Electric part-turn actuators

SG 05.1 – SG 12.1
SGR 05.1 – SGR 12.1
AUMA NORM
for flange type FA

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

Operation instructions

Scope of these instructions: These instructions are valid for part-turn actuators of the type ranges SG 05.1 – SG 12.1 and SGR 05.1 – SGR 12.1 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. 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 himself 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 27) must be observed, otherwise a safe operation of the actuator is no longer guaranteed.

1.4 Warnings and notes

Failure to observe 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 part-turn actuators type SG 05.1 – SG 12.1 and SGR 05.1 – SGR 12.1 have a modular design. The part-turn actuators are driven by an electric motor. A handwheel is provided for manual operation. The limitation of travel is realised 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. Additionally, a mechanical end stop is provided for the protection of the valve. This is not, however, designed to be approached during normal operation.

3. Technical data

Part-turn actuators AUMA NORM require external controls. AUMA offers actuator controls AUMA MATIC AM or AUMATIC AC. These can also easily be mounted to the actuator at a later date.		
Features and functions		
Type of duty [1)]	SG: SGR:	Short time duty S2 - 15 min Intermittent duty S4 - 25 %
Motors	Standard: Options:	3-ph AC asynchronous motor, type IM B9 according to IEC 34 (SG and SGR) 1-phase AC motor DC shunt motor (SG only)
Insulation class	Standard: Option:	F, tropicalized H, tropicalized (3-phase AC motors only)
Motor protection	Standard: Option:	Thermoswitches (NC) (DC motors without motor protection) PTC thermistors (according to DIN 44082)
Self-locking	yes	
Swing angle	Standard: Options:	80° to 110° adjustable between min. and max. value. 30° – 40°, 40° – 55°, 55° – 80°, 110° – 160°, 160° – 230° or 230° – 320°
Limit switching	Counter gear mechanism for end positions CLOSED and OPEN Standard: Options:	Tandem switch (2 NC and 2 NO) for each end position Single switch (1 NC and 1 NO) for each end position switches galvanically isolated Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching), available for any intermediate position
Torque switching	infinitely adjustable torque switching for direction OPEN and CLOSE Standard: Options:	Single switch (1 NC and 1 NO) for each direction Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated
Non-intrusive setting (option)	Magnetic limit and torque transmitter MWG (only possible in combination with actuator controls AUMATIC)	
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA (RWG) For further details see separate data sheet	
Torque feedback signal, analogue (option)	Only in combination with magnetic limit and torque transmitter MWG and controls AUMATIC AC	
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED	
Running indication (option)	Blinker transmitter	
Heater in switch compartment	Standard: Options: A resistance type heater (5 W, 24 V DC) is installed within the actuator in combination with the actuator controls AM or AC.	self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC 24 – 48 V AC/DC or 380 – 400 V AC
Motor heater (option)	12.5 W	
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option:	Handwheel lockable
Electrical connection	Plug/socket connector with screw type connection	
Threads for cable glands	Standard: Options:	NPT-threads Pg-threads, NPT-threads, G-threads
Terminal plan	KMS TP 100/001 (basic version with 3-phase AC motor)	
Splined coupling for connection to the valve shaft	Standard: Options:	Coupling without bore Machined coupling with bore and keyway, square bore or bore with two-flats according to EN ISO 5211
Valve attachment	Dimensions according to EN ISO 5211	

1) Based on 68 °F ambient temperature and at an average load with running torque.
For 1-phase AC motors, please note: When reversing, a pause of at least 100 ms is required.

Service conditions			
Enclosure protection according to EN 60 529 [2]	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-component iron-mica combination	
Standard colour	Standard:	Dark grey (DB 702, similar to RAL 9007)	
	Option:	Other colours are possible on request	
Ambient temperature [3]	Standard SG:	– 20 to + 80 °C/ – 20 to + 175 °F (with 3-phase AC motor)	
		– 25 to + 70 °C / – 20 to + 158 °F(with 1-phase AC and DC motor)	
	Standard SGR:	– 25 to + 60 °C/ – 20 to + 140 °F (with 3-phase AC motor)	
	Options:	– 40 to + 60 °C – 40 to + 140 °F(low temperature)	
		– 50 to + 60 °C/ – 75 to + 140 °F (extreme low temperature) (SG with 3-phase AC current only)	
Lifetime	SG 05.1/SG 07.1:	20,000 operating cycles (OPEN - CLOSE - OPEN) for 90°	
	SG 10.1:	15,000 operating cycles (OPEN - CLOSE - OPEN) for 90°	
	SG 12.1:	10,000 operating cycles (OPEN - CLOSE - OPEN) for 90°	
	SGR 05.1 – 12.1:[4]	min. 2.5 million operations (control steps)	
Other information			
EU Directives	Electromagnetic Compatibility (EMC): (89/336/EEC) Low Voltage Directive: (73/23/EEC) Machinery Directive: (98/37/EC)		
Reference documents	Product description “Electric part-turn actuators SG” Dimension sheets SG Electrical data SG/SGR		

2) For version 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

3) Version with RWG min. – 40 °F (40 °C) and max. + 158 °F (70 °C)

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

4. Transport, storage and packaging

4.1 Transport

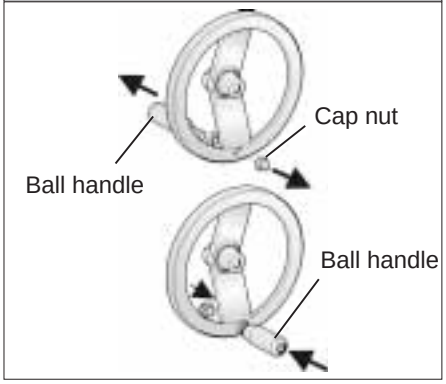
- For transport to place of installation, use sturdy packaging.
- Do not attach ropes or hooks to the handwheel for the purpose of lifting by hoist.
- If part-turn actuator is mounted on valve, attach ropes or hooks for the purpose of lifting by hoist to valve and not to part-turn actuator.

Fitting the ball handle:

To avoid damage during transport, the ball handles are fitted to the inside of the handwheel. Prior to commissioning, the ball handle has to be fitted in the correct position.

- Remove cap nut (figure A).
- Pull out ball handle and re-insert in correct position.
- Fasten with cap nut.
- Remove label from the handwheel for fitting the ball handle.

Figure A



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 part-turn actuators are to be stored for a long time (more than 6 months), the following points must be observed additionally:

- 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 part-turn actuator immediately to electrical mains, so that condensation is prevented by the heater.

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. Manual operation

The actuator may be operated manually for purposes of setting and commissioning, and in case of motor failure or power failure.

Engaging manual operation: Manual operation is activated by pulling at the handwheel. A change-over is not required. The handwheel does not rotate during motor operation.

- **Turning the handwheel during motor operation results in an extension or reduction of the operating time, depending on the direction of rotation.**
- **It is not necessary to use an extension for manual operation. Excessive force may cause damage.**

Disengaging manual operation: Release handwheel.
Handwheel has to engage.

6. Mounting to valve

- **Prior to mounting, the part-turn actuator must be checked for any damage. Damaged parts must be replaced by original spare parts.**
- **After mounting, check part-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.**

- For **butterfly valves**, the recommended mounting position is end position CLOSED (Prior to mounting, bring the part-turn actuator to the mechanical end stop CLOSED by turning the handwheel clockwise.).
- For **ball valves**, the recommended mounting position is end position OPEN (Prior to mounting, bring the part-turn actuator to the mechanical end stop OPEN by turning the handwheel counterclockwise.).

- Thoroughly degrease mounting faces of part-turn actuator and valve.
- Apply a small quantity of grease to the valve shaft.
- Place coupling sleeve onto valve shaft and secure (refer to figure B, detail A or B), ensure that dimensions X, Y, and Z are observed (refer to table 1).
- Apply non-acidic grease at splines of coupling.
- Fit actuator so that fixing holes in actuator and valve mounting flange are in alignment.
  If necessary, move actuator up or down one tooth on the coupling. If required, turn handwheel/crank a little in direction OPEN or CLOSE until holes align to the threads.
- Ensure that the spigot (if provided) mates uniformly in the recess and that the mounting faces are in complete contact.
- Fasten the actuator with bolts of minimum strength class grade 5 using lock washers. Fasten bolts evenly crosswise to the appropriate torque according to table 1.

Figure B

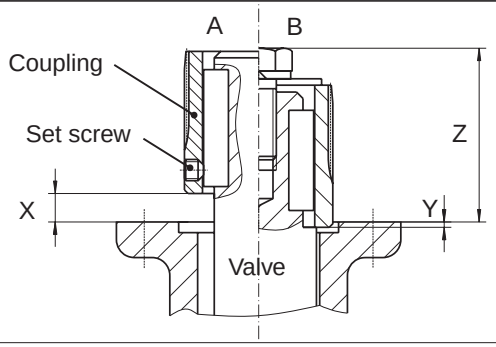


Table 1: Dimensions for couplings/fastening torques for bolts

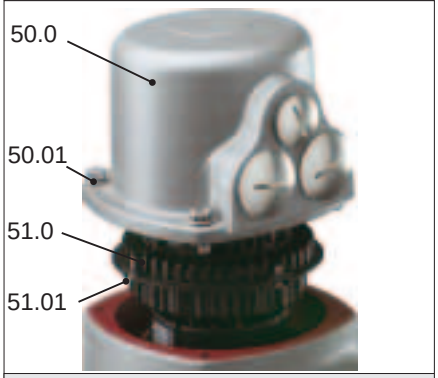
Type	X max.	Y max.	Z max.	Qty. x threads (UNC)	T_A [ft lbs]
SG(R) 05.1-FA07	5	3	60	4 x 5/16 -18	19
SG(R) 07.1-FA07	7	3	60	4 x 5/16 -18	19
SG(R) 10.1-FA12	10	3	77	4 x 1/2 - 13	78
SG(R) 12.1-FA12	10	6	100	4 x 1/2 - 13	78
Conversion factor: 1 Nm corresponds to 1.3529 ft lbs.					

7. Electrical connection

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

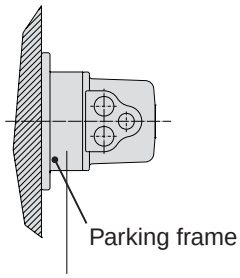
7.1 Connection with AUMA plug/socket connector

Figure C-1: Connection



- Check whether type of current, supply voltage, and frequency comply with motor data (refer to name plate at motor).
- Loosen bolts (50.01) (figure 3) 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 C-2: Parking frame (accessory)



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

Table 2: Technical data AUMA plug/socket connector

Technical data	Power terminals[1)]	Protective earth	Control terminals
No. of contacts max.	6 (3 are used)	1 (leading contact)	50 pins/sockets
Marking	U1, V1, W1, U2, V2, W2	⏚	1 to 50
Connecting voltage max.	750 V	–	250 V
Current max.	25 A	–	16 A
Type of customer connection	Screws	Screw for ring lug	Screws
Cross section max.	6 mm² (10 AWG)	6 mm² (10 AWG)	2.5 mm² (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, please contact AUMA

7.2 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 operating time, output drive type, valve type, and the type of installation are considered.
We recommend to switch off the corresponding contactor directly by the limit or torque switch.

7.3 Reversal time

Actuators operated via non AUMA supplied controls must include a minimum reversal time delay of 100ms.

7.4 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 can easily be mounted to the actuator at a later date.
For enquiries and more information, please state our commission no. (refer to actuator name plate).

7.5 Heater

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

7.6 Motor protection

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

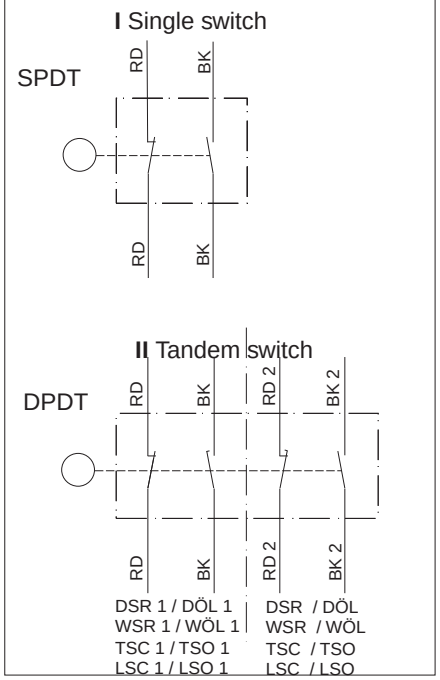
Failure to integrate PTC thermistors or thermoswitches into the control circuit voids the warranty for the motor.

7.7 Remote position transmitter

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

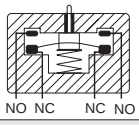
7.8 Limit and torque switches

Figure 4



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 indicationss, the leading contacts of the tandem switches must be used for that purpose and the lagging contacts for motor switching off.

Table 3: Technical data limit/torque switches

	Mechanical life time = 2 x 10^6 starts		
Type of current	**Switch rating I_{max}**		
	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		

7.9 Fitting 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 cable glands with the specified torque to ensure the required enclosure protection.

8. Setting the end stops for part-turn actuators on butterfly valves

For actuators on ball valves refer to page 13, section 9.

The settings can only be performed if the valve has not yet been mounted in a pipeline.

- **If part-turn actuators are supplied without a valve: hex. bolts (03, figure E) are not tightened.**
- **If part-turn actuators are supplied with a valve: hex. bolts (03, figure E) are tightened. End stops and limit switching should have already been set and only have to be checked.**

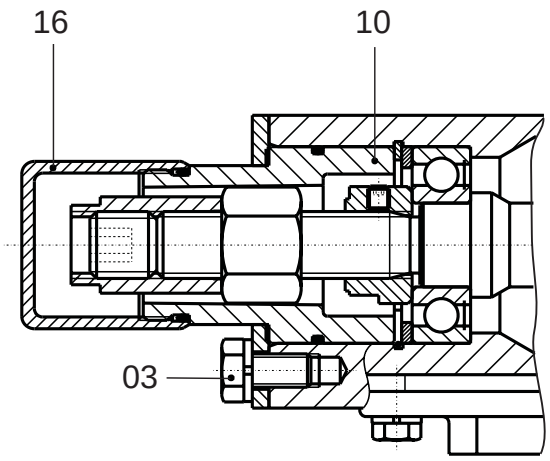
8.1 Setting end stop CLOSED

- If hex. bolts (03, figure E) are tightened: loosen by approx. 3 turns.
- Turn handwheel clockwise (closing direction), until valve is closed (end position CLOSED). Check whether end stop (10) has rotated, otherwise turn end stop (10) clockwise up to the stop.
- In case end position CLOSED has been passed: reverse several turns at the handwheel and approach end position again.
- Turn end stop (10) by 1/8 turn counterclockwise (Protective cap (16) must not be loosened in the process.).

The end stops are designed for the protection of the valve. They have to be set as to ensure that they are not used during normal operation.

- Fasten hex. bolts (03) crosswise with torque 18.4 ft lbs.

Figure E: Setting end stop CLOSED



8.2 Setting end stop OPEN

The swing angle has been set in the factory. Therefore, the end stop OPEN need not be set.

8.3 Setting limit switching CLOSED

After setting the end stop CLOSED, the limit switching for end position CLOSED can be set immediately (page 16, section 13.12.). For this, the switch compartment has to be opened and the indicator disc has to be removed (refer to page 15, section 11.).

9. Setting the end stops for part-turn actuators on ball valves

For actuators on butterfly valves refer to page 12, section 8.

The settings can only be performed if the valve has not yet been mounted in a pipeline.

- **If part-turn actuators are supplied without a valve: hex. bolts (03, figure F) are not tightened.**
- **If part-turn actuators are supplied with a valve: hex. bolts (03, figure F) are tightened. End stops and limit switching should have already been set and only have to be checked.**

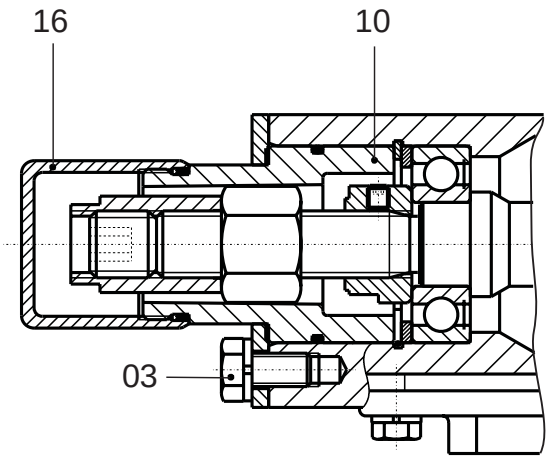
9.1 Setting end stop OPEN

- If hex. bolts (03, figure F) are tightened: loosen by approx. 3 turns.
- Turn handwheel counterclockwise (opening direction), until valve is open (end position OPEN).
  Check whether end stop (10) has rotated, otherwise turn end stop (10) counterclockwise up to the stop.
- In case end position OPEN has been passed: reverse several turns at the handwheel and approach end position OPEN again.
- Turn end stop (10) by 1/8 turn clockwise.
  (Protective cap (16) must not be loosened in the process).

The end stops are designed for the protection of the valve. They have to be set as to ensure that they are not used during normal operation.

- Fasten hex. bolts (03) crosswise with torque 18.4 ft lbs.

Figure F: Setting end stop OPEN



9.2 Setting end stop CLOSED

The swing angle has been set in the factory. Therefore, the end stop CLOSED need not be set.

9.3 Setting limit switching OPEN

After setting the end stop OPEN, the limit switching for end position OPEN can be set immediately (page 16, section 13.12.). For this, the switch compartment has to be opened and the indicator disc has to be removed (refer to page 15, section 11.).

10. Changing the swing angle

The swing angle only has to be changed if the swing range for setting the end stops (sections 8. and 9.) is not sufficient.

Unless ordered otherwise, the swing angle is set to 90°.
In the standard version, the swing angle can be adjusted within the range of 80° to 110°.
For optional swing angle ranges, refer to Technical data, page 5.

10.1 Increasing the swing angle

- Unscrew protective cap (16) (figure G).
- While holding end stop nut (2.4) in position with open end wrench (19 mm), remove set screw (2.02).
- Turn end stop nut (2.4) counterclockwise.
  Do not exceed dimension A max. (table 4).
- Move valve manually to the desired end position OPEN.
- Turn end stop nut (2.4) clockwise until it is tight up to the stop nut (7).
- Degrease face of set screw (2.02).
- Hold end stop nut in position (2.4) with open end wrench (19 mm) and fasten set screw (2.02) with torque 85 Nm.
- Check O-ring (016) and replace if damaged.
- Replace protective cap (16).

Figure G: Setting the swing angle

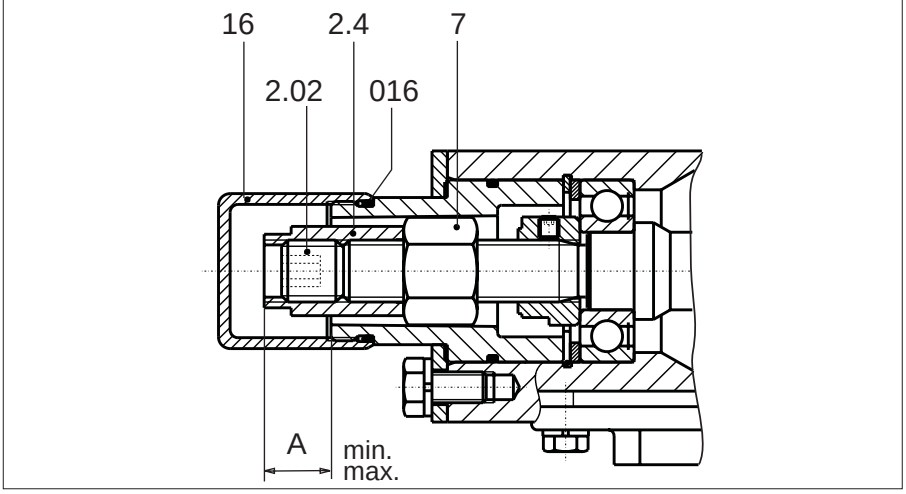


Table 4

Type	A min. [mm]	A max. [mm]
SG 05.1/SGR 05.1	10	22
SG 07.1/SGR 07.1	10	22
SG 10.1/SGR 10.1	8	17
SG 12.1/SGR 12.1	12	23
Conversion factor: 1 mm corresponds to 0.0394 inch		

10.2 Reducing the swing angle

- Unscrew protective cap (16) (figure G).
- While holding end stop nut (2.4) in position with open end wrench (19 mm), remove set screw (2.02).
- Move valve into the desired end position OPEN.
- Turn end stop nut (2.4) clockwise until it is tight up to the stop nut (7) and do not fall below dimension A min.
- Degrease face of set screw (2.02).
- Hold end stop nut in position (2.4) with open end wrench (19 mm) and fasten set screw (2.02) with torque 85 Nm.
- Check O-ring (016) and replace if damaged.
- Replace protective cap (16).

11. Opening the switch compartment

To be able to carry out the following settings (sections 13.12. to 18.), the switch compartment must be opened and 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 himself or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

11.1 Removing the cover from the switch compartment

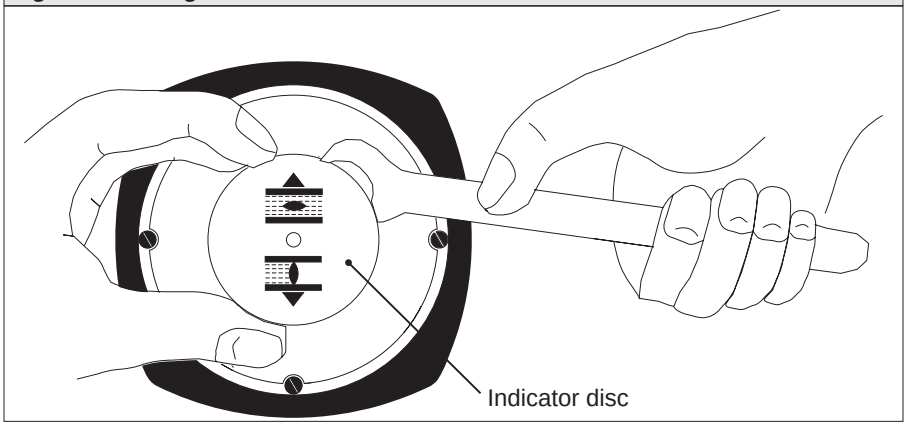
- Remove 4 bolts and take off the cover at the switch compartment (figure H).

Figure H: Cover with indicator glass

11.2 Pulling off the indicator disc

- Pulling off the indicator disc (figure J). Open end wrench may be used as lever.

Figure J: Pulling off the indicator disc

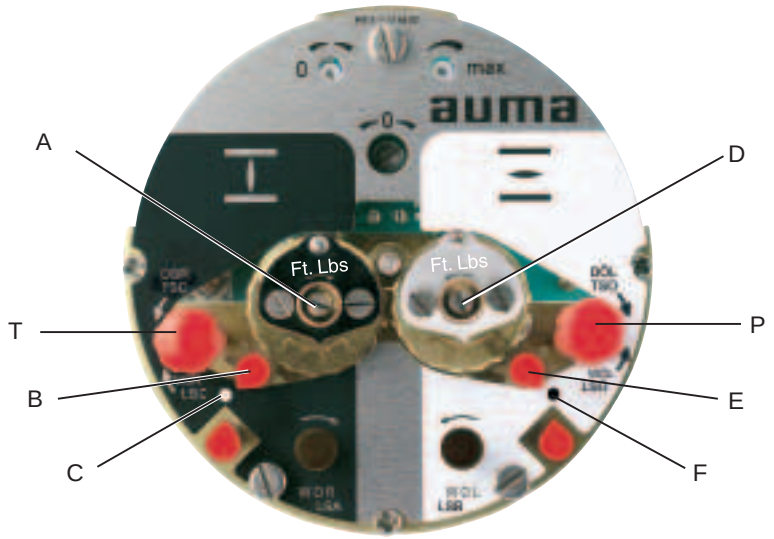


12. Setting the limit switching

12.1 Setting end position CLOSED (black section)

- Turn handwheel clockwise until valve is closed.
- To prevent that the end stop is reached (due to overrun) before the limit switch has tripped, turn handwheel 4 turns (overrun) in counterclockwise direction. 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° every time.
  When pointer B is 90° 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 snapped), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-1: Control unit



12.2 Setting end position OPEN (white section)

- Turn handwheel counterclockwise until valve is open.
- To prevent that the end stop is reached (due to overrun) before the limit switch has tripped, turn handwheel 4 turns (overrun) in clockwise direction. During test run check overrun and, if necessary, correct setting of the limit switching.
- **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° every time.
  When pointer E is 90° 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 snapped), continue turning the setting spindle in the same direction and repeat setting process.

12.3 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 (WÖL) triggers limit switch OPEN.

13. Setting the DUO limit switching (option)

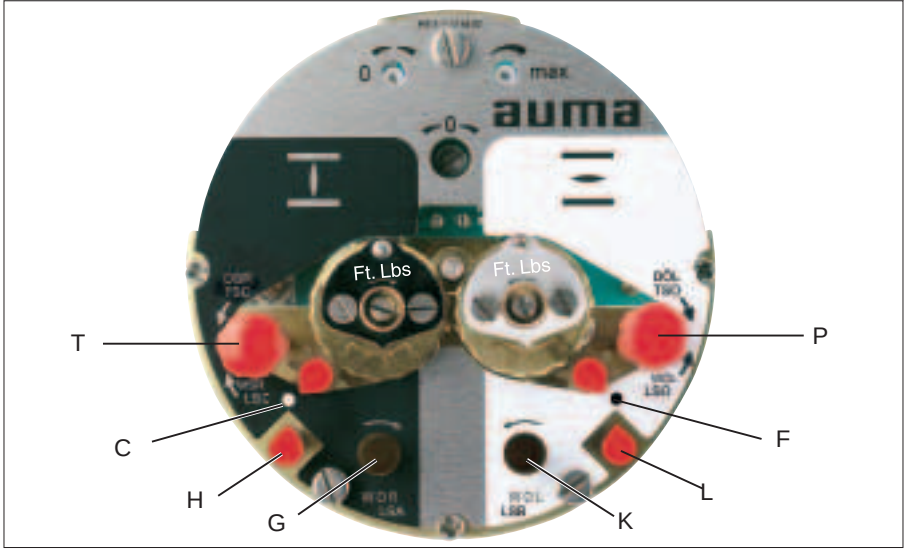
Any application can be switched on or off via the two intermediate position switches.

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

13.1 Setting 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
  (5 mm) in direction of arrow, while observing 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 snapped), continue turning the setting spindle in the same direction and repeat setting process.

Figure K-2: Control unit



13.2 Setting 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, while observing 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 snapped), continue turning the setting spindle in the same direction and repeat setting process.

13.3 Checking the DUO limit switches

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

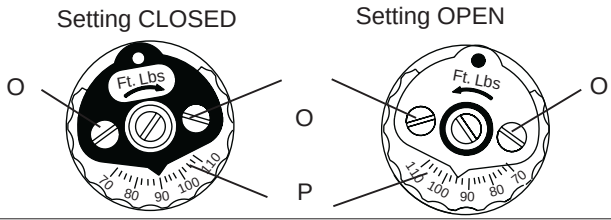
- Turning T in direction of the arrow TSC (DSR) triggers DUO limit switch CLOSED. The torque switch CLOSED is actuated at the same time.
- Turning P in direction of the arrow TSO (DOEL) triggers DUO limit switch OPEN. The torque switch OPEN is actuated at the same time.

14. Setting the torque switching

14.1 Setting

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

Figure L: Torque switching heads



- Loosen both lock screws O at the torque dial (figure L).
- Turn torque dial P to set it to the required torque (1 da Nm = 10 Nm).
  Example:
  Figure L shows the following setting:
  90 ft lbs. for direction CLOSE
  95 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.**

14.2 Checking the torque switches

The red test buttons T and P (figure K-1) are used for manual operation of the torque switches:

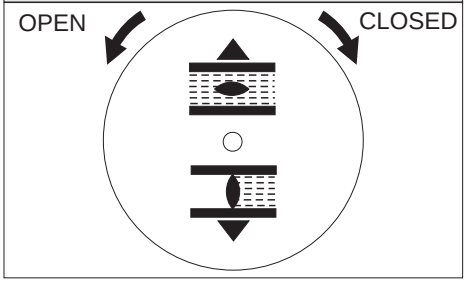
- Turning T in direction of the arrow TSC (DSR) triggers torque switch CLOSED.
- Turning P in direction of the arrow TSO (DOEL) triggers torque switch OPEN.
- If a DUO limit switching (optional) is installed in the actuator, the intermediate position switches will be operated at the same time.

15. Test run

15.1 Checking the direction of rotation

- Place indicator disc on shaft.
  The direction of rotation of the indicator disc (figure M) indicates the direction of rotation of the output drive.

Figure M: Indicator disc



- Move actuator manually to intermediate position or to sufficient distance from end position.
- Switch on actuator in running direction CLOSE and observe the direction of rotation:
  If the indicator disc turns clockwise, the direction of rotation is correct.

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

15.2 Checking the limit switching

- Move actuator manually into both end positions of the valve.
- Check whether 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 16.

If no other options (sections 16. to 18.) require setting:
- Close switch compartment (see page 24, section 19.).

16. Setting the potentiometer (option)

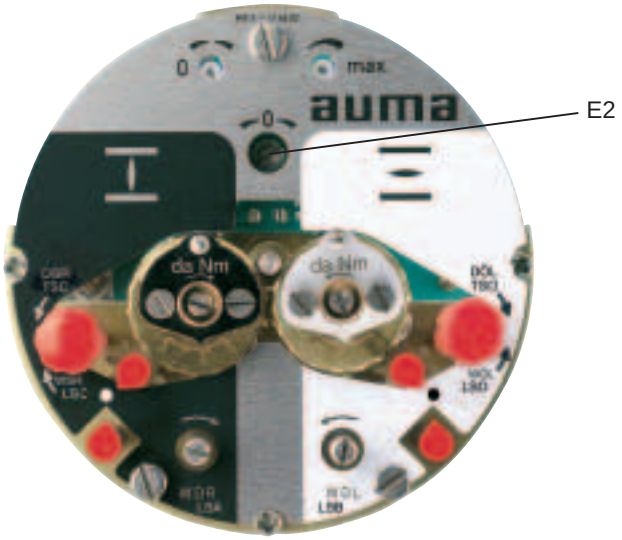
— For remote indication —

- Move valve to end position CLOSED.
- Pull off indicator disc.
- Turn potentiometer (E2) counterclockwise 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



17. Setting the electronic position transmitter RWG (option)

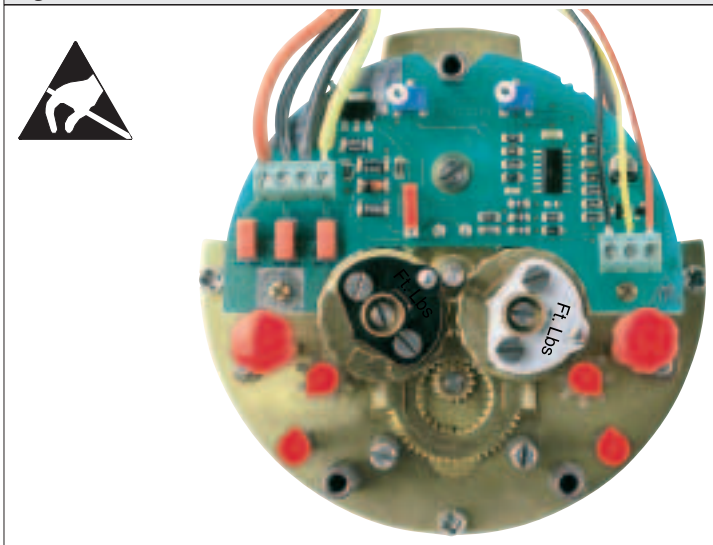
— For remote indication or external control —

After mounting the part-turn actuator to the valve, check setting by measuring the output current (see sections 17.1 or 17.2) and re-adjust, if necessary.

Table 5: Technical data RWG 4020			
Terminal plans		KMS TP_ _ 4 / _ _ _ 3- or 4- wire system	KMS TP _ 4 _ / _ _ _ KMS TP _ 5 _ / _ _ _ 2-wire system
Output current	I_a	0 – 20 mA, 4 – 20 mA	4 – 20 mA
Power supply	U_v	24 V DC, ±15 % regulated	14 V DC + (I x R_B), max. 30 V
Max. input current	I	24 mA at 20 mA output current	20 mA
Max. load	R_B	600 Ω	(Uv - 14 V) / 20 mA

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

Figure P-1: Positioner board



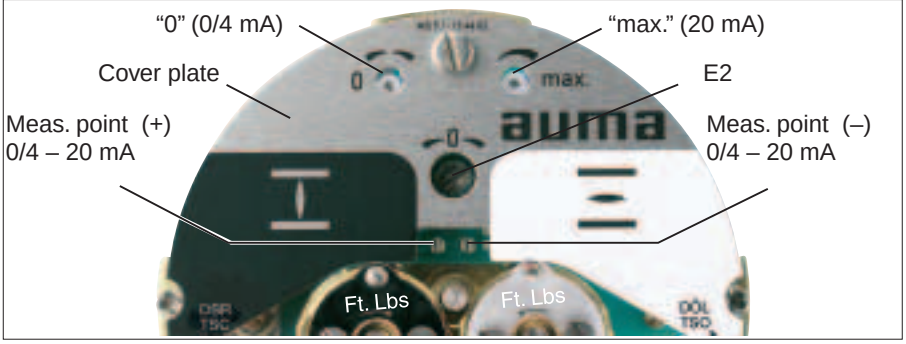
17.1 Setting 2-wire system 4 – 20 mA and 3- /4-wire system 0 – 20 mA

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

The circuit (external load) must be connected (observe max. load R_B), or the appropriate connections at the terminals (refer to wiring diagram) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) counterclockwise until stop is felt.
- Turn potentiometer (E2) slightly back.

Figure P-2



- 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.

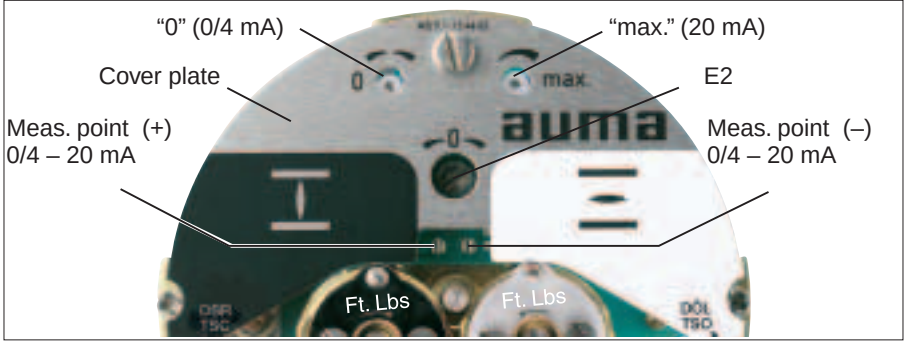
17.2 Setting 3-/4- wire system 4 – 20 mA

- Connect voltage to electronic position transmitter.
- Move valve to **end position CLOSED**.
- Pull off indicator disc.
- Connect ammeter for 0 – 20 mA to measuring points (figure P-3).

The circuit (external load) must be connected (observe max. load R_B), or the appropriate connections at the terminals (refer to wiring diagram) must be jumpered, otherwise no value can be measured.

- Turn potentiometer (E2) counterclockwise until stop is felt.
- Turn potentiometer (E2) slightly back.

Figure P-3



- 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.

18. Setting the mechanical position indicator

- Place indicator disc on shaft.
- Move valve to end position CLOSED.
- Turn lower indicator disc (figure Q-1) 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 in position and turn upper disc with symbol OPEN until it is in alignment with the mark on the cover.

Figure Q-1

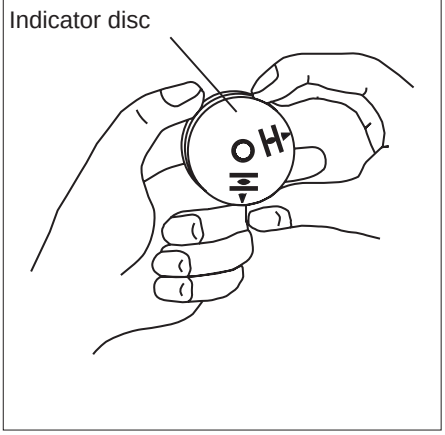


Figure Q-2

The indicator disc turns approx. 180° for a swing angle of 90°.

19. 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.

Check the part-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.

20. Setting the operating time

For part-turn actuators with 1-phase AC motors, the operating time can be adjusted.

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

- Remove motor cover (figure R).
- Set required operating time with potentiometer (figure S).
- Clean sealing faces of housing and motor cover.
- Check whether O-ring is in good condition.
- Apply a thin film of non-acidic grease to the sealing faces.
- Fit and fasten motor cover.
  (For enclosure protection IP 68, the motor cover is additionally sealed with thread sealing material.)

Check the part-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.

Figure R: Part-turn actuator with 1-phase AC motor

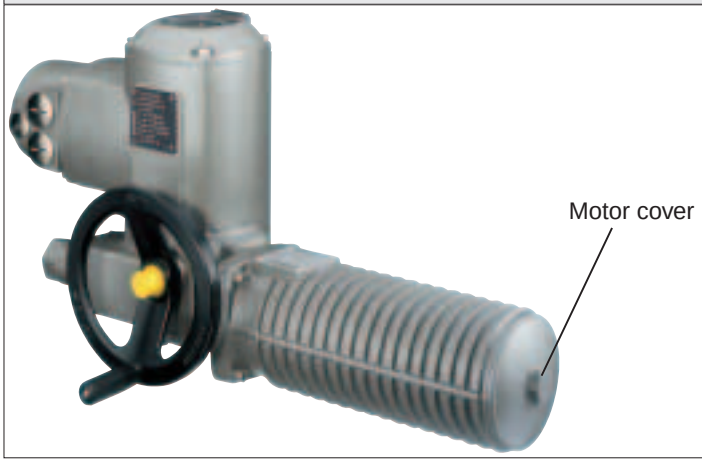


Figure S: Setting the operating time

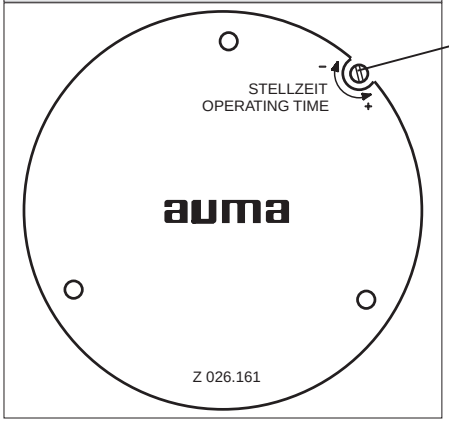


Table 6: Operating times for 90°

SG 05.1	5.6 to 45 seconds
SG 07.1	11 to 90 seconds
SG 10.1	11 to 90 seconds
SG 12.1	22 to 180 seconds

21. 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, controls, and terminal compartment).

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.

22. Maintenance

After maintenance, check part-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. Original paint in small quantities can be supplied by AUMA.

AUMA part-turn actuators require very little 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, be 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 part-turn actuator and valve/gearbox for tightness. If required, tighten applying the torques given in table 1, page 9.

23. Lubrication

AUMA part-turn actuators are filled with grease for lifetime.
A change of grease or re-lubrication is not necessary.

24. 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

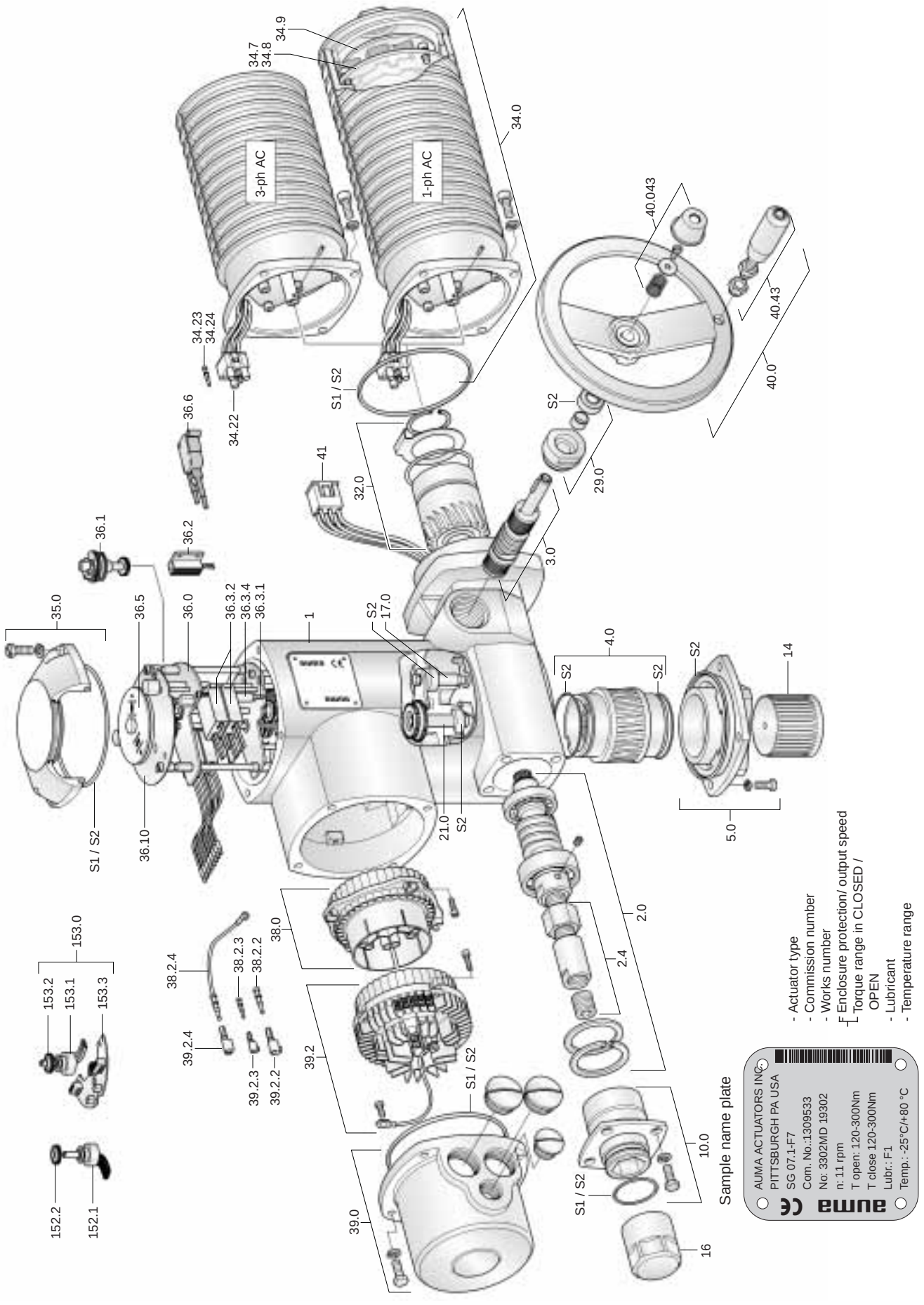
The following generally applies:

- 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.

25. 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
www.auma-usa.com or www.auma.com.

26. Spare parts list part-turn actuator SG(R) 05.1 – SG(R) 12.1 with plug/socket connector



Note:
Please state type and commission no. of the actuator (see name plate) when ordering spare parts. Delivered spare parts may slightly vary from the representation in these instructions.

No.	Type	Designation	No.	Type	Designation
1	E	Housing	36.5	B	Mechanical position indicator
2.0	B	Worm shaft assly.	36.6*	B	Blinker transmitter including pins at wires (without impulse disc and insulation plate)
2.4	E	End stop nut (included in sub-assembly 2.0)			
3.0	B	Manual drive worm assly.	36.10	E	Cover plate
4.0	B	Worm wheel	38.0	B	Pin carrier (without pins)
5.0	B	Mounting flange assly.	38.2.2	B	Pin for motor
10.0	B	Limit stop housing assly.	38.2.3	B	Pin for controls
14	E	Coupling	38.2.4	B	Wire for protective earth
16	E	Cap	39.0	B	Plug cover assly.
17.0	B	Torque finger assly.	39.2	B	Socket carrier (complete with sockets)
21.0	B	Limit drive finger assly.			
29.0	B	Manual drive bearing assly.	39.2.2	B	Socket for motor (included in sub-assembly 39.2)
32.0	B	Planetary gearing assly.			
34.0	B	Motor assly.	39.2.3	B	Socket for control (included in sub-assembly 39.2)
34.22	B	Motor plug pin carrier (without pins)	39.2.4	B	Socket for protective earth (included in sub-assembly 39.2)
34.23	B	Pin for motor			
34.24	B	Pin for thermoswitch	40	B	Handwheel assly.
34.7	B	Motor brake	40.043	E	Cap assly.
34.8	B	Motor electronic board	40.43	B	Ball handle assly.
34.9	B	Cover plate	41	B	Motor plug, socket assly.
35.0	B	Cover assly.	152.1*	B	Potentiometer (without slip clutch)
36.0	B	Control unit assly. (without switches)	152.2*	B	Slip clutch for potentiometer
36.1	B	Torque switching head	153.0*	B	Electronic position transmitter (RWG)
36.2	B	Heater	153.1*	B	Potentiometer for RWG (without slip clutch)
36.3.1	B	Stud bolt for switches	153.2*	B	Slip clutch for RWG
36.3.2	B	Switch for limit/torque switching (including pins at wires)	153.3*	B	Electronic board RWG
			S 1	S	Seal kit (small)
36.3.4	E	Spacer	S 2	S	Seal kit (large)

* not included in basic equipment Motor plug; motor directly wired to pin carrier (no. 52.0).

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