERGENCY, I/O interface respectively without common)</td>
</tr>
<tr>
<td></td>
<td>- OPEN, STOP, CLOSE, EMERGENCY control inputs</td>
</tr>
<tr>
<td></td>
<td>- I/O interface: Selection of control type (fieldbus interface or additional input signals)</td>
</tr>
<tr>
<td></td>
<td>- MODE: Selection between open-close duty (OPEN, STOP, CLOSE) or modulating duty (0/4 – 20 mA position setpoint)</td>
</tr>
<tr>
<td></td>
<td>- Additionally 1 analogue input (0/4 – 20 mA) for position setpoint</td>
</tr>
<tr>
<td>Control voltage/current consumption for control inputs</td>
<td>Standard: 24 V DC, current consumption: approx. 10 mA per input</td>
</tr>
<tr>
<td></td>
<td>Options: 48 V DC, current consumption: approx. 7 mA per input</td>
</tr>
<tr>
<td></td>
<td>60 V DC, current consumption: approx. 9 mA per input</td>
</tr>
<tr>
<td></td>
<td>115 V DC, current consumption: approx. 15 mA per input</td>
</tr>
<tr>
<td></td>
<td>100 – 120 V AC, current consumption: approx. 15 mA per input</td>
</tr>
<tr>
<td></td>
<td>All input signals must be supplied with the same potential.</td>
</tr>
</tbody>
</table>
## Features and functions

### Status signals

**Via Modbus TCP/IP interface**

Additional, binary output signals (only available in combination with additional input signals (option))

- 6 programmable output contacts:
  - 5 potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load)  
  Standard assignment: End position CLOSED, end position OPEN, selector switch REMOTE, torque fault CLOSE, torque fault OPEN
  - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load)  
  Standard assignment: Collective fault signal (torque fault, phase failure, motor protection tripped)

- 6 programmable output contacts:
  - 5 potential-free change-over contacts with one common, max. 250 V AC, 1 A (resistive load)
  - 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load)

- 6 programmable output contacts:
  - 6 potential-free change-over contacts without one common, max. 250 V AC, 5 A (resistive load)

- 6 programmable output contacts:
  - 4 mains failure proof potential-free NO contacts with one common, max. 250 V AC, 1 A (resistive load), 1 potential-free NO contact, max. 250 V AC, 1 A (resistive load), 1 potential-free change-over contact, max. 250 V AC, 5 A (resistive load)

- 6 programmable output contacts:
  - 4 mains failure proof potential-free NO contacts, max. 250 V AC, 5 A (resistive load), 2 potential-free change-over contacts, max. 250 V AC, 5 A (resistive load),

All binary output signals must be supplied with the same potential.

- Analogue output signal for position feedback
  - Galvanically isolated position feedback 0/4 – 20 mA (load max. 500 Ω)

### Local controls

**Standard:**

- Selector switch LOCAL - OFF - REMOTE (lockable in all three positions)
- Push buttons OPEN, STOP, CLOSE, RESET
  - Local STOP
    The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.)
- 6 indication lights:
  - End position and running indication CLOSED (yellow), torque fault CLOSE (red), motor protection tripped (red), torque fault OPEN (red), end position and running indication OPEN (green), Bluetooth (blue)
- Graphic LC display: illuminated

**Options:**

- Special colours for the indication lights:
  - End position CLOSED (green), torque fault CLOSE (blue), torque fault OPEN (yellow), motor protection tripped (violet), end position OPEN (red)

### Bluetooth Communication interface

**Bluetooth class II chip, version 2.1:** With a range up to 10 m in industrial environments, supports the SPP Bluetooth profile (Serial Port Profile).

**Required accessories:**

- AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC)
- AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)

### Application functions

**Standard:**

- Selectable type of seating, limit or torque seating for end position OPEN and end position CLOSED
- Torque by-pass: Adjustable duration (with adjustable peak torque during start-up time)
- Start and end of stepping mode as well as ON and OFF times can be set individually for directions OPEN and CLOSE, 1 to 1,800 seconds
- Any 8 intermediate positions between 0 and 100 %, reaction and signal behaviour programmable
- Running indication blinking: can be set
- Positioner:
  - Position setpoint via Modbus TCP/IP interface
  - Automatic adaptation of dead band (adaptive behaviour selectable)
  - Change-over between OPEN-CLOSE control and setpoint control via fieldbus interface

**Option:**

- PID process controller: with adaptive positioner, via 0/4 – 20 mA analogue inputs and Modbus TCP/IP for process setpoint and actual process value
- Multiport valve: Up to 16 positions, signals (pulse or edge)
- Automatic deblocking: Up to 5 operation trials, travel time in opposite direction can be set
### Features and functions

#### Safety functions
- **Standard:**
  - EMERGENCY operation (programmable behaviour)
    - Via additional input (option, low active) or via fieldbus interface
    - Reaction can be selected: STOP, run to end position CLOSED, run to end position OPEN, run to intermediate position
    - Torque monitoring can be by-passed during EMERGENCY operation.
    - Thermal protection can be by-passed during EMERGENCY operation (only in combination with thermoswitch within actuator, not with PTC thermistor).
- **Options:**
  - Release of local controls via fieldbus interface: Thus, actuator operation can be enabled or disabled via push buttons on local controls.
  - Local STOP
    - The actuator can be stopped via push button STOP of local controls if the selector switch is in position REMOTE. (Not activated when leaving the factory.)
  - Interlock for main/by-pass valve: Enabling the operation commands OPEN or CLOSE via fieldbus interface
  - PVST (Partial Valve Stroke Test): programmable to check the function of both actuator and actuator controls: Direction, stroke, operation time, reversing time

#### Monitoring functions
- Valve overload protection: adjustable, results in switching off and generates fault signal
- Motor temperature monitoring (thermal monitoring): results in switching off and generates fault indication
- Monitoring the heater within actuator: generates warning signal
- Monitoring of permissible on-time and number of starts: adjustable, generates warning signal
- Operation time monitoring: adjustable, generates warning signal
- Phase failure monitoring: results in switching off and generates fault signal
- Automatic correction of rotation direction upon wrong phase sequence (3-ph AC current)

#### Diagnostic functions
- Electronic device ID with order and product data
- Operating data logging: A resettable counter and a lifetime counter each for:
  - Motor running time, number of starts, torque switch trippings in end position CLOSED, limit switch trippings in end position CLOSED, torque switch trippings in end position OPEN, limit switch trippings in end position OPEN, torque faults CLOSE, torque faults OPEN, motor protection trippings
- Time-stamped event report with history for setting, operation and faults
- Status signals according to NAMUR recommendation NE 107: "Failure", "Function check", "Out of specification", "Maintenance required"
- Torque characteristics (for version with MWG in actuator):
  - 3 torque characteristics (torque-travel characteristic) for opening and closing directions can be saved separately.
  - Torque characteristics stored can be shown on the display.

#### Motor protection evaluation
- **Standard:** PTC tripping device in combination with PTC thermistors within actuator motor
- **Option:** Thermal overload relay in controls combined with thermoswitches within actuator

#### Electrical connection
- **Standard:** AUMA Ex plug/socket connector with terminal blocks (KES), flameproof enclosure Ex d
- **Options:** AUMA Ex plug/socket connector (KT); screw-type motor terminals; push-in type control terminals

#### Threads for cable entries
- **Standard:** Metric threads
- **Options:** Pg-threads, NPT-threads, G-threads

#### Wiring diagram
- Refer to name plate

### Settings/programming the Modbus TCP/IP interface

#### Setting the fieldbus address
- Baud rate, parity and Modbus address are set via the display of actuator controls

#### Setting the Modbus gateway
- Settings are made via web server
- Default settings of the IP interface:

<table>
<thead>
<tr>
<th><strong>IP Address Selection</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address Type</strong></td>
</tr>
<tr>
<td><strong>Static IP Address</strong></td>
</tr>
<tr>
<td><strong>Subnet Mask</strong></td>
</tr>
<tr>
<td><strong>Default Gateway</strong></td>
</tr>
</tbody>
</table>
## General Modbus TCP/IP data

<table>
<thead>
<tr>
<th>Communication protocol</th>
<th>Modbus TCP/IP according to IEC 61158 and IEC 61784</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network topology</td>
<td>Star topology/ point-to-point topology</td>
</tr>
<tr>
<td>Transmission medium</td>
<td>IEC IEEE 802.3, cable recommendation: Cat. 6A</td>
</tr>
<tr>
<td>Transmission rate/cable length</td>
<td>● Baud rate of 10/100 Mbits/s</td>
</tr>
<tr>
<td></td>
<td>● Maximum cable length: 100 m</td>
</tr>
</tbody>
</table>

## Supported Modbus functions (services)

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Read Coil Status</td>
</tr>
<tr>
<td>02</td>
<td>Read Input Status</td>
</tr>
<tr>
<td>03</td>
<td>Read Holding Registers</td>
</tr>
<tr>
<td>04</td>
<td>Read Input Registers</td>
</tr>
<tr>
<td>05</td>
<td>Force Single Coil</td>
</tr>
<tr>
<td>15 (0FHex)</td>
<td>Force Multiple Coils</td>
</tr>
<tr>
<td>06</td>
<td>Preset Single Register</td>
</tr>
<tr>
<td>16 (10Hex)</td>
<td>Preset Multiple Registers</td>
</tr>
<tr>
<td>17 (11Hex)</td>
<td>Report Slave ID</td>
</tr>
</tbody>
</table>

## Commands and signals of the Modbus TCP/IP interface

### Process representation output (command signals)

- OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable LOCAL, Interlock OPEN/CLOSE

### Process representation input (feedback signals)

- End positions OPEN, CLOSED
- Actual position value
- Actual torque value, requires magnetic limit and torque transmitter (MWG) in actuator
- Selector switch in position LOCAL/REMOTE
- Running indication (directional)
- Torque switches OPEN, CLOSED
- Limit switches OPEN, CLOSED
- Manual operation by handwheel or via local controls
- Analogue (2) and digital (4) customer inputs

### Process representation input (fault signals)

- Motor protection tripped
- Torque switch tripped in mid-travel
- One phase missing
- Failure of analogue customer inputs

### Behaviour on loss of communication

- The behaviour of the actuator is programmable:
  - Stop in current position
  - Travel to end position OPEN or CLOSED
  - Travel to any intermediate position
  - Execute last received operation command

## Service conditions

### Use

- Indoor and outdoor use permissible

### Mounting position

- Any position

### Installation altitude

- ≤ 2,000 m above sea level
- > 2,000 m above sea level, on request

### Ambient temperature

- Refer to name plate of actuator controls

### Humidity

- Up to 100 % relative humidity across the entire permissible temperature range
<table>
<thead>
<tr>
<th>Service conditions</th>
<th>IP68</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure protection according to EN 60529</td>
<td>Terminal compartment additionally sealed against interior of actuator controls (double sealed)</td>
</tr>
<tr>
<td>According to AUMA definition, enclosure protection IP68 meets the following requirements:</td>
<td></td>
</tr>
<tr>
<td>● Depth of water: Maximum 8 m head of water</td>
<td></td>
</tr>
<tr>
<td>● Duration of continuous immersion in water: Maximum 96 hours</td>
<td></td>
</tr>
<tr>
<td>● Up to 10 operations during continuous immersion</td>
<td></td>
</tr>
<tr>
<td>● Modulating duty is not possible during continuous immersion.</td>
<td></td>
</tr>
<tr>
<td>For exact version, refer to actuator controls name plate.</td>
<td></td>
</tr>
<tr>
<td>Pollution degree according to IEC 60664-1</td>
<td>Pollution degree 4 (when closed), pollution degree 2 (internal)</td>
</tr>
<tr>
<td>Vibration resistance according to IEC 60068-2-6</td>
<td>Resistance against vibration can be given on request</td>
</tr>
<tr>
<td>Corrosion protection</td>
<td>Standard: KS</td>
</tr>
<tr>
<td></td>
<td>Suitable for use in areas with high salinity, almost permanent condensation, and high pollution.</td>
</tr>
<tr>
<td></td>
<td>Option: KX</td>
</tr>
<tr>
<td></td>
<td>Suitable for use in areas with extremely high salinity, permanent condensation, and high pollution.</td>
</tr>
<tr>
<td>Coating</td>
<td>Double layer powder coating</td>
</tr>
<tr>
<td></td>
<td>Two-component iron-mica combination</td>
</tr>
<tr>
<td>Colour</td>
<td>Standard: AUMA silver-grey (similar to RAL 7037)</td>
</tr>
<tr>
<td></td>
<td>Option: Available colours on request</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td>Wall bracket</td>
<td>For actuator controls mounted separately from the actuator, including plug/socket connector. Connecting cable on request.</td>
</tr>
<tr>
<td></td>
<td>Recommended for high ambient temperatures, difficult access, or in case of heavy vibration during service.</td>
</tr>
<tr>
<td></td>
<td>Cable length between actuator and actuator controls is max. 100 m (Not suitable for version with potentiometer in the actuator). Instead of the potentiometer, the actuator has to be equipped with an electronic position transmitter. (MWG requires a separate data cable.)</td>
</tr>
<tr>
<td>Programming software</td>
<td>AUMA CDT (Commissioning and Diagnostic Tool for Windows-based PC)</td>
</tr>
<tr>
<td></td>
<td>AUMA Assistant App (Commissioning and Diagnostic Tool for Android devices)</td>
</tr>
<tr>
<td>Further information</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 12 kg (including Ex-plug/socket connector and terminal board)</td>
</tr>
<tr>
<td>EU Directives</td>
<td>ATEX Directive: (2014/34/EU)</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic Compatibility (EMC): (2014/30/EU)</td>
</tr>
<tr>
<td></td>
<td>Machinery Directive: (2006/42/EC)</td>
</tr>
</tbody>
</table>
14. **Spare parts**

14.1. **Multi-turn actuators SAEx 07.2 – SAEx 16.2 / SAREx 07.2 – SAREx 16.2 KES**
Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

<table>
<thead>
<tr>
<th>Ref. no.</th>
<th>Designation</th>
<th>Type</th>
<th>Ref. no.</th>
<th>Designation</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>002.0</td>
<td>Bearing flange</td>
<td>Sub-assembly</td>
<td>549.0</td>
<td>Output drive types B/B1/B2/B3/B4/C/E</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>003.0</td>
<td>Hollow shaft</td>
<td>Sub-assembly</td>
<td>549.1</td>
<td>Output drive sleeve B/B1/B2/B3/B4/C/E</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>005.0</td>
<td>Drive shaft</td>
<td>Sub-assembly</td>
<td>551.1</td>
<td>Parallel key</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>005.1</td>
<td>Motor coupling</td>
<td>Sub-assembly</td>
<td>553.0</td>
<td>Mechanical position indicator</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>005.3</td>
<td>Manual drive coupling</td>
<td>Sub-assembly</td>
<td>554.0</td>
<td>Socket carrier for motor plug/socket connector with cable harness</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>006.0</td>
<td>Worm wheel</td>
<td>Sub-assembly</td>
<td>556.0</td>
<td>Potentiometer for position transmitter</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>009.0</td>
<td>Manual gearing</td>
<td>Sub-assembly</td>
<td>556.1</td>
<td>Potentiometer without slip clutch</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>017.0</td>
<td>Torque lever</td>
<td>Sub-assembly</td>
<td>557.0</td>
<td>Heater</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>018.0</td>
<td>Gear segment</td>
<td>Sub-assembly</td>
<td>558.0</td>
<td>Blinker transmitter including pins at wires (without impulse disc and insulation plate)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>019.0</td>
<td>Crown wheel</td>
<td>Sub-assembly</td>
<td>559.0-1</td>
<td>Electromechanical control unit with switches, including torque switching heads</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>022.0</td>
<td>Drive pinion II for torque switching</td>
<td>Sub-assembly</td>
<td>559.0-2</td>
<td>Electronic control unit with magnetic limit and torque transmitter (MWG)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>023.0</td>
<td>Output drive wheel for limit switching</td>
<td>Sub-assembly</td>
<td>560.0-1</td>
<td>Switch stack for direction OPEN</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>024.0</td>
<td>Drive wheel for limit switching</td>
<td>Sub-assembly</td>
<td>560.0-2</td>
<td>Switch stack for direction CLOSE</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>025.0</td>
<td>Locking plate</td>
<td>Sub-assembly</td>
<td>560.1</td>
<td>Switch for limit/torque</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>058.0</td>
<td>Cable for protective earth</td>
<td>Sub-assembly</td>
<td>560.2</td>
<td>Switch case</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>070.0</td>
<td>Motor (only for V... motors incl. ref. no. 079.0)</td>
<td>Sub-assembly</td>
<td>566.0</td>
<td>RWG position transmitter</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>079.0</td>
<td>Planetary gearing for motor drive (only for V... motors)</td>
<td>Sub-assembly</td>
<td>566.1</td>
<td>Potentiometer for RWG without slip clutch</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>155.0</td>
<td>Reduction gearing</td>
<td>Sub-assembly</td>
<td>566.2</td>
<td>Position transmitter board for RWG</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>500.0</td>
<td>Cover</td>
<td>Sub-assembly</td>
<td>566.3</td>
<td>Cable set for RWG</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>502.0</td>
<td>Pin carrier without pins</td>
<td>Sub-assembly</td>
<td>567.1</td>
<td>Slip clutch for potentiometer</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>505.0</td>
<td>Pin for controls</td>
<td>Sub-assembly</td>
<td>568.1</td>
<td>Stem protection tube (without cap)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>506.0</td>
<td>Pin for motor</td>
<td>Sub-assembly</td>
<td>568.2</td>
<td>Protective cap for stem protection tube</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>511.0</td>
<td>Threaded plug</td>
<td>Sub-assembly</td>
<td>568.3</td>
<td>V-seal</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>514.0</td>
<td>Output drive type A (without stem nut)</td>
<td>Sub-assembly</td>
<td>568.4</td>
<td>Threaded sleeve</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>514.1</td>
<td>Axial needle roller bearing</td>
<td>Sub-assembly</td>
<td>573.0</td>
<td>Ex plug/socket connector with terminal blocks (KES)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>514.2</td>
<td>Radial seal for output drive type A</td>
<td>Sub-assembly</td>
<td>575.1</td>
<td>Stem nut A (without thread)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>516.0</td>
<td>Output drive type D</td>
<td>Sub-assembly</td>
<td>583.0</td>
<td>Motor coupling on motor shaft</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>516.1</td>
<td>Output drive shaft D</td>
<td>Sub-assembly</td>
<td>583.1</td>
<td>Pin for motor coupling</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>528.0</td>
<td>Terminal frame (without terminals)</td>
<td>Sub-assembly</td>
<td>584.0</td>
<td>Retaining spring for motor coupling</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>529.0</td>
<td>End clamp</td>
<td>Sub-assembly</td>
<td>607.0</td>
<td>Cover</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>533.0</td>
<td>Terminals for motor/controls</td>
<td>Sub-assembly</td>
<td>614.0</td>
<td>EWG position transmitter</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>535.1</td>
<td>Snap ring</td>
<td>Sub-assembly</td>
<td>627.0</td>
<td>MWG 05.03 cover</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>539.0</td>
<td>Screw plug</td>
<td>Sub-assembly</td>
<td>S1</td>
<td>Seal kit, small</td>
<td>Set</td>
</tr>
<tr>
<td>542.0</td>
<td>Handwheel with ball handle</td>
<td>Sub-assembly</td>
<td>S2</td>
<td>Seal kit, large</td>
<td>Set</td>
</tr>
</tbody>
</table>
14.2. Actuator controls ACExC 01.2 KES Modbus TCP/IP
Please state device type and our order number (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Representation of spare parts may slightly vary from actual delivery.

<table>
<thead>
<tr>
<th>Ref. no.</th>
<th>Designation</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>002.0</td>
<td>Local controls</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>002.3</td>
<td>Local controls board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>002.4</td>
<td>Face plate for display</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>006.0</td>
<td>Power supply unit</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>008.1</td>
<td>I/O board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>008.1</td>
<td>Fieldbus board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>009.0</td>
<td>Logic board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>011.1</td>
<td>Relay board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>012.0</td>
<td>Option board</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>500.0</td>
<td>Cover</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>502.0</td>
<td>Pin carrier without pins</td>
<td></td>
</tr>
<tr>
<td>505.0</td>
<td>Pin for controls</td>
<td></td>
</tr>
<tr>
<td>506.0</td>
<td>Pin for motor</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>508.0</td>
<td>Switchgear</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>509.1</td>
<td>Padlock</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>510.0</td>
<td>Fuse kit</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>528.0</td>
<td>Terminal frame (without terminals)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>532.0</td>
<td>Cable conduit (actuator connection)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>535.1</td>
<td>Retaining ring</td>
<td></td>
</tr>
<tr>
<td>573.0</td>
<td>Ex plug/socket connector with terminal blocks (KES)</td>
<td>Sub-assembly</td>
</tr>
<tr>
<td>607.0</td>
<td>Cover</td>
<td></td>
</tr>
<tr>
<td>626.0</td>
<td>Modbus TCP-RTU Gateway</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Seal kit</td>
<td>Set</td>
</tr>
</tbody>
</table>
15. Certificates

Information

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

15.1. Declaration of Incorporation and EU Declaration of Conformity

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

for electric actuators of the following types:

SAEx 07.2, SAEx 07.6, SAEx 10.2, SAEx 14.2, SAEx 14.6, SAEx 16.2, SAEx 16.6, SAEx 16.8, SAREx 10.2, SAREx 14.2, SAREx 14.6, SAREx 16.2, SQREx 05.2, SQREx 07.2, SQREx 10.2, SQREx 12.2, SQREx 14.2, SQREx 05.2, SQREx 07.2, SQREx 10.2, SQREx 12.2, SQREx 14.2

in versions:

AUMA NORM
AUMATIC AMExC 01.1
AUMATIC ACExC 01.2

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

2014/34/EU (ATEX Directive)
2014/30/EU (EMC Directive)

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

Directive 2014/34/EU
EN 60079-0:2012 / A11:2013
EN 60079-1:2014
EN 60079-7:2007

EN 60079-11:2012
EN 13463-1:2009
EN 13463-5:2011

EC type test certificate:

DEKRA 11ATEX0008 X
DEKRA 13ATEX0016 X
DEKRA Certification B.V., 6825 MJ Arnhem, Netherlands
EU identification number 0344

The standards stipulated in the EC type test certificate were partially replaced by new issues. AUMA Riepler GmbH declare the compliance with the requirements of the new issues of standards, since the modified requirements of the new issues of standards are irrelevant for the products stipulated above.

Notification relating to quality assurance within production:

DEKRA 12ATEXQ1217
DEKRA Certification B.V., 6825 MJ Arnhem, Netherlands
EU identification number 0344

Directive 2014/30/EU
EN 61000-6-2:2005 / AC:2005

Directive 2006/42/EC
EN ISO 12100:2010
EN ISO 8210:1996
EN ISO 8211:2001

AUMA actuators are designed for the operation of industrial valves. Putting into service is prohibited until the final machinery has been declared in conformity with the provisions of Directive 2000/45/EC.

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

Appendix I, articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.2, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4

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

Authorised person for documentation: Peter Malus, Aumnastrasse 1, 79370 Muellheim, Germany

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

EN 60034-1:2010 / AC:2010
EN 60178:1997

Muelheim, 2016-09-01
Dr. J. Hoffmann, Managing Director

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