

# auma®

## Electric multi-turn actuators

SA 07.1 – SA 48.1  
SAR 07.1 – SAR 30.1  
AUMA NORM  
for flanges type FA



AUMA Actuators, Inc.  
Registered to ISO 9001  
Certificate No. A4682

### Operation instructions

**Scope of these instructions:** These instructions are valid for multi-turn actuators of the type range SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 in version AUMA NORM. These operation instructions are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.

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## 1. Safety instructions

- 1.1 Range of application** AUMA actuators are designed for the operation of industrial valves, e.g. globe valves, gate valves, butterfly valves and ball valves. For other applications, please consult us. The manufacturer is not liable for any possible damage resulting from use in other than the designated applications. Such risk lies entirely with the user. Observance of these operation instructions is considered as part of the actuator's designated use.
- 1.2 Commissioning (electrical connection)** During electrical operation, certain parts inevitably carry lethal voltages. Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.
- 1.3 Maintenance** The maintenance instructions (refer to page 25) must be observed, otherwise a safe operation of the actuator is no longer guaranteed.
- 1.4 Warnings and notes** Non-observance of the warnings and notes may lead to serious injuries or damage. Qualified personnel must be thoroughly familiar with all warnings and notes in these operation instructions. Correct transport, proper storage, mounting, and installation, as well as careful commissioning are essential to ensure a trouble-free and safe operation. During operation, the multi-turn actuator warms up and surface temperatures > 140 °F may occur. Check the surface temperature prior to contact in order to avoid burns. The following references draw special attention to safety-relevant procedures in these operation instructions. Each is marked by the appropriate pictograph.



**This pictograph means: Note!**

“Note” marks activities or procedures which have major influence on the correct operation. Non-observance of these notes may lead to consequential damage.



**This pictograph means: Electrostatically endangered parts!**

If this pictograph is attached to a printed circuit board, it contains parts which may be damaged or destroyed by electrostatic discharges. If the boards need to be touched during setting, measurement, or for exchange, it must be assured that immediately before a discharge through contact with an earthed metallic surface (e.g. the housing) has taken place.



**This pictograph means: Warning!**

“Warning” marks activities or procedures which, if not carried out correctly, can affect the safety of persons or material.

## 2. Short description

AUMA multi-turn actuators type SA 07.1 – SA 48.1 and SAR 07.1 – SAR 30.1 have a modular design. The limitation of travel is realized via limit switches in both end positions. Torque seating is also possible in both end positions. The type of seating is determined by the valve manufacturer.

### 3. Technical data

**Table 1: Multi-turn actuator SA 07.1 – SA 48.1 / SAR 07.1 – SAR 30.1**

Multi-turn actuators AUMA NORM require electric controls. AUMA offers the controls AUMA MATIC AM or AUMATIC AC for the sizes SA(R) 07.1 - SA(R) 16.1. These can also easily be mounted to the actuator at a later date.	
<b>Features and functions</b>	
Type of duty <sup>1)</sup>	Standard: SA Short time duty S2 - 15 min SAR Intermittent duty S4 - 25 % Option: SA Short time duty S2 - 30 min SAR Intermittent duty S4 - 50 % Intermittent duty S5 - 25 %
Motors	Standard: 3-ph AC asynchronous motor, type IM B9 according to IEC 34 Options: 1-ph AC motor, type IM B14 according to IEC 34 DC shunt motor, type IM B14 according to IEC 34 DC compound motor, type IM B14 according to IEC 34 Special motors
Insulation class	Standard: F, tropicalized Option: H, tropicalized
Motor protection	Standard: Thermostats (NC) Option: PTC thermistors (according to DIN 44082)
Supply voltage	Refer to motor nameplate
Self-locking	yes; for output speeds from 4,8 to 108 rpm and from size SA 35.1 for output speeds from 4,8 to 26 rpm
Limit switching	Counter gear mechanism for end positions CLOSED and OPEN for 1 to 500 turns per stroke (optional for 1 to 5,000 turns per stroke) Standard: Tandem switch (2 NC and 2 NO) for each end position; switches galvanically isolated Options: Single switch (1 NC and 1 NO) for each end position Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching)
Torque switching	adjustable torque switching for direction OPEN and CLOSE Standard: Single switch (1 NC and 1 NO) for each direction Options: Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated
Non-intrusive setting (option)	Magnetic limit and torque transmitter MWG for the sizes SA 07.1 – SA 48.1 (only possible in combination with actuator controls AUMATIC) for 1 to 500 turns per stroke or for 10 to 5,000 turns per stroke
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA For further details see separate data sheet
Torque feedback signal, analogue (option)	Only in combination with magnetic limit and torque transmitter MWG and actuator controls AUMATIC
Mechanical position indicator (option)	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Running indication (option)	Blinker transmitter
Heater in switch compartment	Standard: self-regulating PTC heater, 5 – 20 W, 110 – 250 V DC/AC Options: 24 – 48 V DC/AC or 380 – 400 V AC A resistance type heater (5 W, 24 V DC) is installed in the actuator in combination with the actuator controls AUMA MATIC or AUMATIC.
Motor heater (option)	SA(R) 07.1 – 10.1: 12.5 W SA(R) 14.1 – 16.1: 25 W SA(R) 25.1 – 30.1: 50 W SA 35.1 – 48.1: 50 W
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable
Electrical connections	Standard: SA(R) 07.1 – 16.1: AUMA plug/socket connector with screw type connection, SA(R) 25.1 – 48.1: Control connections on AUMA plug/socket connector, motor connection via terminals Option: for special motors: Motor connection directly via terminal board at the motor
Threads for cable glands	Standard: NPT-threads Options: Pg-threads, G-threads
Terminal plan	Terminal plan according to commission number included in delivery

1) Based on 68 °F ambient temperature and at an average load with running torque according to Technical data SA(R).

Service conditions	
Output drive types	A, B1, B2, B3, B4 according ISO 5210 (A, B2, B4 according to MSS SP-102) A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drives: AF, AK, AG, IB1, IB3
Enclosure protection according to EN 60 529 <sup>2)</sup>	Standard: IP 67 Options: IP 68 IP 67-DS (Double Sealed) IP 68-DS (Double Sealed) (Double Sealed = additional protection of the interior of the housing against ingress of dust and dirt when removing the plug)
Corrosion protection	Standard: KN Suitable for installation in industrial units, in water or power plants with a low pollutant concentration Options: KS Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in wastewater treatment plants, chemical industry) KX Suitable for installation in extremely aggressive atmosphere with high humidity and high pollutant concentration KX-G Same as KX, however aluminium-free version (outer parts)
Finish coating	Standard: Two part acrylic polyurethane
Color	Standard: Dark grey (DB 702, similar to RAL 9007) Option: Other colours are possible on request
Ambient temperature <sup>3)</sup>	Standard: SA - 20 to + 80 °C/ - 20 to + 175 °F SAR - 25 to + 60 °C/ - 20 to + 140 °F Options: SA - 40 to + 60 °C/ - 40 to + 140 °F (low temperature) - 50 to + 60 °C/ - 58 to + 140 °F (extreme low temperature) - 60 to + 60 °C/ - 75 to + 140 °F (extreme low temperature) - 0 to + 120 °C/ + 32 to + 250 °F (high temperature) SAR - 40 to + 60 °C/ - 40 to + 140 °F (low temperature)
Vibration resistance according to IEC 60068-2-6	2 g, for 10 to 200 Hz (only for sizes SA(R) 07.1 – SA(R) 16.1 without controls) Resistant to vibrations during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid for multi-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls). Not valid in combination with gearboxes
Lifetime <sup>4)</sup>	SA 07.1 – SA 10.1 20,000 operating cycles (OPEN - CLOSE - OPEN) with 30 turns per stroke SA 14.1 – SA 16.1 15,000 operating cycles SA 25.1 – SA 30.1 10,000 operating cycles SA 35.1 – SA 48.1 5,000 operating cycles SAR 07.1 – SAR 10.1 <sup>4)</sup> 5 million starts SAR 14.1 – SAR 16.1 <sup>4)</sup> 3.5 million starts SAR 25.1 – SAR 30.1 <sup>4)</sup> 2.5 million starts
Other information	
Reference documents	Product description "Electric multi-turn actuators SA" Dimension sheets SA(R) Electrical data sheets SA/SAR Technical data sheets SA/SAR
<p>2) For 3-phase asynchronous motors in enclosure protection IP 68, higher corrosion protection KS or KX is strongly recommended. Additionally, for enclosure protection IP 68, we recommend to use the double sealed terminal compartment DS. For 1-phase AC motors, DC motors, or special motors, the enclosure protection according the name plate applies.</p> <p>3) Versions with RWG up to max. to + 158 °F</p> <p>4) The lifetime depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operation time, the number of starts per hour chosen should be as low as permissible for the process.</p>	

## 4. Transport, storage and packaging

### 4.1 Transport

- For transport to place of installation, use sturdy packaging.
- Do not attach ropes or hooks to the handwheel for the purpose of lifting by hoist.
- If multi-turn actuator is mounted on valve, attach ropes or hooks for the purpose of lifting by hoist to valve and not to multi-turn actuator.

#### Fitting the handwheel:

For transport purposes, handwheels from a diameter of 400 mm (1 inch corresponds to 25.4 mm) are supplied separately.



**Engage manual operation prior to mounting the handwheel! If the manual operation is not engaged, damages can occur at the change-over mechanism.**

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



**Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.**

- Install the hand wheel over the red change-over lever on to the shaft (figure A-2).
- Secure handwheel using the snapping supplied.

Figure A-1

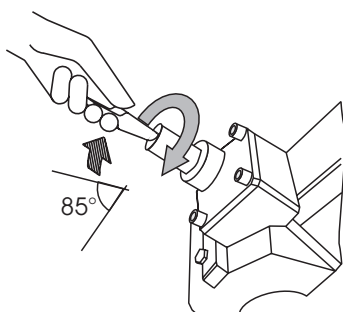
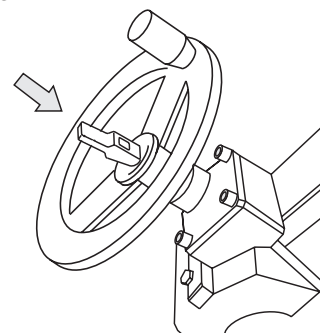


Figure A-2



### 4.2 Storage

- Store in 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.

If multi-turn actuators are to be stored for a long time (more than 6 months), in addition, the following points must imperatively be observed :

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



**After mounting, connect actuator immediately to electrical system, so that the heater prevents condensation.**

### 4.3 Packaging

Our products are protected by special packaging for the transport ex works. The packaging consists of environmentally friendly materials which can easily be separated and recycled.

We use the following packaging materials: wood, cardboard, paper and Polyurethane foam. For the disposal of the packaging material, we recommend recycling and collection centers.

## 5. Mounting to valve/gearbox



- Prior to mounting the multi-turn actuator must be checked for damage. Damaged parts must be replaced by original spare parts.
- After mounting, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.

Mounting is most easily done with the valve shaft/gearbox shaft pointing vertically upward. But mounting is also possible in any other position. The multi-turn actuator leaves the factory in position CLOSED (limit switch CLOSED tripped).

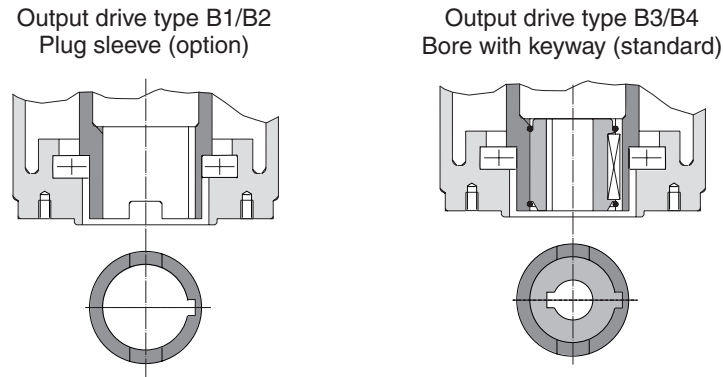
- Check if mounting flange fits the valve/gearbox.



**Spigot at flanges should be loose fit!**

The output drive types B1, B2, B3 or B4 (figure A-3) are delivered with bore and keyway (usually according to ISO 5210) and are sometimes shipped with bore and keyway according to customer request.

**Figure A-3**



For output drive type A (figure B-1), the internal thread of the stem nut must match the thread of the valve stem. If not ordered explicitly with thread, the stem nut is unbored or with pilot bore when delivered. For finish machining of stem nut refer to next page.

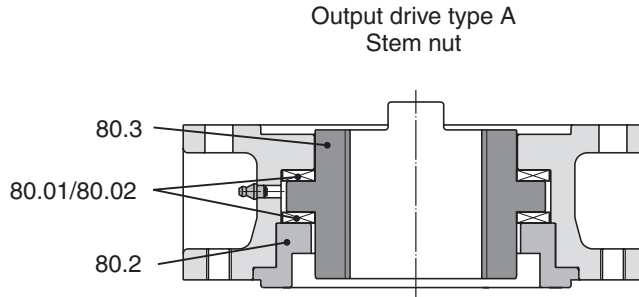
- Check whether bore and keyway match the input shaft of valve/gearbox.
- Thoroughly degrease mounting faces at multi-turn actuator and valve/gearbox.
- Apply a small quantity of grease to input shaft of valve/gearbox.
- Place actuator on valve/gearbox and fasten. Fasten bolts (quality grade 5, refer to table 2) evenly crosswise.

UNC threads	T <sub>A</sub> (ft lbs)
5/16" - 18	19
3/8" - 16	33
1/2" - 13	78
5/8" - 11	155
3/4" - 10	255
1" - 8	590
1 1/4" - 7	1,200
Conversion factor: 1 Nm corresponds to 1.3529 ft lbs.	



**Finish machining of stem nut (output drive type A):**

**Figure B-1**



The output drive flange does not have to be removed from the actuator.

- Remove spigot ring (80.2, figure B-1) from mounting flange.
- Take off stem nut (80.3) together with thrust bearing (80.01) and thrust bearing races (80.02).
- Remove thrust bearing and thrust bearing races from stem nut.
- Drill and bore stem nut and cut thread.
- When fixing in the chuck, make sure stem nut runs true!
- Clean the machined stem nut.
- Apply Lithium soap EP multi-purpose grease to thrust bearing and races, then place them on stem nut.
- Re-insert stem nut with thrust bearings into the mounting flange. Ensure that dogs are placed correctly in the slots of the hollow shaft.
- Screw in spigot ring until it is firm against the shoulder.
- Press Lithium soap EP multi-purpose grease on mineral oil base into the grease nipple with a grease gun (for quantities, refer to table below):

**Table 3: Grease quantities for lubricating bearings**

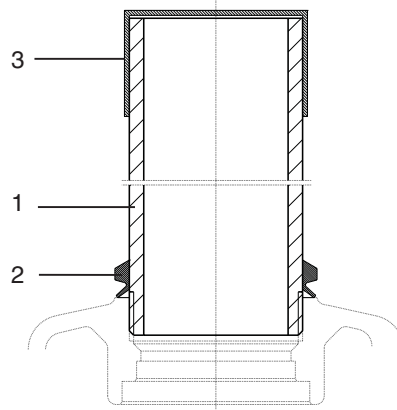
Output drive	A 07.2	A 10.2	A 14.2	A 16.2	A 25.2	A 30.2	A 35.2	A 40.2	A 48.2
Qty <sup>1)</sup> in g	1.5 g	2 g	3 g	5 g	10 g	14 g	20 g	25 g	30 g

1) For grease with a density  $\rho = 900 \text{ g/dm}^3$ ; conversion factor: 1 oz corresponds to 28.35 g

**Protection tube for rising valve stem**

- Protection tubes may be supplied loose. Seal thread with hemp, Teflon tape, or thread sealing material.
- Screw protection tube (1) into thread (figure B-2) and tighten it firmly.
- Push down the sealing (2) to the housing.
- Check whether cap (3) is available and without damage.

**Figure B-2: Protection tube for rising valve stem**



## 6. Manual operation

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

**Engaging manual operation:** • Lift up change-over lever in the center of the handwheel to approx. 85°, while slightly turning the handwheel back and forth until manual operation engages (figure C).

Figure C

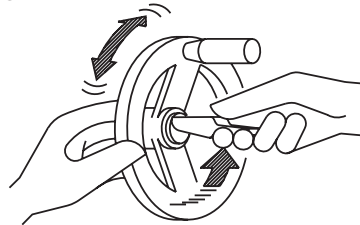
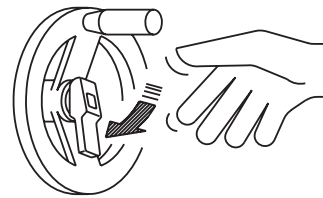


Figure D



**Manual force is sufficient for operating the change-over lever. It is not necessary to use an extension. Excessive force may damage the change-over mechanism.**

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



**Operating the change-over lever while the motor is running (figure E) can lead to increased wear at the change-over mechanism.**

Figure E

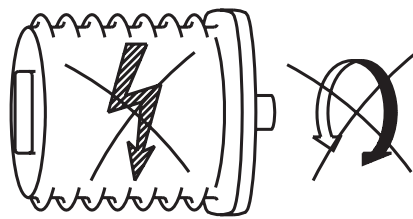
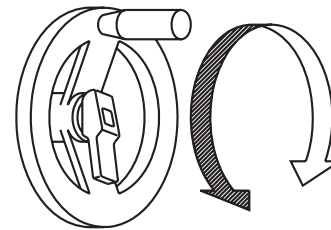


Figure F



- Turn handwheel in desired direction (figure F).

**Disengaging manual operation:**

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

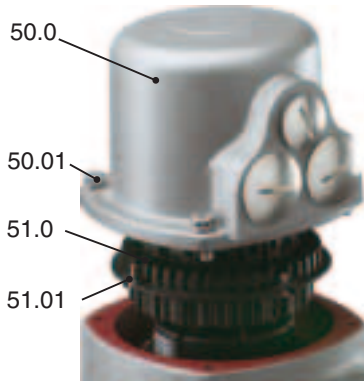
## 7. Electrical connection



**Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.**

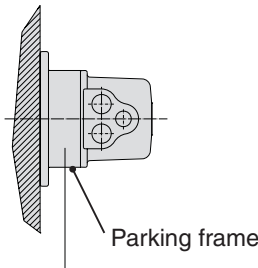
### 7.1 Connection with AUMA plug/socket connector

**Figure G-1: Connection**



- Check whether type of current, supply voltage, and frequency correspond to motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure G-1) and remove plug cover.
- Loosen screws (51.01) and remove socket carrier (51.0) from plug cover (50.0).
- Insert cable glands or conduit fittings suitable for connecting cables.  
 (The enclosure protection stated on the name plate is only ensured if properly sealed connections are made).
- Seal cable entries which are not used with sealed threaded plugs.
- Connect cables according to order-related terminal plan.
- The terminal plan applicable to the actuator is placed inside the terminal compartment, the operation instructions are attached to the handwheel in a weather-proof bag.

**Figure G-2: Parking frame (accessory)**



A special parking frame (figure G-2) for protection against touching the bare contacts and against environmental influences is available.

**Table 4: Technical data AUMA plug/socket connectors**

Technical data	Power terminals <sup>1)</sup>	Protective earth	Control pins
No. of contacts max.	6 (3 are used)	1 (leading contact)	50 pins/sockets
Marking	U1, V1, W1, U2, V2, W2	according to VDE	1 to 50
Voltage max.	750 V	–	250 V
Nominal current max.	25 A	–	16 A
Type of customer connection	Screws	Screw for ring lug	Screws
Cross section max.	6 mm <sup>2</sup> (10 AWG)	6 mm <sup>2</sup> (10 AWG)	2.5 mm <sup>2</sup> (12 AWG)
Material: Pin/ socket carrier	Polyamide	Polyamide	Polyamide
	Contacts	Brass (Ms)	Brass (Ms)
			Brass, tin plated or gold plated (option)

1) Suitable for copper wires. For aluminium wires it is necessary to contact AUMA.

From size SA(R) 25.1, the motor connection is realised via a separate terminal board

## 7.2 Motor connection for the sizes SA(R) 25.1/SAR 30.1 – SA 48.1.

From the size SA(R) 25.1, the power for the motor is connected to separate terminals. For this, the cover at the motor connection compartment has to be removed.

The control contacts are connected to the AUMA plug/socket connector.

Cross section motor terminals:

16 mm<sup>2</sup> to 70 mm<sup>2</sup> (6 to 2/0 AWG), depending on the actuator size

**Figure G-3: Connection to SA(R) 25.1**



AUMA plug/socket connector

Cover motor connection compartment

## 7.3 Motor connection for special motors

For versions with special motors (e.g. DC motors), the connection is performed directly at the motor (figure G-4).

**Figure G-4: Connection special motor**



## 7.4 Delay time

The delay time is the time from the tripping of the limit or torque switches to the motor power being removed. To protect the valve and the actuator, we recommend a delay time < 50 ms. Longer delay times are possible provided the output speed, output drive type, valve type, and the type of installation are taken into consideration.

We recommend to switch off the corresponding contactor directly by the limit or torque switch.

## 7.5 Controls made by AUMA

In case the required reversing contactors are not to be installed in the control cabinet, the controls AUMA MATIC or AUMATIC for the sizes SA(R) 07.1 – SA(R) 16.1 can be easily mounted to the actuator at a later date.

For enquiries and more information, please state our commission no. (refer to actuator name plate).

## 7.6 Heater

AUMA multi-turn actuators have a heater installed as standard. To prevent condensation, the heater must be connected.

## 7.7 Motor protection

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

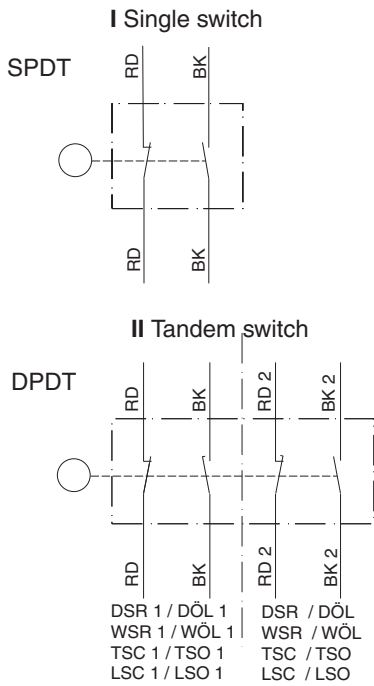
Failure to integrate PTC thermistors or thermostats into the control circuit voids the warranty for the motor.

## 7.8 Remote position transmitter

For the connection of remote position transmitters (potentiometer, RWG) shielded cables must be used.

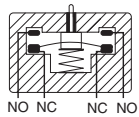
**7.9 Limit and torque switches**

**Figure G-5**



Only the same potential can be switched on the two circuits (NC/NO contact) of a limit or torque switch. If different potentials are to be switched simultaneously, tandem switches are required. To ensure correct actuator indications, the leading contacts of the tandem switches must be used for that purpose and the lagging contacts for motor switching off.

**Table 5: Technical data for limit and torque switches**

			
Mechanical lifetime = 2 x 10 <sup>6</sup> starts			
Type of current	Switch rating I <sub>max</sub>		
	30 V	125 V	250 V
1-phase AC (ind. load) cos phi = 0,8	5 A	5 A	5 A
DC (resistive load)	2 A	0,5 A	0,4 A
with gold plated contacts	min. 5 V, max. 50 V		
Current	min. 4 mA, max. 400 mA		

**7.10 Fitting of the cover**

**After connection:**

- Insert the socket carrier (51.0) into the plug cover (50.0) and fasten it with screws (51.01).
- Clean sealing faces at the plug cover and the housing.
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease (e.g. Vaseline) to the sealing faces.
- Replace plug cover (50.0) and fasten bolts (50.01) evenly crosswise.
- Fasten conduit connections with the specified torque to ensure the required enclosure protection.

## 8. Opening the switch compartment

To be able to carry out the following settings (sections 9. to 15.), the switch compartment must be opened and, if installed, the indicator disc must be removed.

These settings are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.



**Work on the electrical system or equipment must only be carried out by a skilled electrician themselves or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.**

### 8.1 Removing the switch compartment cover

- Loosen 4 bolts and take off the cover at the switch compartment (figures H) .

*Fig. H-1: Cover with indicator glass*



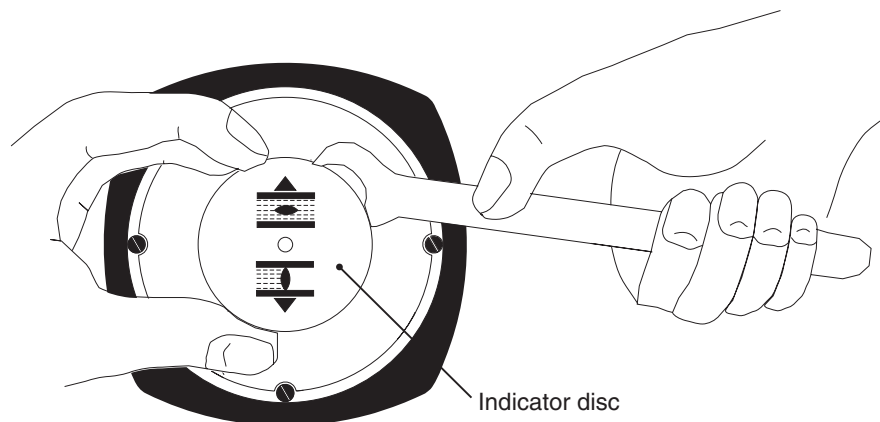
*Fig. H-2: Cover without indicator glass*



### 8.2 Pulling off the indicator disc (option)

- If installed, pull off indicator disc (figure J). Open end wrench may be used as lever.

*Figure J: Pulling off the indicator disc*

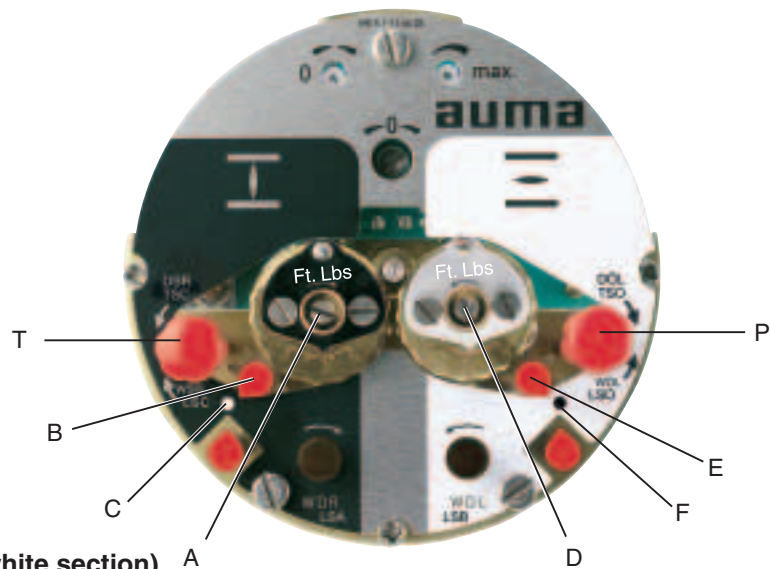


## 9. Setting the limit switching

### 9.1 Setting the end position CLOSED (black section)

- Turn handwheel clockwise until valve is closed.
- After having reached the end position, turn back handwheel by approximately  $\frac{1}{2}$  a turn (overrun). During test run, check overrun and, if necessary, correct setting of the limit switching.
- **Press down** and turn setting spindle A (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer B. While a ratchet is felt and heard, the pointer B moves  $90^\circ$  every time. When pointer B is  $90^\circ$  from mark C, continue turning slowly. When pointer B has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-1: Control unit



### 9.2 Setting the end position OPEN (white section)

- Turn handwheel counterclockwise until valve is open, then turn back by approximately  $\frac{1}{2}$  a turn.
- **Press down** and turn setting spindle D (figure K-1) with a flat blade screw driver in direction of arrow, thereby observe pointer E. While a ratchet is felt and heard, the pointer E moves  $90^\circ$  every time. When pointer E is  $90^\circ$  from mark F, continue turning slowly. When pointer E has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

**9.3 Checking the limit switches** The red test buttons T and P (figure K-1) are used for manual operation of the limit switches.

- Turning T in direction of the arrow LSC (WSR) triggers limit switch CLOSED.
- Turning P in direction of the arrow LSO (WOL) triggers limit switch OPEN.

## 10. Setting the DUO limit switching (option)

Any application can be switched on or off via the two intermediate position switches.

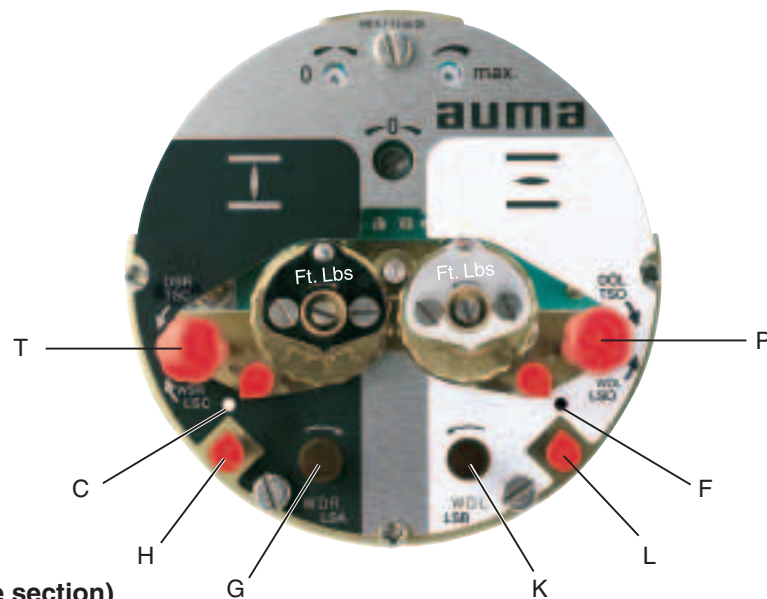


**For setting, the switching point (intermediate position) must be approached from the same direction as later during electrical operation.**

### 10.1 Setting the direction CLOSE (black section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle G (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer H. While a ratchet is felt and heard, the pointer H moves 90° every time. When pointer H is 90° from mark C, continue turning slowly. When pointer H has reached the mark C, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-2: Control unit



### 10.2 Setting the direction OPEN (white section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle K (figure K-2) with a flat blade screw driver in direction of arrow, thereby observe pointer L. While a ratchet is felt and heard, the pointer L moves 90° every time. When pointer L is 90° from mark F, continue turning slowly. When pointer L has reached the mark F, stop turning and release setting spindle. If you override the tripping point inadvertently (ratchet is heard after the pointer has rotated), continue turning the setting spindle in the same direction and repeat setting process.

**10.3 Checking the DUO switches** The red test buttons T and P (Figure K-2) are used for manual operation of DUO limit switches.

- Turning T in direction of the arrow TSC (DSR) triggers DUO limit switch CLOSED. The torque switch CLOSED is actuated at the same time.
- Turning P in direction of the arrow TSO (DÖL) triggers DUO limit switch OPEN. The torque switch OPEN is actuated at the same time.



## 11. Setting the torque switching

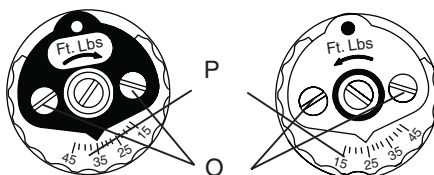
### 11.1 Setting



- The set torque must suit the valve!
- This setting should only be changed with the consent of the valve manufacturer!

**Figure L: Torque switching heads indication in ft lbs**

Setting CLOSED      Setting OPEN



- Loosen both lock screws O at the torque dial (figure L).
- Turn torque dial P to set it to the required torque.

Examples:

Figure L shows the following setting:

35 ft lbs for direction CLOSE

25 ft lbs for direction OPEN

- Tighten lock screws O again



- The torque switches can also be operated in manual operation.
- The torque switching acts as overload protection over full travel, also when stopping in the end positions by limit switching.

### 11.2 Checking the torque switches

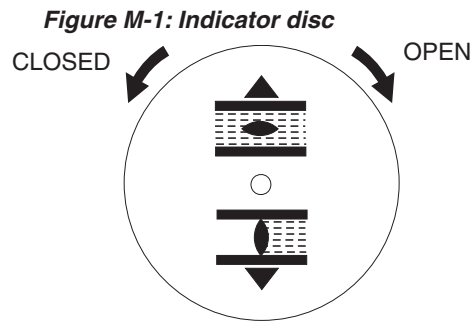
The red test buttons T and P (figure K-2) are used for manual operation of the torque switches:

- Turning T in direction of the arrow TSC (DSR) triggers torque switch CLOSED.
- Turning P in direction of the arrow TSO (DÖL) triggers torque switch OPEN.
- If a DUO limit switching (optional) is installed in the actuator, the intermediate position switches will be operated at the same time.

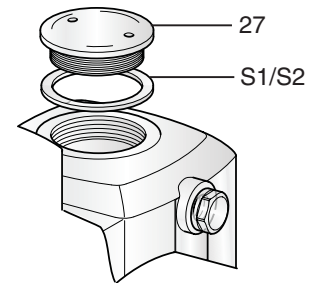
## 12. Test run

### 12.1 Check direction of rotation

- If provided, place indicator disc on shaft. The direction of rotation of the indicator disc (figure M-1) indicates the direction of rotation of the output drive.
- If there is no indicator disc, the direction of rotation can also be observed on the hollow shaft. For this, remove screw plug (no. 27) (figure M-2).



**Figure M-2: Opening the hollow shaft**



- Move actuator manually to intermediate position or to sufficient distance from end position.
- Switch on actuator in direction CLOSE and observe the direction of rotation:



**If the direction of rotation is wrong, switch off immediately**  
 Then, correct phase sequence at motor connection. Repeat test run.

**Table 6:**

<b>Direction of rotation of the indicator disc:</b>	
counterclockwise	correct
<b>Direction of rotation of the hollow shaft:</b>	
clockwise	correct

### 12.2 Check limit switching

- Move actuator manually into both end positions of the valve.
- Check if limit switching is set correctly. Hereby observe that the appropriate switch is tripped in each end position and released again after the direction of rotation is changed. If this is not the case, the limit switching must first be set, as described from page 15.

**If no other options (sections 13. to 15.) require setting:**

- Close switch compartment (see page 23, section 16.).

### 13. Setting the potentiometer (option)

– For remote indication –

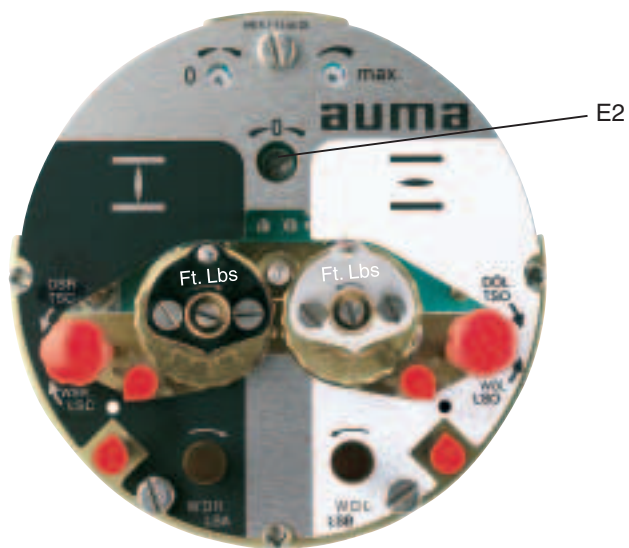
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Turn potentiometer (E2) clockwise until stop is felt.
- End position CLOSED corresponds to 0 %, end position OPEN to 100 %.
- Turn potentiometer (E2) back a little.



**Due to the ratio of the reduction gearings for the position transmitter the complete resistance range is not always utilized for the whole travel. Therefore, an external possibility for adjustment (setting potentiometer) must be provided.**

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

*Figure N: Control unit*



## 14. Setting the electronic position transmitter RWG (option)

– For remote indication or external controls –

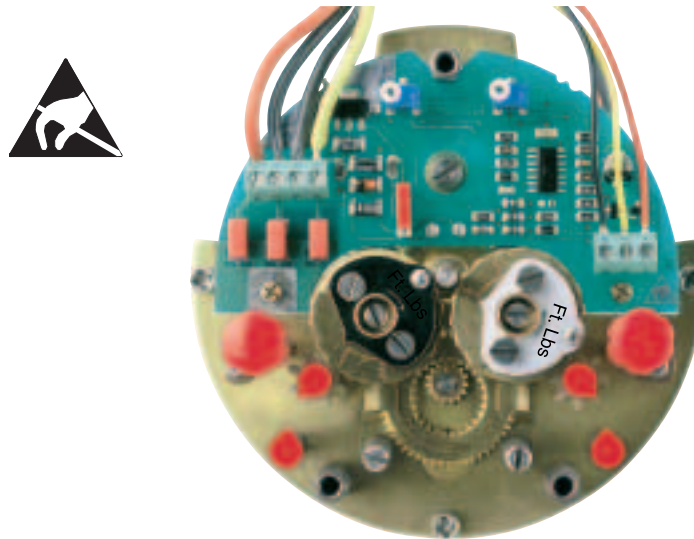
After mounting the multi-turn actuator to the valve, check setting by measuring the output current (see sections 14.1 or 14.2) and re-adjust, if necessary.

**Table 7: Technical data RWG 4020**

Terminal plans		KMS TP__4 / ___	KMS TP _4_ / ___ KMS TP _5_ / ___
		3- or 4-wire system	2-wire system
Output current	$I_a$	0 – 20 mA, 4 – 20 mA	4 – 20 mA
Power supply	$U_v$	24 V DC, $\pm 15\%$ regulated	14 V DC + $(I \times R_B)$ , max. 30 V
max. input current	$I$	24 mA at 20 mA output current	20 mA
max. load	$R_B$	600 $\Omega$	$(U_v - 14 V) / 20 \text{ mA}$

The position transmitter board (figure P-1) is located under the cover plate (figure P-2).

**Figure P-1: Position transmitter board**



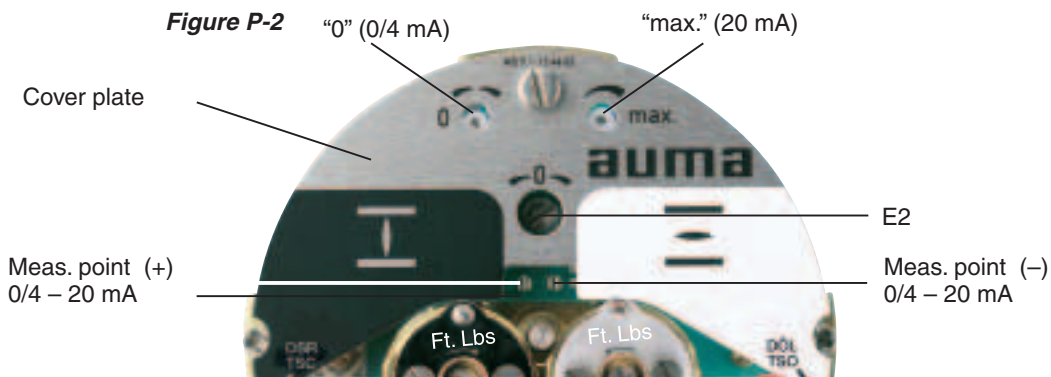
**14.1 Setting for 2-wire system 4 – 20 mA and 3-/4-wire system 0 – 20 mA**

- Connect voltage to electronic position transmitter.
- Move valve to **end position CLOSED**.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



**The circuit (external load) must be connected (max. load  $R_B$ ), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.**

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.



- Turn potentiometer “0” clockwise until output current starts to increase.
- Turn potentiometer “0” back until the following value is reached:  
 for 3- or 4-wire system: approx. 0.1 mA  
 for 2-wire system: approx. 4.1 mA.  
 This ensures that the signal remains above the dead and live zero point.
- Move valve to end position OPEN.
- Set potentiometer “max.” to end value 20 mA.
- Approach end position CLOSED again and check minimum value (0.1 mA or 4.1 mA). If necessary, correct the setting.



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

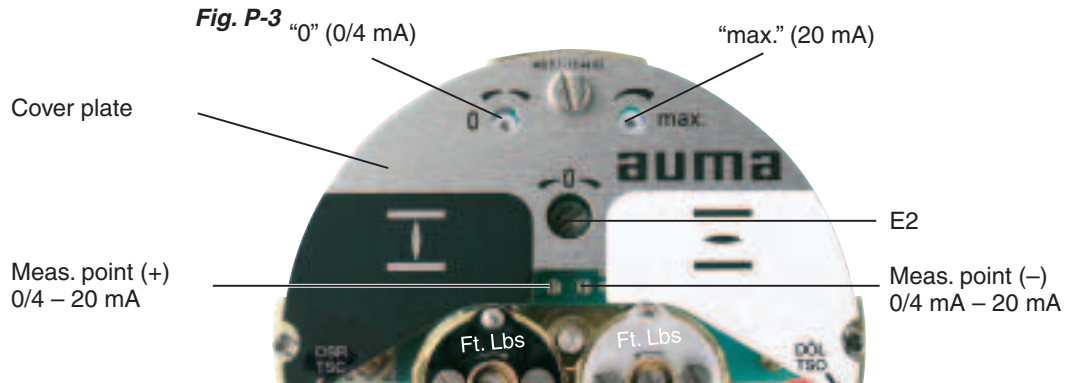
## 14.2 Setting the 3-/4- wire system 4 – 20 mA

- Connect voltage to electronic position transmitter.
- Move valve to end position CLOSED.
- If installed, pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-2).



**The circuit (external load) must be connected (max. load  $R_B$ ), or the appropriate connections at the terminals (refer to terminal plan) must be jumpered, otherwise no value can be measured.**

- Turn potentiometer (E2) clockwise to the stop.
- Turn potentiometer (E2) back a little.



- Turn potentiometer "0" clockwise until output current starts to increase.
- Turn back potentiometer "0" until a residual current of approx. 0.1 mA is reached.
- Move valve to end position OPEN.
- Set potentiometer "max." to end value 16 mA.
- Move valve to end position CLOSED.
- Set potentiometer "0" from 0.1 mA to initial value 4 mA.  
This results in a simultaneous shift of the end value by 4 mA, so that the range is now 4 – 20 mA.
- Approach both end positions again and check setting. If necessary, correct the setting.



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

## 15. Setting the mechanical position indicator (option)



- Place indicator disc on shaft.
- Move valve to end position CLOSED.
- Turn lower indicator disc (figure Q1) until symbol  CLOSED is in alignment with the mark on the cover (figure Q-2).
- Move actuator to end position OPEN.
- Hold lower indicator disc CLOSED in position and turn upper disc with symbol  OPEN until it is in alignment with the mark on the cover.

Figure Q-1

Indicator disc

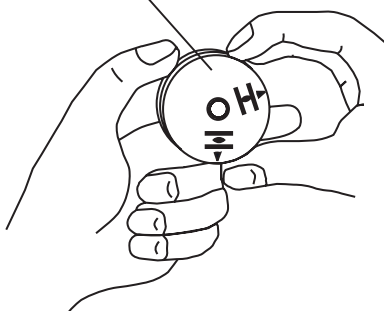


Figure Q-2



Indicator disc rotates by approximately 180° to 230° at full travel from OPEN to CLOSED or vice versa.

A suitable reduction gearing was installed in our factory. If the turns per stroke are changed at a later date, the reduction gearing may have to be exchanged, too.

## 16. Closing the switch compartment

- Clean sealing faces of housing and cover
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease to the sealing faces.
- Replace cover on switch compartment and fasten bolts evenly crosswise.



**After commissioning, check for damage to paint finish of multi-turn actuator. If damage to paint-finish has occurred after mounting, it has to be touched up to avoid corrosion.**

## 17. Enclosure protection IP 68 (option)

### Definition

According to EN 60 259, the conditions for meeting the requirements of enclosure protection IP 68 are to be agreed between manufacturer and user.

AUMA actuators and controls in enclosure protection IP 68 meet the following requirements according to AUMA:

- Duration of submersion in water max. 72 hours
- Head of water max. 6 m
- Up to 10 operations during submersion
- Modulating duty is not possible during submersion

Enclosure protection IP 68 refers to the interior of the actuators (motor, gearing, switch compartment, control, and terminal compartment).

### **For multi-turn actuators, the following has to be observed:**

When using output drive types A and AF (stem nut), it cannot be prevented that water enters the hollow shaft along the valve stem during submersion. This leads to corrosion. The water also enters the thrust bearings of output drive type A, causing corrosion and damage of the bearings. The output drive types A and AF should therefore not be used.

### Inspection

AUMA actuators and controls in enclosure protection IP 68 undergo a routine testing for tightness in the factory.

### Cable glands

- For the entries of the motor and control cables appropriate, cable glands in enclosure protection IP 68 must be used. The size of the cable glands must be suitable for the outside diameter of the cables, refer to recommendations of the cable gland manufacturers.
- As standard, actuators and controls are delivered without cable glands. For delivery, the threads are sealed with plugs in the factory.
- When ordered, cable glands can also be supplied by AUMA at an additional charge. For this, it is necessary to state the outside diameter of the cables.
- The cable glands must be sealed against the housing at the thread with an O-ring.
- It is recommended to additionally apply a liquid sealing material (Loctite or similar).

### Commissioning

When commissioning, the following should be observed:

- Sealing faces of housing and covers must be clean
- O-rings of the covers must not be damaged
- A thin film of non-acidic grease should be applied to sealing faces
- Covers should be tightened evenly and firmly

### After submersion

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



## 18. Maintenance

After maintenance, check multi-turn actuator for damage to paint finish. If damage to paint-finish has occurred, it has to be touched up to avoid corrosion. Original paint in small quantities can be supplied by AUMA.

AUMA multi-turn actuators require low-level maintenance. Precondition for reliable service is correct commissioning.

Seals made of elastomers are subject to ageing and must therefore regularly be checked and, if necessary, exchanged.

It is also very important that the O-rings at the covers are placed correctly and cable glands tightened firmly to prevent ingress of dirt or water.

### We recommend additionally:

- If rarely operated, perform a test run about every 6 months. This ensures that the actuator is always ready to operate.
- Approximately six months after commissioning and then every year, check bolts between actuator and valve/gearbox for tightness. If required, tighten applying the torques given in table 2, page 8.
- For multi-turn actuators with output drive type A: at intervals of approx. 6 months from commissioning press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with grease gun (quantity see table 3, page 9).

## 19. Lubrication

- The gear housing is filled with lubricant in the factory.
- A grease change is recommended after the following operation time:
  - If rarely operated, after 10 – 12 years
  - If operated frequently, after 6 – 8 years



**Lubrication of the valve stem must be done separately.**

## 20. Disposal and recycling

AUMA actuators have an extremely long lifetime. However, they have to be replaced at one point in time.

The actuators have a modular design and may therefore easily be disassembled, separated, and sorted according to materials, i.e.:

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

The following generally applies:

- Collect greases and oils during disassembly. As a rule, these substances 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 regional regulations for waste disposal.

## 21. Service

AUMA offers extensive services such as maintenance and inspection for actuators.

The AUMA service department can be reached at:

phone: 724-743-AUMA (2862)

fax: 724-743-7411

email: [mailbox@auma-usa.com](mailto:mailbox@auma-usa.com)

[www.auma-usa.com](http://www.auma-usa.com) or [www.auma.com](http://www.auma.com).

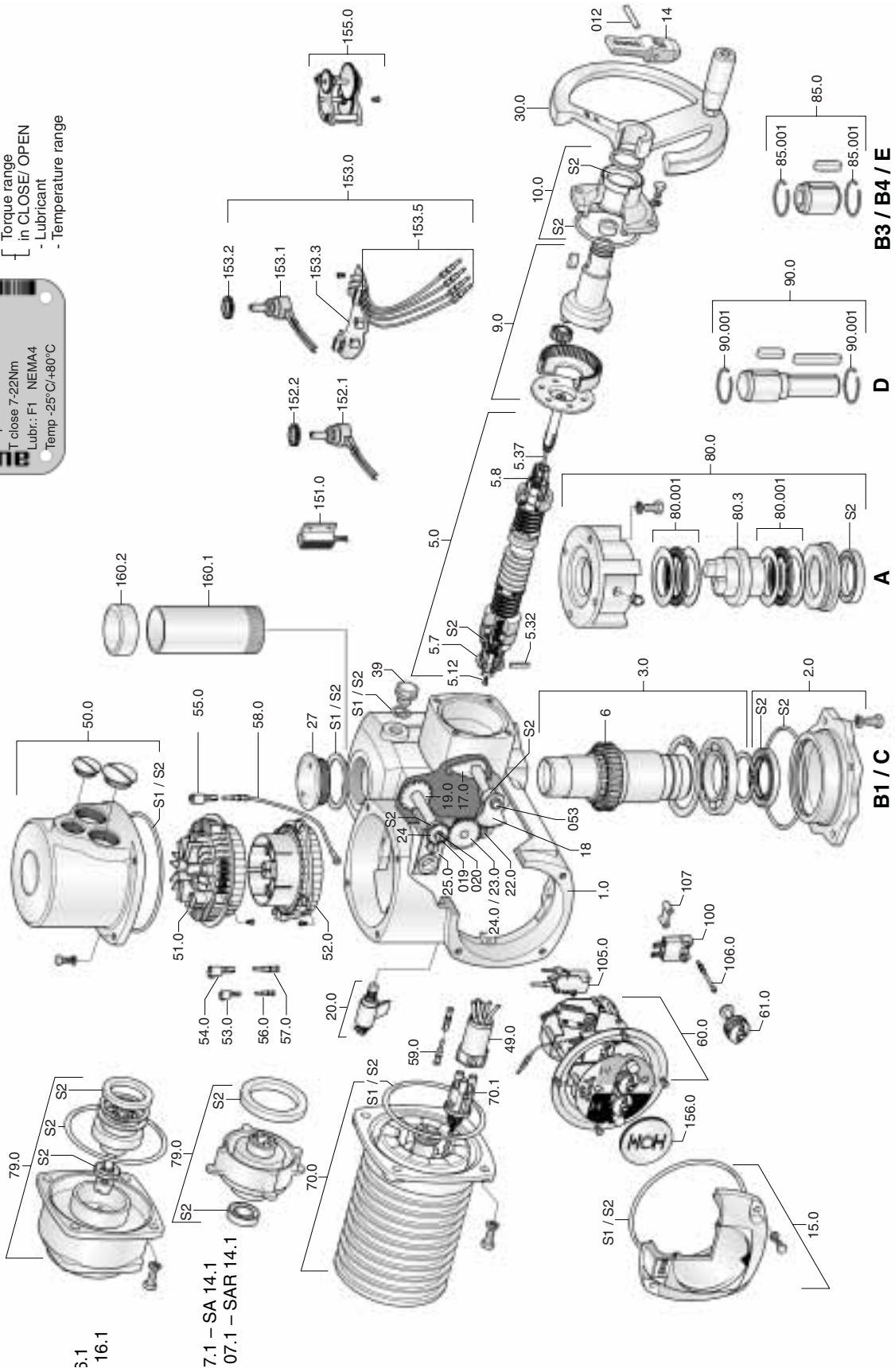
Operation instructions

22. Spare parts list Multi-turn actuator SA(R) 07.1 – SA(R) 16.1 with plug/socket connector

Sample name plate



- Actuator type
- Commission number
- Comm./ sales order number
- Works/ Serial number
- Protection type
- Torque range
- in CLOSE/ OPEN
- Lubricant
- Temperature range



**Notes:**  
When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

No.	Type	Designation	No.	Type	Designation
012	E	Notched pin	58.0	B	Wire for protective earth
019	E	Cheese head screw	59.0 <sup>1)</sup>	B	Pin for motor and thermoswitch in motor plug
020	E	Clamping washer			
053	E	Countersunk screw	60.0	B	Control unit assly. (but without torque head, without switches)
1.0	B	Housing assly.			
2.0	B	Flange, bottom assly.			
3.0	B	Hollow shaft assly. (without worm wheel)	61.0	B	Torque switching head
5.0	B	Worm shaft assly.	70.1 <sup>1)</sup>	B	Motor pin carrier (without pins)
5.12	E	Set screw			
5.32	E	Coupling pin	79.0 <sup>2)</sup>	B	Planetary gearing for motor drive assly.
5.37	B	Pull rod assly.	80.0 <sup>3)</sup>	B	Output drive form A assly. (without thread in stem nut)
5.7	E	Motor coupling			
5.8	B	Manual drive coupling assly.	80.001 <sup>3)</sup>	E	Thrust bearing set
6	E	Worm wheel	80.3 <sup>3)</sup>	E	Stem nut form A (without thread)
9.0	B	Planetary gear assly. for manual drive	85.0 <sup>3)</sup>	B	Output drive B3
10.0	B	Retaining flange assly.	85.001 <sup>3)</sup>	E	Snap ring
14	E	Change-over lever	90.0 <sup>3)</sup>	B	Output drive D
15.0	B	Cover for switch compartment assly.	90.001 <sup>3)</sup>	E	Snap ring
17.0	B	Torque lever assly.	100	B	Switch for limit/ torque switching (including pins at wires)
18	E	Gear segment			
19.0	B	Crown wheel assly.	105.0	B	Blinker transmitter including pins at wires (without impulse disc and insulation plate)
20.0	B	Swing lever assly.			
22.0	B	Drive pinion II for torque switching assly.	106.0	B	Stud bolt for switches
23.0	B	Drive wheel for limit switching assly.	107	E	Spacer
24	E	Drive wheel for limit switching	151.0	B	Heater
24.0	B	Intermediate wheel for limit switching assly.	152.1 <sup>3)</sup>	B	Potentiometer (without slip clutch)
25.0	E	Locking plate	152.2 <sup>3)</sup>	B	Slip clutch for potentiometer
27	E	Screw plug	153.0 <sup>3)</sup>	B	RWG assly.
30.0	B	Handwheel with ball handle assly.	153.1 <sup>3)</sup>	B	Potentiometer for RWG (without slip clutch)
39	E	Screw plug			
49.0 <sup>1)</sup>	B	Motor plug, socket assly.	153.2 <sup>3)</sup>	B	Slip clutch for RWG
50.0	B	Cover assly.	153.3 <sup>3)</sup>	B	Electronic board RWG
51.0	B	Socket carrier assly. (with sockets)	153.5 <sup>3)</sup>	B	Wires for RWG
52.0	B	Pin carrier (without pins)	155.0 <sup>3)</sup>	B	Reduction gearing
53.0	B	Socket for control	156.0 <sup>3)</sup>	B	Mechanical position indicator
54.0	B	Socket for motor	160.1 <sup>3)</sup>	E	Protection tube(without cap)
55.0	B	Socket for protective earth	160.2 <sup>3)</sup>	E	Cap for stem protection tube
56.0	B	Pin for control	S1	S	Seal kit, small
57.0	B	Pin for motor	S2	S	Seal kit, large

- 1) SA 16.1 with output speeds of 32 to 216 rpm or SAR 16.1 with output speeds of 32 and 54 rpm without plug/ socket connector; motor directly wired to pin carrier (No. 52.0) .
- 2) not available for all output speeds
- 3) not included in basic equipment

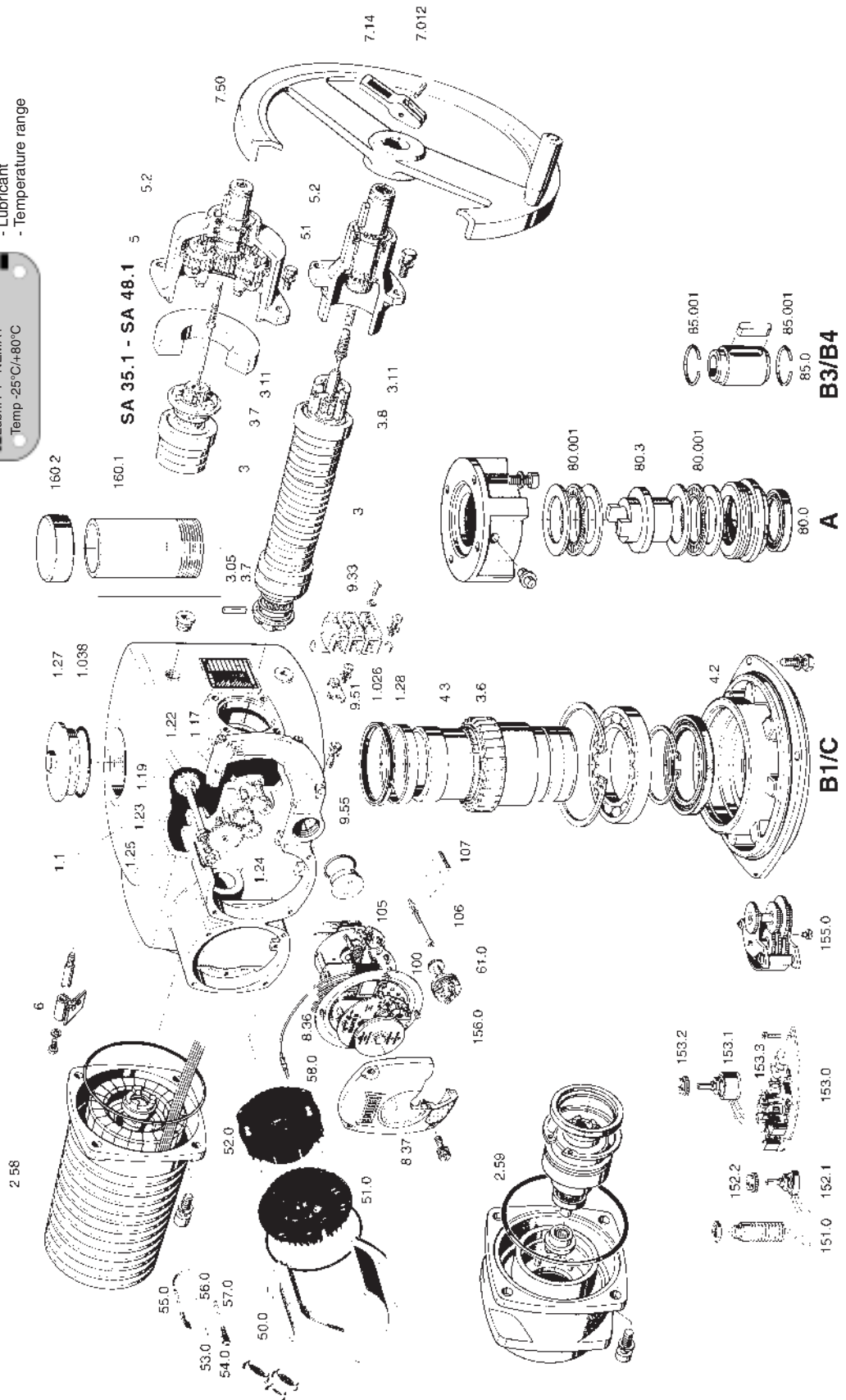
Operation instructions

23. Spare parts list Multi-turn actuator SA 25.1 – SA 48.1/SAR 25.1 – SAR 30.1

Sample name plate



- Actuator type
- Commission number
- Comm./ sales order number
- Works/ Serial number
- Protection type
- Torque range
- Lubricant
- Temperature range



**Notes:**  
When placing orders for spare parts, it is essential to mention type of actuator and our commission number (refer to actuator name plate). Delivered spare parts may slightly vary from the representation in these instructions.

No.	Type	Designation	No.	Type	Designation
1.026	E	Quad ring / radial seal	54.0	B	Socket for motor
1.038	E	O-ring	55.0	B	Socket for protective earth
1.1	B	Housing assly.	56.0	B	Pin for control
1.17	B	Torque lever assly.	57.0	B	Pin for motor
1.19	B	Crown wheel assly.	58.0	B	Wire for protective earth
1.22	B	Drive pinion II for torque switching assly.	61.0	B	Torque switching head
1.23	B	Drive wheel for limit switching assly.	80.0 *	B	Output drive form A assly. (without thread in stem nut)
1.24	B	Intermediate wheel for limit switching assly.		80.001*	S
1.25	E	Locking plate	80.3 *	E	Stem nut form A (without thread)
1.27	E	Screw plug	85.0 *	B	Output drive form B3 assly.
1.28	E	Bearing bush	85.001*	E	Snap ring
2.58	B	Motor	100	B	Switch for limit/ torque switching (including pins at wires)
2.59 ●	B	Planetary gear assly. for motor drive			
3	B	Drive shaft assly.	105	B	Blinker transmitter including pins at wires (without impulse disc and insulation plate)
3.05	E	Dowel pin			
3.11	B	Pull rod assly.	106.0	B	Stud bolts for switches
3.6	B	Worm wheel assly.	107	E	Spacer
3.7	E	Motor coupling	151.0	B	Heater
3.8	B	Manual drive coupling assly.	152.1 *	B	Potentiometer (without slip clutch)
4.2	B	Flange, bottom assly.	152.2 *	B	Slip clutch for potentiometer
4.3	B	Hollow shaft assly.	153.0 *	B	RWG assly.
5	B	Planetary gear assly. for manual drive	153.1 *	B	Potentiometer for RWG (without slip clutch)
5.1	E	Mounting flange	153.2 *	B	Slip clutch for RWG
5.2	B	Hand wheel shaft assly.	153.3 *	B	Printed board for RWG
6	B	Swing lever assly	155.0 *	B	Reduction gearing
7.012	E	Notched pin	156.0 *	B	Mechanical position indicator
7.14	E	Change-over lever	160.1 *	E	Protection tube (without cap)
7.50	B	Handwheel with ball handle assly.	160.2 *	E	Cap
8.36	B	Control unit assly. (but without torque head, without switches)	S1	S	Seal kit (small)
			S2	S	Seal kit (large)
8.37	B	Switch compartment cover			
9.33	B	Terminals for motor connection			
9.51	B	Protective earth connection			
9.55	B	Cover for motor connection compartment assly.			
50.0	B	Plug cover assly.			
51.0	B	Socket carrier assly. (with sockets)			
52.0	B	Pin carrier (without pins)			
53.0	B	Socket for control			

● not available for all output speeds

\* not included in basic equipment

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