Electric multi-turn actuators

SA 07.1 – SA 30.1
SAR 07.1 – SAR 30.1
with actuator controls
AUMA MATIC AM 01.1 / AM 02.1
for flange type FA

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

Operation instructions

Scope of these instructions: These instructions valid for multi-turn actuators of the type range SA 07.1 – SA 30.1/ SAR 07.1 – SAR 30.1 with the actuator controls AM 01.1 / AM 02.1.
These operation instructions are only valid for “clockwise closing”, i.e. driven shaft turns clockwise to close the valve.

Table of contents

		Page
1.	**Safety instructions**	**4**
1.1	Range of application	4
1.2	Electrical connection	4
1.3	Maintenance	4
1.4	Warnings and notes	4
2.	**Short description**	**5**
3.	**Technical data**	**6**
4.	**Additional information to the wiring diagram legend**	**9**
5.	**Transport, storage and packaging**	**10**
5.1	Transport	10
5.2	Storage	10
5.3	Packaging	11
6.	**Mounting to valve/ gearbox**	**12**
7.	**Mounting positions of the local controls**	**14**
8.	**Electrical connection**	**15**
8.1	Connection with AUMA plug/ socket connector (S, SH, SE)	17
9.	**Manual operation**	**19**
10.	**Operation and indications of the local controls**	**20**
11.	**Opening the switch compartment**	**22**
11.1	Removing the cover from the switch compartment	22
11.2	Pulling off the indicator disc (option)	22
12.	**Setting the limit switching**	**23**
12.1	Setting end position CLOSED (black section)	23
12.2	Setting end position OPEN (white section)	23
12.3	Checking the limit switches	23
13.	**Setting the DUO limit switching (option)**	**24**
13.1	Setting direction CLOSE (black section)	24
13.2	Setting direction OPEN (white section)	24
13.3	Checking the DUO limit switches	24
14.	**Setting the torque switching**	**25**
14.1	Setting	25
14.2	Checking the torque switches	25
15.	**Test run**	**26**
15.1	Checking the direction of rotation	26
15.2	Checking the setting of the limit switching	27
15.3	Checking the type of seating	27
15.4	Checking the PTC tripping device (option)	27
16.	**Setting the potentiometer (option)**	**29**

		Page
17.	**Setting the electronic position transmitter RWG (option)**	**30**
17.1	Setting 2-wire system 4 – 20 mA and 3- /4-wire system 0 – 20 mA	31
17.2	Setting 3- / 4- wire system 4 – 20 mA	32
18.	**Setting the mechanical position indicator (option)**	**33**
19.	**Closing the switch compartment**	**33**
20.	**Actuator controls AUMA MATIC**	**34**
20.1	Functions of the diagnosis LEDs on the interface board (standard version)	34
20.2	Programming the logic board	35
20.3	EMERGENCY - OPEN and EMERGENCY - CLOSE signal (option)	36
21.	**Electronic positioner (option)**	**37**
21.1	Technical data	37
21.2	Setting	37
21.2.1	Setting type of signal	39
21.2.2	Setting actuator behavior on loss of signal	40
21.3	Positioner adjustment for end position CLOSED (standard version)	41
21.4	Positioner adjustment for end position OPEN (standard version)	43
21.5	Setting the sensitivity	43
21.6	Positioner adjustment for end position OPEN (inverse operation)	45
21.7	Positioner adjustment end position CLOSED (inverse operation)	46
21.8	Positioner in Split Range version (option)	47
21.8.1	Split Range: description of functions	47
21.8.2	Programming	47
21.8.3	Positioner adjustment for Split Range	47
22.	**Timer (option)**	**49**
22.1	Functions of the diagnosis LEDs (timer)	49
22.2	Setting start and end of stepping mode via DUO limit switching (option)	50
22.3	Setting ON and OFF times	51
23.	**Fuses**	**52**
23.1	Fuses within the actuator controls	52
23.2	Motor protection	54
24.	**Enclosure protection IP 68 (option)**	**55**
25.	**Maintenance**	**56**
26.	**Lubrication**	**56**
27.	**Disposal and recycling**	**56**
28.	**Service**	**57**
29.	**Spare parts list Multi-turn actuator SA(R) 07.1 – SA(R) 16.1**	**60**
30.	**Spare parts list controls AUMA MATIC**	**62**
	Index	**63**
	Addresses of AUMA offices and representatives	**64**

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 controls'/ actuator's designated use.

1.2 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 56) 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 a grounded 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 of the type range SA 07.1 – SA 30.1/SAR 07.1 – SAR 30.1 are driven by an electric motor and controlled by the actuator controls AUMA MATIC AM 01.1/ AM 02.1, which is included in the scope of delivery. A handwheel is provided for manual operation.

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.

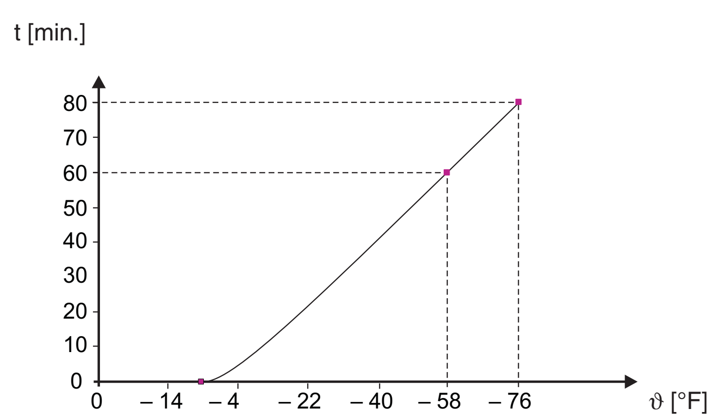
Both the multi-turn actuator and the controls have a modular design, i.e. they are designed in accordance with the principle of a modular construction system. This means that each actuator or each controls are individually manufactured and combined for a specific valve automation task. An order-specific commission number, printed on the name plate, is assigned to each actuator/ controls.

Commissioning

Please note that for low temperature versions (– 58 °F), the controls requires a heat-up time.
This heat-up time is applicable in case the actuator and the controls are not live and have cooled down to ambient temperature. In case commissioning has to be performed under these conditions, the following heat-up times have to be observed:

60 min. at – 58 °F
80 min. at – 76 °F

Figure A: Heat-up time chart



3. Technical data

Features and functions	
Type of duty [1]	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 Option: Special motors
Insulation class	Standard: F, tropicalized Option: H, tropicalized
Motor protection	Standard: Thermoswitches (NC) Option: PTC thermistors (according to DIN 44082)
Self-locking	Yes, for output speeds from 5.6 to 108 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 Options: 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), adjustable for any intermediate position
Torque switching	Infinitely 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
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA (RWG) For further details, see separate data sheet
Mechanical position indicator (option)	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Running indication (option)	Blinker transmitter
Heater in switch compartment	Standard: Resistance type heater with 5 W, 24 V DC Options: Self-regulating PTC heater, 5 – 20 W 24 – 48 V AC/DC, 110 – 250 V AC/DC or 380 – 400 V AC
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
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation. Option: Handwheel lockable
Connection to controls	AUMA plug/ socket connector with screw type connection
Output drive types	A, B1, B2, B3, B4 according to EN ISO 5210 A, B, D, E according to DIN 3210 C according to DIN 3338 Special output drives: AF, AK, AG, IB1, IB3
Power supply, mains frequency and current consumption	For mains voltage and mains frequency, refer to name plates at the controls and the motor Permissible variation of the nominal voltage: ± 10 % Permissible variation of the mains frequency: ± 5 % Motor current consumption: Refer to motor name plate Current consumption of the controls depending on the mains voltage: 100 to 120 V AC = max. 600 mA 208 to 240 V AC = max. 300 mA 380 to 500 V AC = max. 150 mA
External supply of the electronics (option)	24 V DC + 20 % / – 15 %, Observe current consumption of the controls
Rated power	Refer to motor name plate Note: The controls is designed for the rated power of the actuator
Overvoltage category	Category III

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

Switchgear	Standard:	Reversing contactors[2] (mechanically and electrically interlocked) for motor power up to 1.5 kW
	Options:	Reversing contactors[2] (mechanically and electrically interlocked) for nominal motor current up to 18 A (OPEN - CLOSE- duty) or 16 A (modulating duty)
		Thyristor unit[3] (recommended for modulating actuators) for motor power up to 1.5 kW, 500 V AC with internal fuses for motor power up to 5.5 kW, 500 V AC, external fuses required
Control	Standard:	Control inputs 115 V AC, OPEN - STOP - CLOSE (via opto-isolator, with one common), current consumption: approx. 10 mA per input Observe min. duration of impulse for modulating actuators
	Option:	Control inputs 24 V DC, OPEN - STOP - CLOSE (via opto-isolator, with one common), current consumption: approx. 15 mA per input
Output signals	Standard:	5 output relays with gold-plated contacts: 4 potential-free NO contacts with one common: max. 250 V AC, 0.5 A (resistive load) Standard configuration: End position OPEN, end position CLOSED, selector switch REMOTE, selector switch LOCAL 1 potential-free change-over contact, max. 250 V AC, 0.5A (resistive load) for collective fault signal Standard configuration: Torque fault, phase failure, motor protection tripped
	Option:	Signals in connection with positioner: End position OPEN, end position CLOSED (requires tandem switch within actuator) Selector switch REMOTE, selector switch LOCAL via 2nd level selector switch 1 potential-free change-over contact, max. 250 V AC, 0.5A (resistive load) for collective fault signal: Torque fault, phase failure, motor protection tripped
Voltage output	Standard:	Auxiliary voltage 115 V AC, max. 30 mA for supply of the control inputs,[3], galvanically isolated from internal voltage supply
	Option:	Auxiliary voltage 24 V DC, max. 50 mA for supply of the control inputs, galvanically isolated from internal voltage supply
Local controls	Standard:	Selector switch LOCAL - OFF - REMOTE (lockable in all three positions)
		Push buttons OPEN - STOP - CLOSE
		3 indication lights: End position CLOSED (red), collective fault signal (yellow), end position OPEN (green)
	Option:	Protection cover, lockable
Functions	Standard:	Switch-off mode adjustable Limit or torque seating for end position OPEN and end position CLOSED
		Overload protection against excessive torques over the whole travel
		Excessive torque (torque fault) can be excluded from collective fault signal
		Phase failure monitoring with automatic phase correction
		Push-to-run operation or self-retaining in REMOTE
		Push-to-run operation or self-retaining in LOCAL
		Blinker transmitter signal of actuator can be switched on or off (option)
	Options:	Positioner[4]: Nominal position value via analogue input E1 = 0/4 – 20 mA Adjustable behavior on loss of signal Adjustable sensitivity (dead band) and pause time Split Range operation
Motor protection evaluation	Standard:	Monitoring of the motor temperature in combination with thermoswitches in the actuator motor
	Options:	Additional thermal overload relay in the controls in combination with thermoswitches within the actuator
		PTC tripping device in combination with PTC thermistors in the actuator motor
Electrical connection	Standard:	AUMA plug/ socket connector with screw type connection
	Options:	Parking frame for wall mounting of the disconnected plug
		Protection cover for plug compartment (when plug is removed)

2) The lifetime guaranteed by the manufacturer amounts to min. 2 million cycles. If a higher number of switching cycles is to be expected, thyristor units with virtually unlimited lifetime should be used
3) Not possible in combination with PTC tripping device
4) Requires position transmitter (potentiometer or RWG) in actuator

Threads for cable glands	Standard: NPT-threads Options: Pg-threads, G-threads
Wiring diagram	Wiring diagram according to commission number included in delivery
Further options for version with RWG in the actuator	
Position feedback (option)	Analogue output E2 = 0/4 – 20 mA (load max. 500 Ω)
Service conditions	
Enclosure protection according to EN 60 529 [5)]	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 color	Standard: AUMA silver-grey (similar to RAL 7037) Option: Other colors are possible on request
Ambient temperature	Standard: SA: – 25 °C to + 70 °C SAR: – 25 °C to + 60 °C Options: – 40 °C to + 60 °C/ – 40 to 140 °F, low temperature version – 50 °C to + 60 °C/ – 75 to 140 °F, extreme low temperature version incl. heating system – 60 °C to + 60 °C/ – 75 to 140 °F, extreme low temperature version incl. heating system
Vibration resistance according to IEC 60 068-2-6	1 g, from 10 Hz to 200 Hz Resistant to vibrations during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Applies to actuator with actuator controls, not valid in combination with gearboxes
Lifetime	SA 07.1 – 10.1: 20,000 operations (OPEN - CLOSE - OPEN) with 30 turns per stroke SA 14.1 – 16.1: 15,000 operations (OPEN - CLOSE - OPEN) with 30 turns per stroke SA 25.1 – 30.1: 10,000 operations (OPEN - CLOSE - OPEN) with 30 turns per stroke SAR 07.1 – 10.1: 5 million operations/ starts[6)] SAR 14.1 – 16.1: 3.5 million operations/ starts[6)] SAR 25.1 – 30.1: 2.5 million operations/ starts[6)]
Weight	Multi-turn actuator: Refer to Technical data SA/ SAR Actuator controls: Approx. 7 kg (including AUMA plug/ socket connector)
Accessories	
Wall bracket[7)]	AUMA MATIC mounted separately from the actuator, including plug/ socket connector. Connecting cables on request. Recommended for high ambient temperatures, difficult access, or in case of heavy vibrations during service.
Further information	
Reference documents	Product description “Electric multi-turn actuators SA/ SAR” Product description “Actuator controls AUMA MATIC” Dimension sheets SA/ SAR “...with integral controls AUMA MATIC” Technical data sheets AM 01.1/AM 02.1 Technical data sheets SA/ SAR Electrical data sheets SA/ SAR

5) 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 special motors, the enclosure protection according to the name plate applies

6) The lifetime of modulating actuators 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

7) Cable length between actuator and AUMA MATIC max. 100 m. Not suitable for version with potentiometer in the actuator. Instead of the potentiometer, an RWG has to be used in the actuator

4. Additional information to the wiring diagram legend

Information A:

A running indication is possible if blinker transmitter (S5) is installed (opening and closing of contacts).

Direction CLOSE:	Connections X_K 6 - X_K 7
Direction OPEN:	Connections X_K 6 - X_K 8

Contacts remain closed in end position.
When connected to an external PLC, the blinking signal can be switched off via the DIP-switches (table 4, page 35).

Information B:

The type of seating in the end positions is determined by the valve manufacturer. The setting is done at the programming switches S1-2 and S3-2 (see page 35). The tripping of a torque switch in an intermediate position switches off the actuator and causes a fault signal.
The limit switches serve for signalization when switching off by torque seating. They need to be set so that the appropriate switch is tripped shortly before reaching the end position. If the torque switch trips before the limit switch, the actuator is switched off and a fault signal is generated.
For further programming possibilities, e.g. self-retaining in operation mode REMOTE, see table 4, page 35.

Information D:

The following faults are registered and can be transmitted to the control room as a potential-free collective fault signal:

- Power failure
- Phase failure
- Motor protection tripped
- Torque switch tripped in mid-travel.
  This signal can be switched off on the logic board, see table 4, page 35.

Information E:

Input signals according to DIN 19 240.
The nominal operation current of inputs X_K 2, X_K 3, and X_K 4 amounts to 10 – 15 mA. If the internal voltage 24 V DC is used for remote control, it must only be connected via potential-free contacts.

Information F:

In case of wrong phase sequence, the running direction is automatically adjusted. In case of a phase failure, the actuator stops. The fault is indicated at LED V14 on the interface board (see page 34). For collective fault signal, see information D.

Information G:

Potential-free contacts are available for signals. The internal control voltage (X_K 11 / + 24 V and X_K 5 / – 24V) must not be used for external lamps, relays, etc.

Please note that this information only pertains to point to point drawings.

5. Transport, storage and packaging

5.1 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 are supplied separately.

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

- Engage manual operation (figure B-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 handwheel over the red change-over lever on to the shaft (figure B-1).
- Release change-over lever (should snap back into initial position by spring action, figure B), if necessary, push it back manually.
- Secure handwheel using the snapring supplied.

Figure B-1

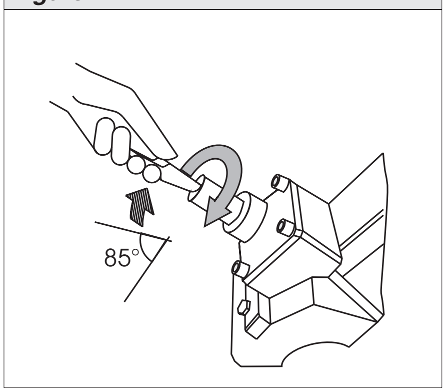
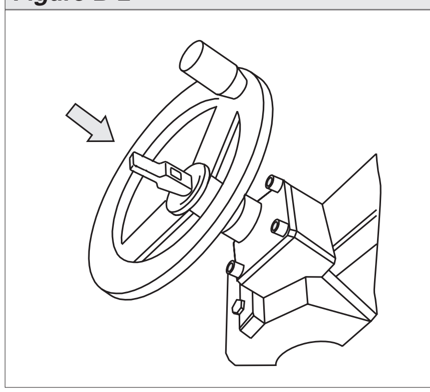


Figure B-2



5.2 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), 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 actuator immediately to electrical system, so that the heater prevents condensation.

5.3 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.

6. 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 to valve/ gearbox, touch up any possible damage to paint finish.**

The multi-turn actuator leaves the factory in position CLOSED (limit switch CLOSED tripped).

- Check if mounting flange fits the valve/ gearbox.

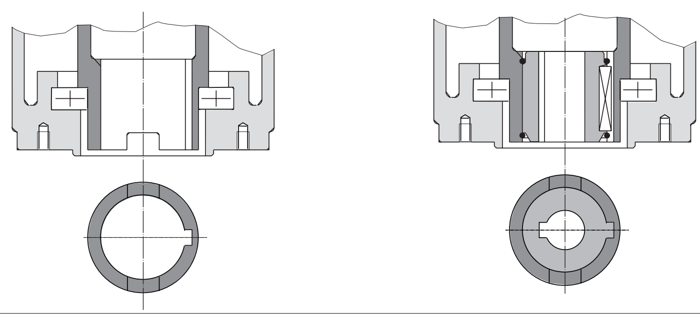
Spigot at flanges should be loose fit!

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

Figure B-3

Output drive type B1/B2
Plug sleeve

Output drive type B3/B4
Bore with keyway



For output drive type A (figure C-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.

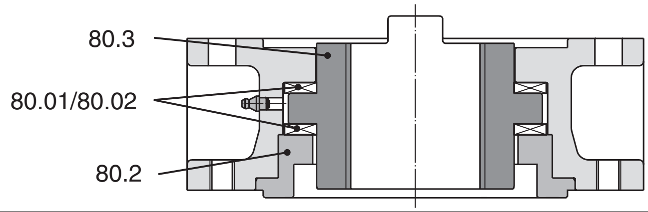
- Check whether bore and keyway match the input shaft of valve/ gearbox.
- Thoroughly degrease mounting faces at multi-turn actuator and valve/ gearbox.
- Apply a small quantity of grease to input shaft of valve/gearbox.
- Place actuator on valve/gearbox and fasten. Fasten bolts (quality min. grade 5, refer to table 1) evenly crosswise.

Table 1: Standard dry fastening torque for bolts

UNC bolts – grade 5	T_A (ft lbs.)
5/16 - 18	19
3/8 - 16	33
1/2 - 13	78
5/8 - 11	155
3/4 - 10	255
Conversion factor: 1 Nm corresponds to 1.3529 ft lbs.	

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

Figure C-1



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

- Remove spigot ring (80.2, figure C-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, please refer to table):

Table 2: Grease quantities for output drive type A

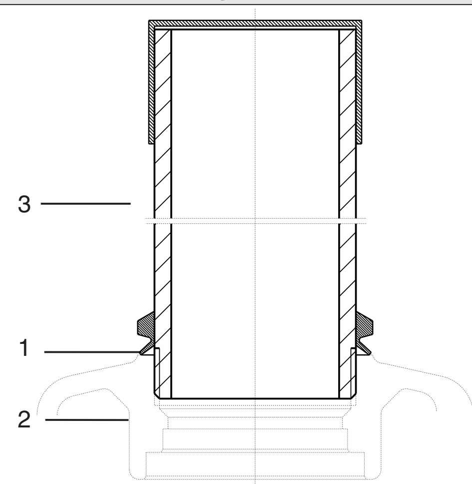
Output drive	A 07.2	A 10.2	A 14.2	A 16.2	A 25.2	A 30.2	A 35.2	A 40.2	A 48.2
Qty[1)]	1.5 g	2 g	3 g	5 g	10 g	14 g	20 g	25 g	30 g

1) For greases with a density ρ = 0.9 kg/dm³³; conversion factor: 1 oz corresponds to 28.35 g

Protection tube for rising valve stem

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

Figure C-2: Protection tube for rising valve stem



7. Mounting positions of the local controls

The mounting position of the local controls is designed according to the order. If, after mounting the actuator to the valve or the gearbox on site, the local controls is in an unfavorable position, the mounting position can easily be changed at a later date.

Four mounting positions are possible:

Figure D-1: Mounting position A

Figure D-2: Mounting position B

Figure D-3: Mounting position C

Figure D-4: Mounting position D

Changing the mounting position

- **Disconnect actuator from the mains before opening.**
- **Turn local controls by a maximum of 180°, rotate circuit board accordingly!**
- **Ensure that the wires are neither twisted nor jammed.**

- Loosen 4 bolts and remove the local controls.
- Turn local controls in one of the four positions and re-place on the actuator, rotate circuit board accordingly.
- Clean sealing faces of housing and cover.
- Check whether O-ring is in good condition.
- Replace cover on switch compartment and fasten bolts evenly crosswise.

8. 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.

Wiring diagram

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.

External fuse

For short-circuit protection and for protecting the actuator, fuses and disconnect switches have to be provided by the customer.
The current values for sizing the switch can be derived from the current consumption of the motor plus the current consumption of the controls.
Motor current consumption:
Refer to name plate on motor (nominal current).
Current consumption of the controls depending on the mains voltage:
100 to 120 V AC = max. 650 mA
208 to 240 V AC = max. 325 mA
380 to 500 V AC = max. 190 mA
The maximum permissible fuse for controls with a rated power of 1.5 kW is 16 A (gL/ gG), and for controls with a rated power of 7.5 kW, the value amounts to 32 A (gL/ gG).

Cable installation in accordance with EMC

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

- Lay cables being susceptible to interference or sources of interference at the highest possible distance from each other.
- The interference immunity of signal and bus cables increases if the cables are laid close to the ground potential.
- If possible, avoid laying long cables and make sure that they are installed in areas being subject to low interference.
- Avoid long parallel paths with cables being either susceptible to interference or interference sources.
- For the connection of remote position transmitters (potentiometer, RWG), screened cables must be used.

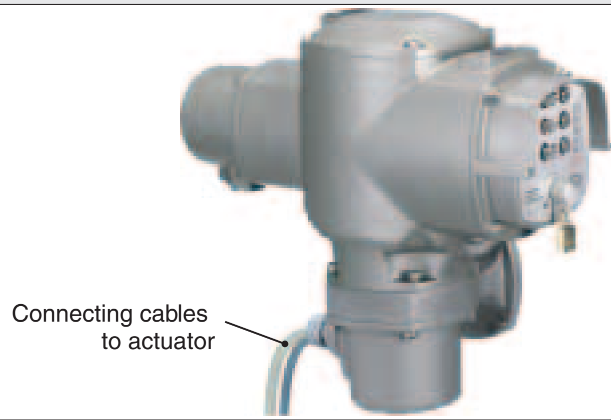
Heater

As standard, the control unit of the actuator is equipped with a heater to prevent condensation within the actuator. Unless ordered otherwise, the heater is internally supplied. For external supply (option), the heater always has to be connected.
Some actuators are optionally equipped with an additional motor heater. The motor heater is always externally supplied and has to be connected according to the wiring diagram.

Actuator controls on wall bracket (accessory)

For version on wall bracket, please observe the following:

Figure E: AUMA MATIC on wall bracket



- Versions with potentiometer in the actuator are not suitable. Instead of the potentiometer, an RWG has to be used in the actuator
- Permissible cable distance between actuator and AUMA MATIC amounts to a maximum of 100 m.
- Factory supplied cables for the connection between actuator and AUMA MATIC on wall bracket can be obtained from AUMA on request.
  In case non factory supplied cables are used, the following additionally has to be observed:
- Use suitable flexible and screened connecting cables.
- Connect the wires in correct phase sequence.
  Check the direction of rotation before switching on (see page 26)

Subsequent mounting of the actuator controls on the actuator

In case the actuator and the actuator controls have different commission numbers (refer to name plates), the designations of the terminal plan and the wiring diagram (KMS . . .) have to match for both devices.

8.1 Connection with AUMA plug/ socket connector (S, SH, SE)

Figure F-1: Version SH (standard)

Figure F-2: Version S

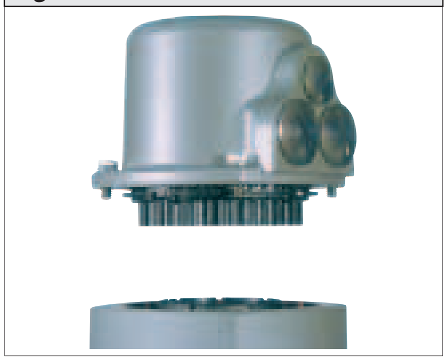
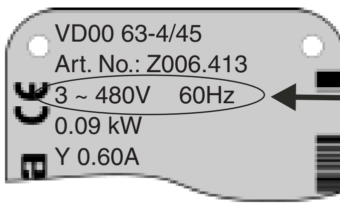


Figure F-3: Version SE

Before mains connection

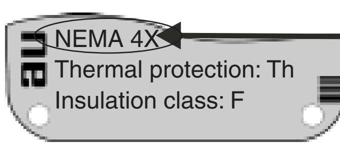
Check whether type of current, supply voltage, and frequency comply with motor data (refer to name plate at motor):



Current type/mains voltage/mains frequency

Opening the terminal compartment

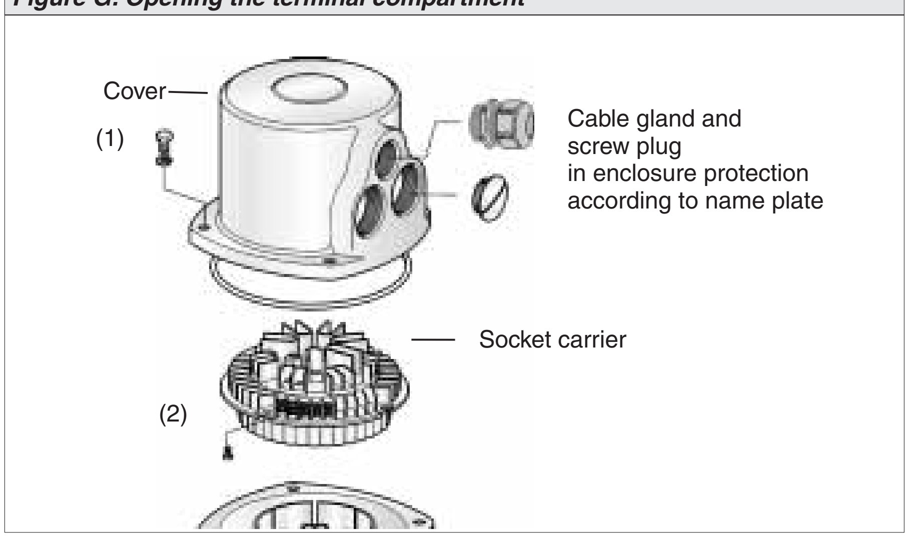
- Loosen bolts (1) and remove cover (figure G).
- Loosen screws (2) and remove socket carrier from cover.
- Insert cable glands suitable for connecting cables
  (The enclosure protection stated on the name plate is only ensured if suitable cable glands are used.).



Enclosure protection

- Seal cable entries which are not used with suitable plugs.

Figure G: Opening the terminal compartment

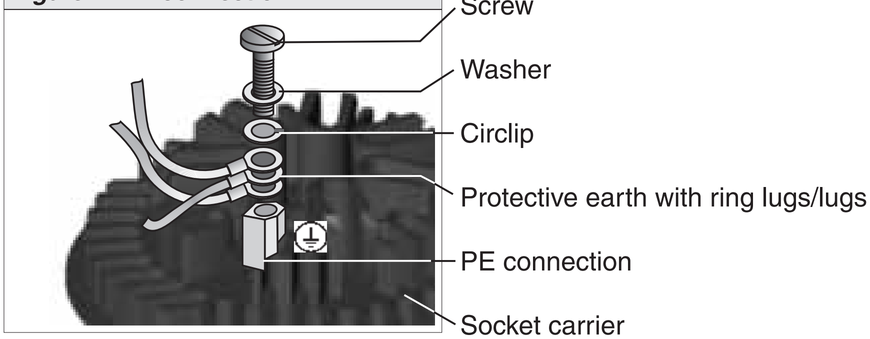


Connecting the cables

- Connect cables according to order-related wiring diagram.
  Cross sections:
  - Power terminals (U1, V1, W1, U2, V2, W2) and
    protective earth (symbol: ⏚)
    max. 6 mm² flexible, max. 10 mm² solid
  - Control contacts (1 to 50) = max. 2.5 mm²
- All PE conductors have to be tightened firmly to the PE connection (symbol: ⏚) using either ring lugs (flexible cables), or lugs (solid cables) (figure H).

Each time the PE connection has been disconnected, it has to be ensured that the PE conductors are firmly connected.

Figure H: PE connection



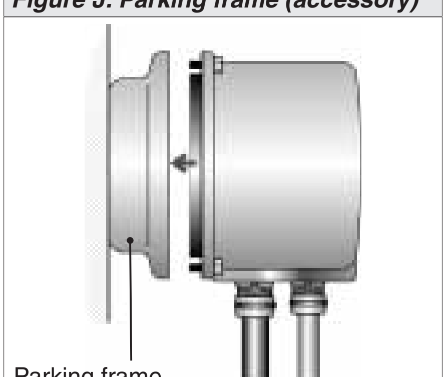
Closing the terminal compartment

- Insert socket carrier into the cover and fasten with screws (2) (figure G).
- Clean sealing faces at the 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 cover and fasten bolts (1) evenly crosswise.
- Fasten cable glands with the specified torque to ensure the required enclosure protection.

Parking frame, protection cover (accessories)

A special parking frame (figure J) for protection against touching the exposed contacts and against environmental influences is available.
The open terminal compartment can be closed using a protective cover (not illustrated).

Figure J: Parking frame (accessory)



9. 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 K-1).

Figure K-1

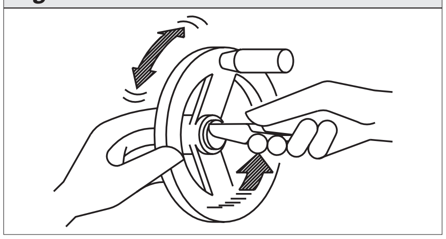
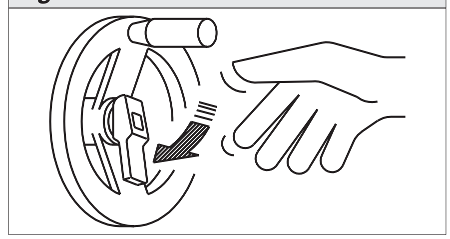


Figure K-2



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 K), if necessary, push it back manually.

Operating the change-over lever while the motor is running (figure L-1) can lead to increased wear at the change-over mechanism.

Figure L-1

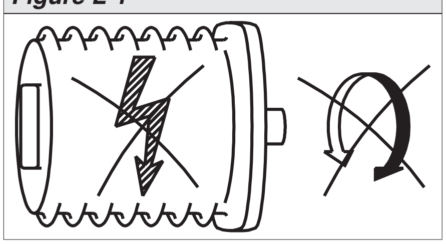
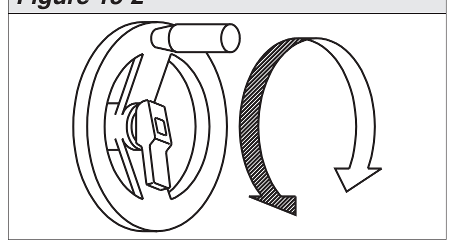


Figure 13-2



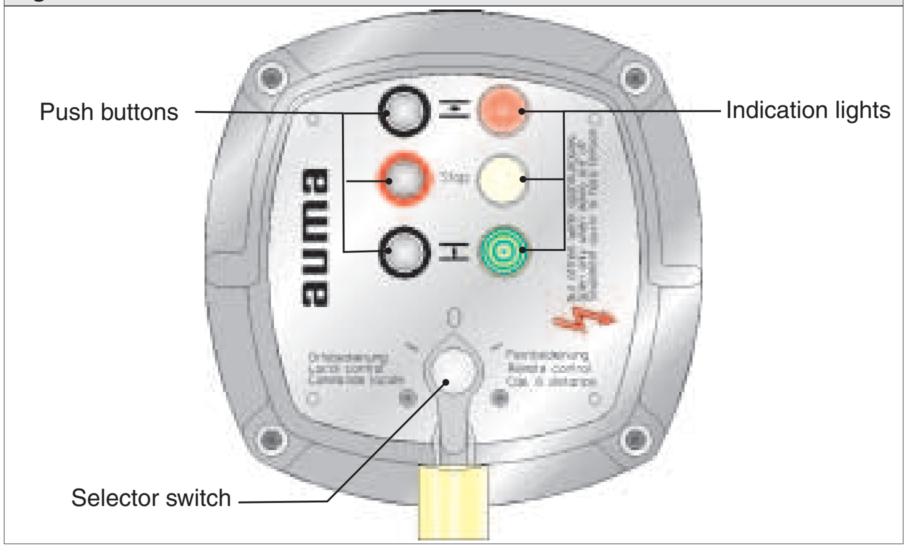
- Turn handwheel into desired direction (figure 13-2).

Disengaging manual operation

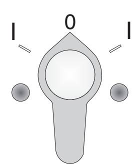
Manual operation is automatically disengaged when motor is started again.
The handwheel does not rotate during motor operation.

10. Operation and indications of the local controls

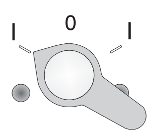
Figure M: Local controls



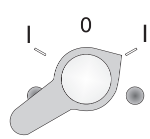
Selector switch



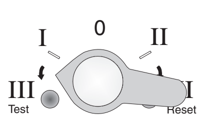
Position OFF (0):
- No remote control possible
- No local control possible
- Actuator remains ready for signalization
  signalization (the controls’ power supply is maintained)



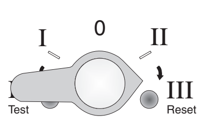
Position Local control (I):
The actuator can be operated locally via the push buttons
OPEN - STOP - CLOSE.



Position Remote control (II):
The actuator can be controlled from remote, e.g. via the control room.



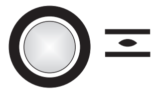
Position Test (III):
Test PTC tripping device (refer to page 27)
Only available in combination with motor protection
(PTC thermistor).
Yellow indication light (fault) is illuminated.



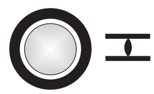
Position Reset (III):
Reset fault signal (yellow indication light) after the motor protection has tripped (refer to page 54).
Only available in combination with motor protection
(PTC thermistor).

Push buttons

If the selector switch is in position local control (I), use the push buttons OPEN - STOP - CLOSE to operate the actuator locally.


OPEN: Actuator runs in direction OPEN

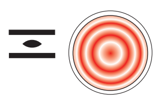
STOP: Actuator stops


CLOSE: Actuator runs in direction CLOSE

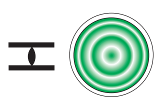
The operation commands OPEN - CLOSE can be used for control during push-to-run operation or in the self-retaining mode.
In the push-to-run operation, the actuator runs as long as the push button is pressed.
In the self-retaining mode, the actuator runs to the defined end position, unless another command has been received beforehand.
For further information on the programming, refer to page 35.

Indication lights

The 3 indication lights give the following signals (standard indication).


Illuminated (red): Actuator is in end position OPEN

Collective fault signal (yellow)


Illuminated (green): Actuator is in end position CLOSED

Collective fault signal:
The collective fault signal (yellow indication light) will be activated if one of the following events occurs:
- Torque fault, i.e. the set torque (page 25) was exceeded before reaching an end position.
- Motor protection has tripped (refer to page 54), i.e. the motor is overheated.
- A phase failure (for 3-phase AC motors) has occurred.
- Test PTC tripping device

Indication lights are blinking:
If the actuator is equipped with a blinker, the indication lights can be used as running indication.
If the blinker transmitter is active (page 35), the respective indication light blinks during operation.

11. Opening the switch compartment

To be able to carry out the following settings (up to and including clause 18.), 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.

11.1 Removing the cover from the switch compartment

- Loosen 4 bolts and take off the cover at the switch compartment (figure N-1 or figure N-2).

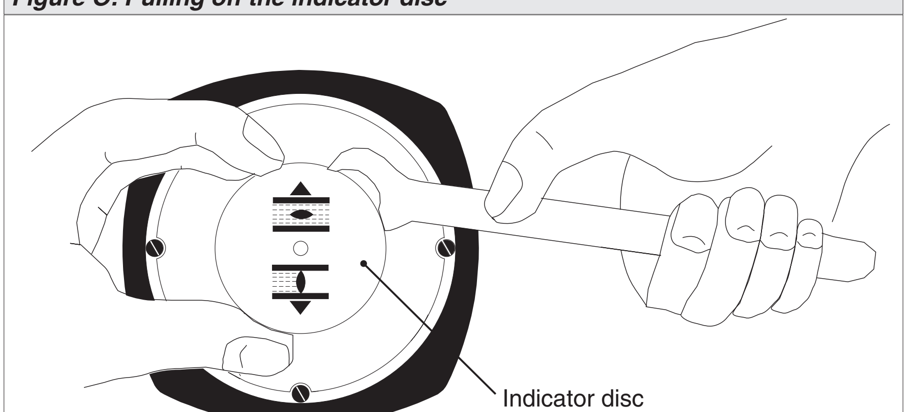
Figure N-1: Cover with indicator glass

Figure N-2: Cover without indicator glass

11.2 Pulling off the indicator disc (option)

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

Figure O: Pulling off the indicator disc

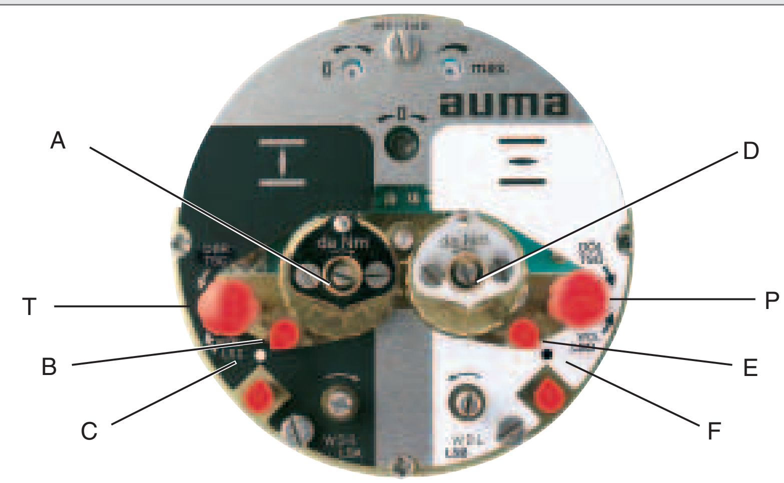


12. Setting the limit switching

12.1 Setting end position CLOSED (black section)

- Turn handwheel clockwise until valve is closed.
- Turn handwheel back by approximately half 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 P-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 rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure P-1: Control unit



12.2 Setting end position OPEN (white section)

- Turn handwheel counterclockwise until valve is open.
- Turn handwheel back by approximately ½ a turn (overrun). During test run check overrun and, if necessary, correct setting of the limit switching.
- **Press down** and turn setting spindle D (figure P-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 rotated), 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 P-1) are used for manual operation of the limit switches.

- Turning T in direction of the arrow LSC (WSR) triggers limit switch CLOSED.
  The green indication light on the local controls is illuminated as long as the test button is pushed down.
- Turning P in direction of the arrow LSO (WÖL) triggers limit switch OPEN.
  The yellow indication light (fault) on the local controls is illuminated.
- The red indication light on the local controls is illuminated as long as the test button is pushed down.

13. Setting the DUO limit switching (option)

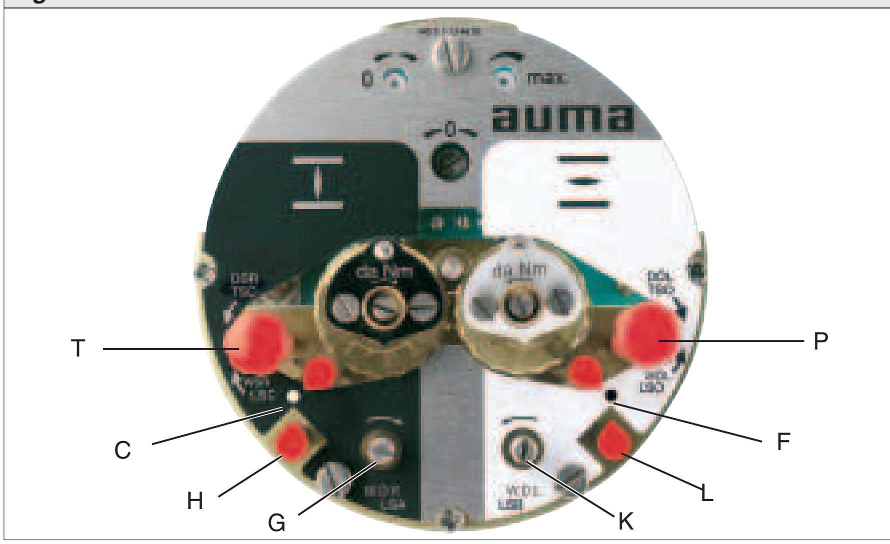
Any application can be switched on or off via the two intermediate position switches.

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

13.1 Setting direction CLOSE (black section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle G (figure P-2) with a flat blade screw driver 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 rotated), continue turning the setting spindle in the same direction and repeat setting process.

Figure P-2: Control unit



13.2 Setting direction OPEN (white section)

- Move valve to desired intermediate position.
- **Press down** and turn setting spindle K (figure P-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 rotated), 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 P-2) are used for manual operation of the DUO limit switches.

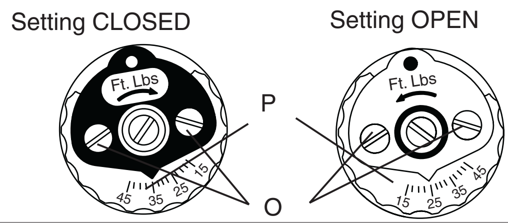
- Turning T in direction of the arrow TSC (DSR) triggers DUO limit switch CLOSED.
  The torque switch CLOSED is actuated at the same time.
- Turning P in direction of the arrow TSO (DÖL) triggers DUO limit switch OPEN.
  The torque switch OPEN is actuated at the same time.
- After checking the switches, the fault (red indication light) has to be reset using the OPEN or CLOSE push buttons of the local controls for operation in the opposite direction.

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 Q: Torque switching heads



- Loosen both lock screws O at the torque dial (figure Q).
- Turn torque dial P to set it to the required torque.
  Example:
  Figure Q 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.**

14.2 Checking the torque switches

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

- Turning T in direction of the arrow TSC (DSR) triggers torque switch CLOSED.
  The yellow indication light (fault) on the local controls is illuminated.
- Turning P in direction of the arrow TSO (DÖL) triggers torque switch OPEN.
  The yellow indication light (fault) on the local controls is illuminated.
- If a DUO limit switching (optional) is installed in the actuator, the intermediate position switches will be operated at the same time.
- After checking the switches, the fault (yellow indication light) has to be reset using the OPEN or CLOSE push buttons of the local controls for operation in the opposite direction.

15. Test run

15.1 Checking the direction of rotation

- If provided, place indicator disc on shaft.
  The direction of rotation of the indicator disc (figure R-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 purpose, remove screw plug (no. 27) (figure R-2).

Figure R-1: Indicator disc

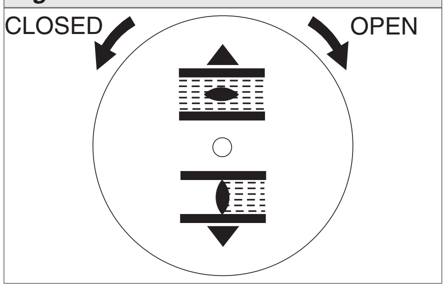
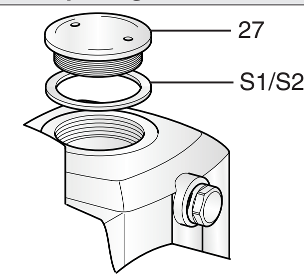
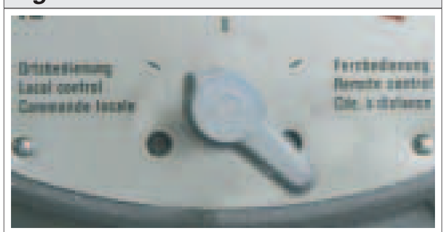


Figure R-2: Opening the hollow shaft



- Move actuator manually to intermediate position or to sufficient distance from end position.
- Set selector switch to local control (I) (figure S).

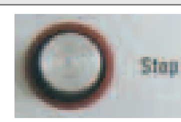
Figure S: Selector switch LOCAL



- Switch on the voltage supply.
- Press push button CLOSE (figure T-1) and observe the direction of rotation:
  If the indicator disc turns counterclockwise, the direction of rotation is correct.

Figure T-1: Push button CLOSE

Figure T-2: Push button STOP

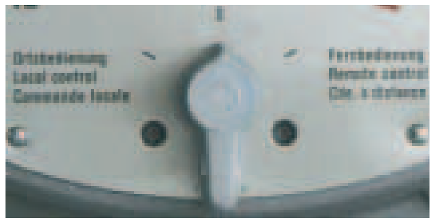


If the direction of rotation is wrong, switch off immediately.
Afterwards, correct phase sequence in the connecting cable from the wall bracket to the actuator and repeat test run.

15.2 Checking the setting of the limit switching

- Set selector switch to position OFF (0) (figure U-1).

Figure U-1: Selector switch OFF



The controls' power supply is maintained in position OFF.

- Move actuator manually into both end positions of the valve.
- Check if limit switching is set correctly for both end positions. 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 be set again.

When limit switching is set correctly:

- Set selector switch to local control (I) (figure S).
- Perform test run at the local controls via push buttons OPEN - STOP - CLOSE.

15.3 Checking the type of seating

The valve manufacturer states whether switching off in the end positions should be by limit switch (limit seating) or torque switch (torque seating).

- For checking the setting, refer to page 35, subclause 20.2.

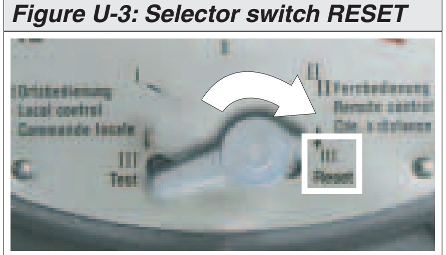
15.4 Checking the PTC tripping device (option)

- Turn selector switch to position TEST (wiping) (figure U-2).
  If the PTC tripping device is working properly, the tripping of the motor protection is signaled via the collective fault signal (refer to wiring diagram) and via the fault indication light on the local controls.

Figure U-2: Selector switch TEST

- Turn selector switch to position RESET (wiping) (figure U-3):
  The fault signal is reset if the device is working properly.

Figure U-3: Selector switch RESET



In case the selector switch position TEST does not initiate a fault signal, the wiring and the selector switch have to be checked by the AUMA service.

If no other options (clauses 16. to 18.) require setting:
- Close switch compartment (see page 33, clause 19.).

16. Setting the potentiometer (option)

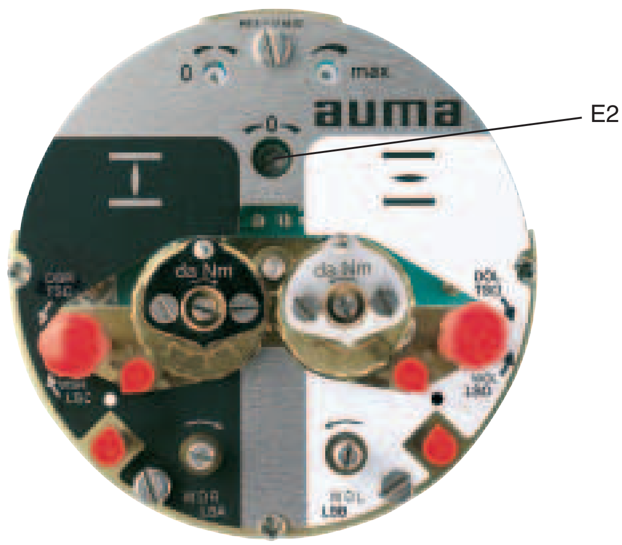
— For remote indication —

- Move valve to **end position CLOSED**.
- Turn potentiometer (E2) clockwise to the stop.
  End position CLOSED corresponds to 0 %, end position OPEN to 100 %.
- Turn potentiometer (E2) slightly back.

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 V: Control unit



17. Setting the electronic position transmitter RWG (option)

— For remote indication or external control —

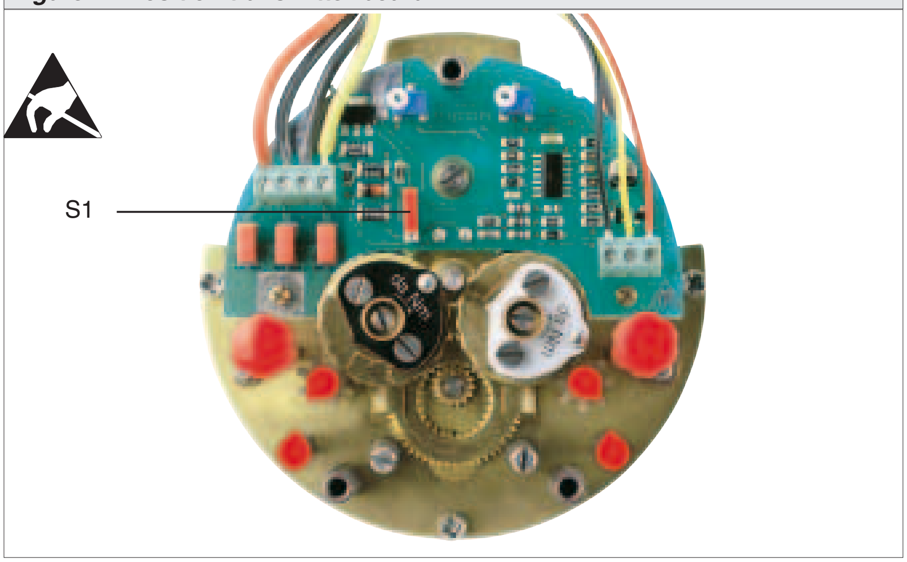
After mounting the actuator on the valve, check setting and adjust, if necessary (refer to subclauses 17.1 or 17.2).

Table 3: 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 % smoothed	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 W) is located under the cover plate (figure Y).

Figure W: Position transmitter board



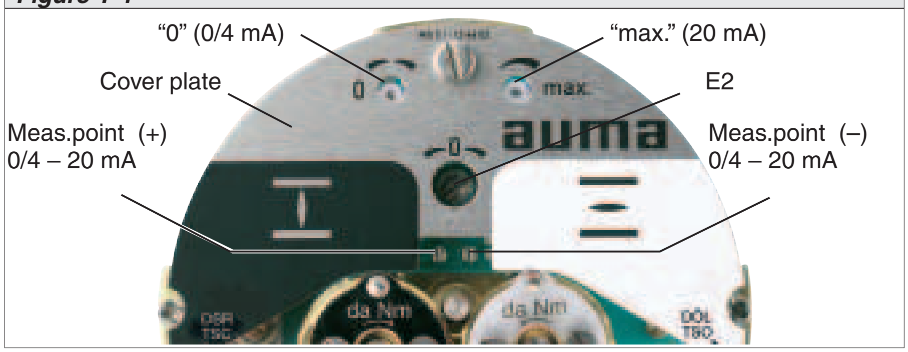
17.1 Setting 2-wire system 4 – 20 mA and 3- /4-wire system 0 – 20 mA

- Connect voltage to electronic position transmitter via AM.
- Move valve to **end position CLOSED**.
- Connect ammeter for 0 – 20 mA to measuring points (figure Y-1).

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

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

Figure Y-1



- 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.

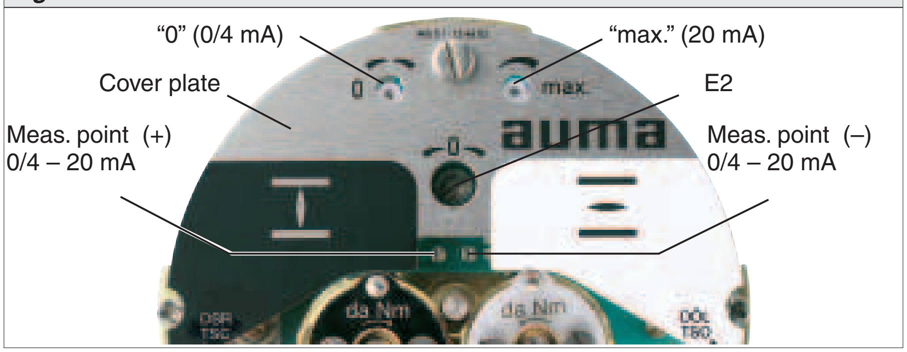
17.2 Setting 3- / 4- wire system 4 – 20 mA

- Connect voltage to electronic position transmitter via AM.
- Move valve to **end position CLOSED**.
- Connect ammeter for 0 – 20 mA to measuring points (figure Y-2).

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

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

Figure Y-2



- 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 (option)

- Place indicator disc on shaft.
- Move valve to **end position CLOSED**.
- Turn lower indicator disc (figure Z-1) until symbol CLOSED is in alignment with the mark on the cover (figure Z-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 Z-1

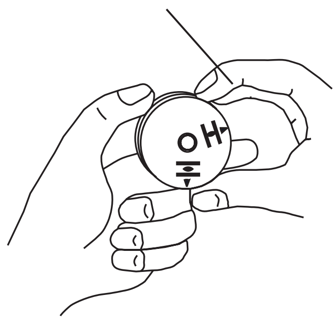


Figure Z-2

Indicator disc rotates approximately 180° to 230° at full travel from OPEN to CLOSED or vice versa. For this purpose, a suitable reduction gearing was installed in our factory.
If the turns per stroke of the actuator are changed at a later date, the reduction gearing may have to be exchanged.

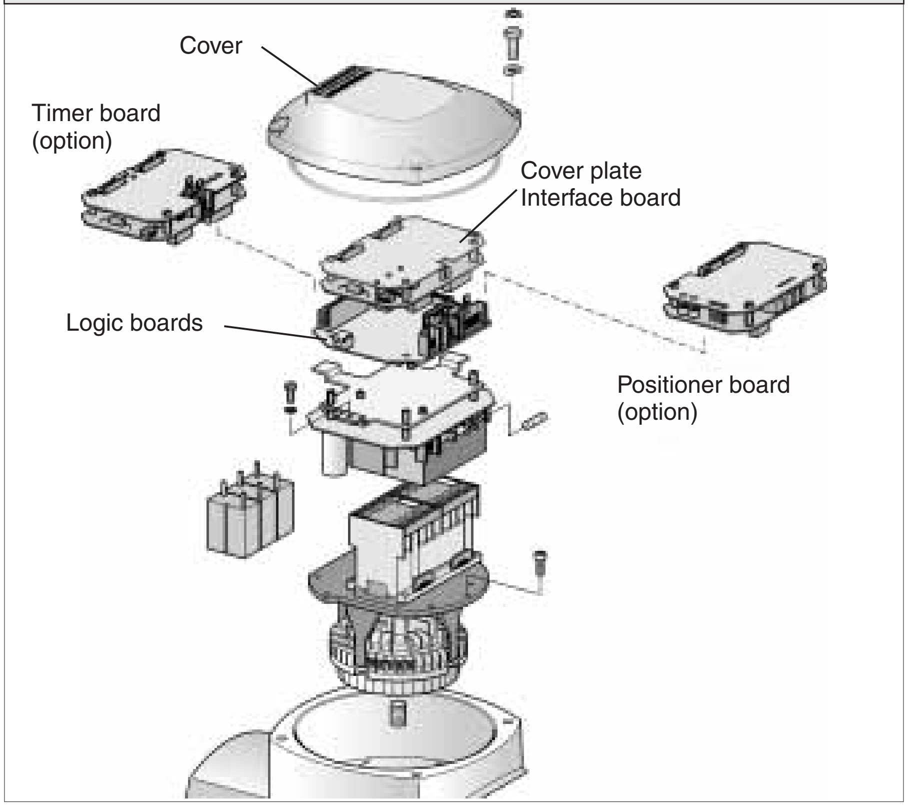
19. Closing the switch compartment

- 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 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.

20. Actuator controls AUMA MATIC

Figure AA: Positions of the boards within the controls



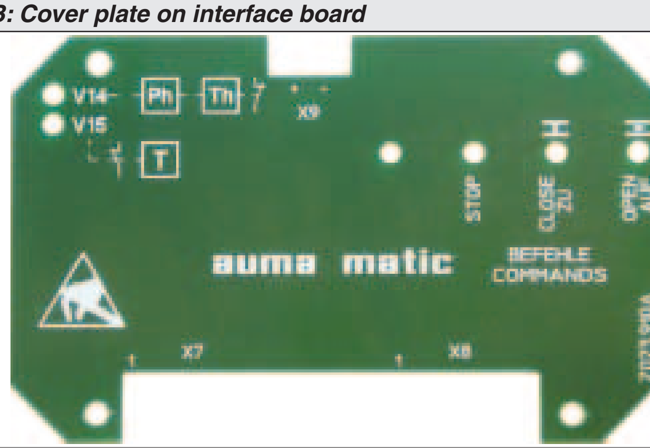
20.1 Functions of the diagnosis LEDs on the interface board (standard version)

V14 is illuminated: Phase failure and/ or motor protection tripped.
In combination with motor protection (PTC thermistor) (option):
Reset by selector switch position III at local controls

V15 is illuminated: Torque fault: Torque switch operated in mid-travel

The LEDs STOP, CLOSE, OPEN indicate the available control commands (only in selector switch position REMOTE).

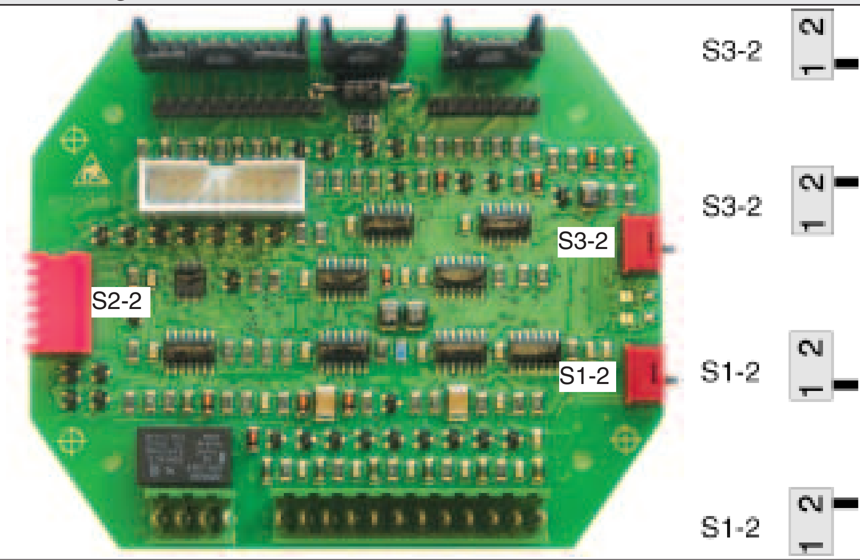
Figure AB: Cover plate on interface board



20.2 Programming the logic board

The type of seating – limit or torque seating – (switch S1-2 and switch S3-2, figure AC) must be determined by the valve manufacturer.

Figure AC: Logic board A2



Position 1:
Limit seating
in end position OPEN

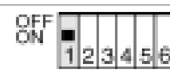
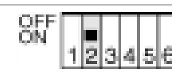
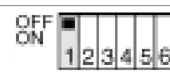
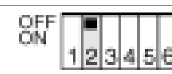
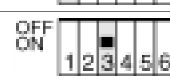
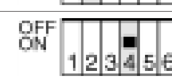
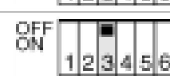
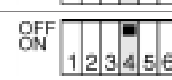
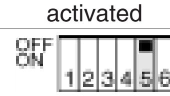
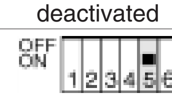
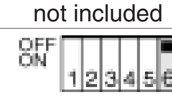
Position 2:
Torque seating
in end position OPEN

Position 1:
Limit seating
in end position CLOSED

Position 2:
Torque seating
in end position CLOSED

- Set desired programming according to table 4 at the switch S2-2.

Table 4

DIP switch S2-2	Programming (ON = pressed)	
	Direction CLOSE	Direction OPEN
Self-retaining REMOTE		
Push-to-run operation REMOTE		
Self-retaining LOCAL		
Push-to-run operation LOCAL		
Blinker transmitter (option)	activated 	deactivated 
Torque fault: Torque switch tripping (in mid-travel) contained in collective fault signal	included 	not included 

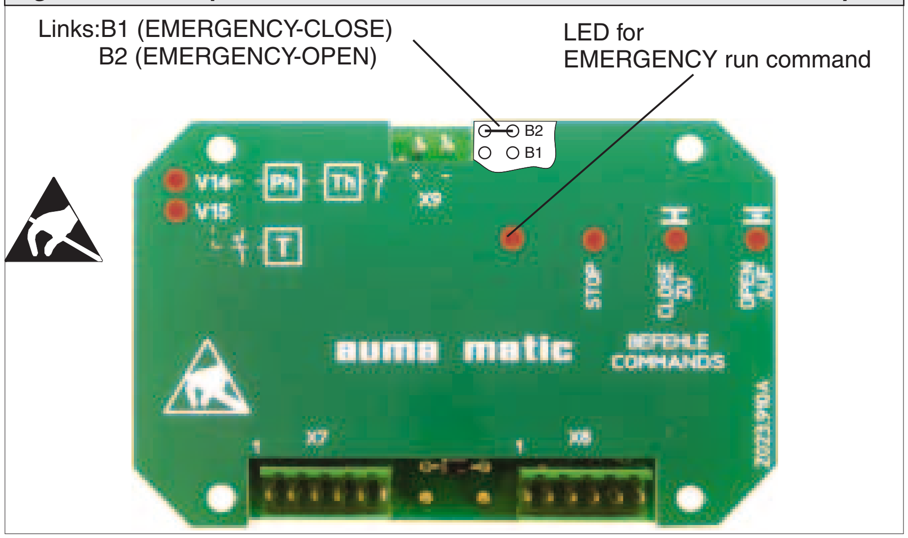
20.3 EMERGENCY - OPEN and EMERGENCY - CLOSE signal (option)

(5th digit in wiring diagram MSP … C, D, or P)

When an EMERGENCY run command is given, the actuator operates the valve to the predetermined end position (effective in all three selector switch positions: LOCAL, OFF, REMOTE).

- The input at terminal X_K 1 (refer to wiring diagram) must be connected to an NC contact (closed circuit principle).
- If EMERGENCY - OPEN or EMERGENCY - CLOSE signal is generally not desired:
  Take off cover plate and disconnect links B1 (for EMERGENCY - CLOSE) and B2 (for EMERGENCY - OPEN).

Figure AD: Cover plate for EMERGENCY - OPEN or EMERGENCY - CLOSE option



21. Electronic positioner (option)

21.1 Technical data

Table 5: Technical data for positioner	
Command signal (input signal E1, set value)	0/4 – 20 mA (option: 0 – 5 V)
Feedback (input signal E2, actual value)	0 – 5 V (option: 0/4 – 20 mA)
Sensitivity (dead band) ΔE (P9)	0.5 % – 2.5 %
Fine tuning "Sens" (P7) (useful for output speeds < 16 rpm only; not possible with 1-phase AC motors)	min. 0.25 %
Pause time "t-off "(P10)	0.5 – 10 s
Input resistance	250 Ohm
Modulating duty with stepping mode (not required for modulating setting)**:**	
Running time "t-on" (P8) effective until error is ≤ 25 %; then set value is automatically reduced by 3.	0.5 – 15 s

21.2 Setting

The positioner in the actuator controls AUMA MATIC is programmed according to the purchase order details and is set together with the actuator prior to delivery.
Due to peculiarities of the regulating system not known beforehand, a readjustment may become necessary. Before adjusting the positioner, the programming of the positioner should be checked.

- Check programming of the logic board according to subclause 20.2.

The self-retaining REMOTE function (see table 4) must be switched off in conjunction with the positioner.

- Take off cover plate (figure AE) and carry out required programming at positioner board (figure AF) according to tables 6 and 7.

Prior to setting, it must be ensured that the circuit for the position feedback E2 (see wiring diagram) is closed (measuring device or link). In case of missing signal E2, the LED (V10) "E1/E2 < 4 mA" (figure AE) is illuminated and the positioner shows no reaction.

Figure AE: Cover plate positioner

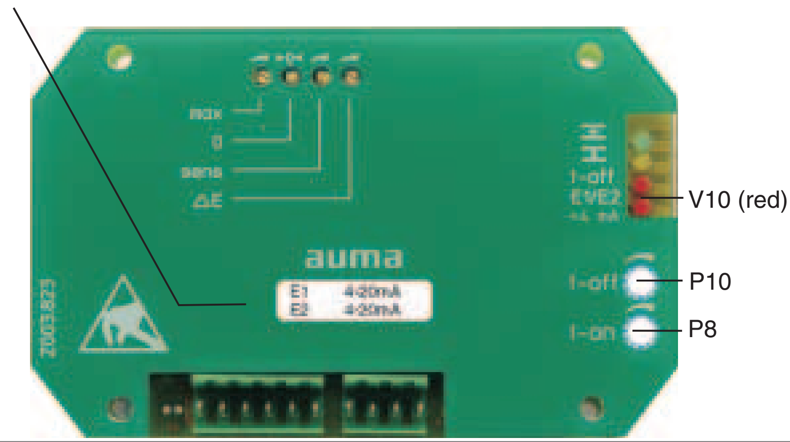
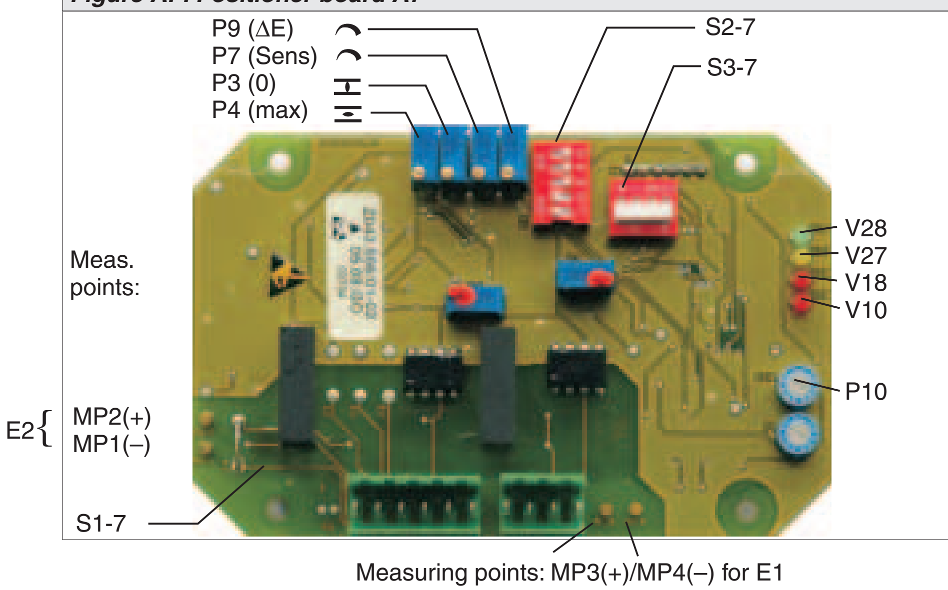
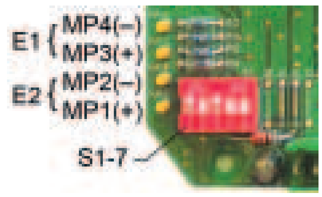


Figure AF: Positioner board A7

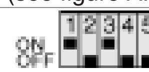
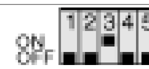
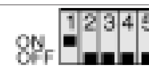
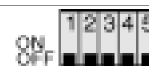


21.2.1 Setting type of signal

The signal type (current/ voltage signal) of nominal value E1 and actual value E2 is set in the factory and marked with a label on the cover plate of the positioner (refer to figure AE).
For split range version (page 38) and for versions with a setpoint E1 ≠ 0/4 – 20 mA, it is possible to change the type of signalling. For these versions, the positioner board is equipped with an additional switch S1-7.



If the setting is subject to subsequent change, the marking also has to be changed. Furthermore, the wiring diagram indicated on the name plate of the actuator controls also changes (see page 61).

Table 6: Possible settings		
		Programming
Command signal Setpoint E1	Feedback Actual value E2 1)	via DIP switch S1-7 (see figure AF)
4 – 20 mA 0 – 20 mA	4 – 20 mA 0 – 20 mA	
4 – 20 mA 0 – 20 mA	0 – 5 V	
0 – 5 V	4 – 20 mA 0 – 20 mA	
0 – 5 V	0 – 5 V	
0 – 10 V	4 – 20 mA 0 – 20 mA	
0 – 10 V	0 – 5 V	

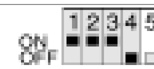
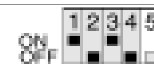
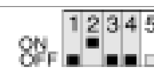
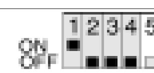
1) Signals for internal feedback:
0/4 – 20 mA from electronic position transmitter
or 0 – 5 V from precision potentiometer 5 k Ω

21.2.2 Setting actuator behavior on loss of signal

In case of a loss of signal of nominal value E1 or actual value E2, the reaction of the actuator can be programmed via the switch S2-7. The complete range of choices, however, is only available with signals 4 – 20 mA.

The following reactions are possible:
Fail as is:
Actuator stops immediately and remains in this position.
Fail close
Actuator moves the valve to the end position CLOSED.
Fail open:
Actuator moves the valve to the end position OPEN.

Table 7: Possible settings

Behavior on loss of signal of		Prerequisite1)		Programming
E1	E2	Command signal Setpoint E1	Feedback Actual value E22)	via DIP switch S2-7 (see figure AF)
fail as is		4 – 20 mA	4 – 20 mA	
fail close		4 – 20 mA	4 – 20 mA	
		0 – 20 mA 0 – 5 V	4 – 20 mA	
fail open		4 – 20 mA	4 – 20 mA	
		4 – 20 mA	0 – 20 mA 0 – 5 V	
fail as is	fail open	4 – 20 mA	0 – 5 V	
fail close	fail open	4 – 20 mA 0 – 20 mA	0 – 5 V	
		0 – 20 mA	4 – 20 mA	
		0 – 20 mA 0 – 5 V 0 – 10 V	0 – 20 mA 0 – 5 V	
fail close	fail as is	0 – 20 mA	4 – 20 mA	
		0 – 10 V	4 – 20 mA	

1) During loss of signal, signals from 0 – 20 mA and 0 – 5 V may be misinterpreted since E1 or E2 (without any fault) can also be < 4 mA (end position CLOSED = 0 mA or 0 V) when working properly.

2) Signals for internal feedback:
0/4 – 20 mA from electronic position transmitter or 0 – 5 V from precision potentiometer 5 k Ω

21.3 Positioner adjustment for end position CLOSED (standard version)

Before beginning the setting of the positioner, it has to be ensured that the limit and torque switching of the actuator as well as the feedback have been set (clauses 16. and 17.).

- Set selector switch (local controls) to position LOCAL.
- Move multi-turn actuator by pressing push button to **end position CLOSED**.
- Supply nominal value E1 of 0 or 4 mA (see wiring diagram).
- Turn potentiometer “t-off” (P10) counterclockwise to the stop (figure AG).

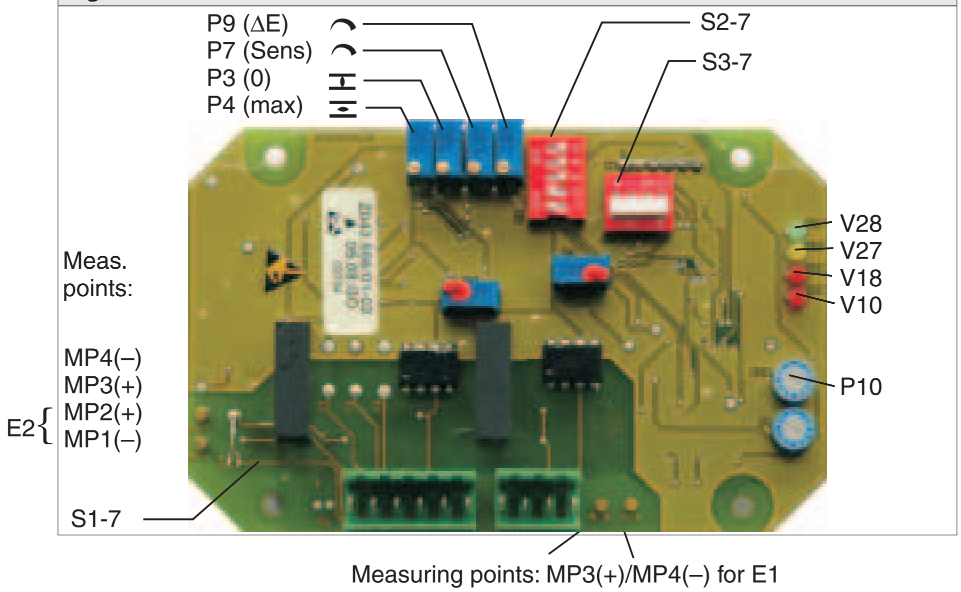
Missing signals E1/ E2 or wrong polarity are indicated by LED (V10) “E1/E2 < 4 mA" (figures AE or AG)

- Connect voltmeter to measuring points MP3 and MP4 (figure AG) for measuring the nominal value (0 – 5 V).
  For a nominal value E1 of 0 mA, the voltmeter shows 0 V.
  For a nominal value E1 of 4 mA, the voltmeter shows 1 V.
  In case nominal value (0 V or 1 V) is not correct:
  Correct nominal value signal from control room.
- Connect voltmeter to measuring points MP2 and MP1 for measuring the actual value signal.
  For an actual value E2 of 0 V, the voltmeter shows 0 V.
  For an actual value E2 of 5 V, the voltmeter shows 1 V.
  If measured value is not correct:
  Adjust position feedback according to clause 16. and 17. and repeat “positioner adjustment”.

Table 8

	Possible LED display: (refer to figures AG and AH)		Required setting in end position CLOSED: (refer to figures AG and AH)
If	the LEDs are not illuminated	Then	Turn potentiometer “0” (P3) slowly clockwise until LED (V27 yellow) is illuminated
	LED (V28 green) is illuminated		Turn potentiometer “0” (P3) slowly clockwise until LED (V28 green) is no longer illuminated and LED (V27 yellow) is illuminated
	LED (V27 yellow) is illuminated		Turn potentiometer “0” (P3) counterclockwise until LED (V27 yellow) is no longer illuminated. Then turn potentiometer “0” (P3) slightly clockwise until LED (V27 yellow) is illuminated

Figure AG: Positioner board A7



21.4 Positioner adjustment for end position OPEN (standard version)

- Run multi-turn actuator by pressing push button (local controls) to **end position OPEN**.
- Connect voltmeter to measuring points MP2 and MP1 for measuring the actual value E2:
  When position feedback is set correctly, the voltmeter shows approx. 5 V.
  If measured value is not correct:
  Adjust position feedback according to clause 16. and 17. and repeat "positioner adjustment".
- Connect max. command signal (nominal value E1) = 20 mA.
- Connect voltmeter to measuring points MP4 and MP3 for measuring the nominal value E1:
  For a nominal value of 20 mA, the voltmeter shows 5 V.
  If measured value is not 5 V:
  Check the externally supplied command signal E1.

Table 9

If	LED display: (refer to figures AG and AH)	Then	Required setting in end position OPEN: (refer to figures AG and AH)
	the LEDs are not illuminated		Turn potentiometer "max." (P4) slowly counterclockwise until LED (V28 green) is illuminated
	LED (V28 green) is illuminated		Turn potentiometer "max" (P4) clockwise until LED (V28 green) is no longer illuminated. Then turn potentiometer "max" (P4) slowly counterclockwise until LED (V28 green) is illuminated
	LED (V27 yellow) is illuminated		Turn potentiometer "max" (P4) slowly counterclockwise until LED (V27 yellow) is no longer illuminated and LED (V28 green) is illuminated

21.5 Setting the sensitivity

- Set selector switch at the local controls to position REMOTE.
- Set command signal E1 according to label on cover plate (see figure AH).
  The sensitivity (ΔE / dead band) is set to maximum value (2.5 %) in the factory.
- The deadband can be increased by turning the potentiometer ΔE (P9) clockwise. Left stop = small dead band (= high sensitivity). For a precise setting of the dead band, a set point device with setting options in the 0.1 mA range is required.
- A better sensitivity (ΔE_{min}= 0.25 %) can be achieved by turning the potentiometer P7 (sens) clockwise.


When setting ΔE, the following must be observed:
If the number of starts is too high, this will lead to unnecessary wear at the valve and actuator. Therefore the maximum possible dead band acceptable for the process must be set.

To prevent exceeding the max. permissible number of starts (refer to Technical data sheets for modulating actuators) in extreme cases, a pause time between 0.5 s (left stop) and 10s (right stop) may be set with the potentiometer "t-off" (P10).

Figure AH: Cover plate for positioner

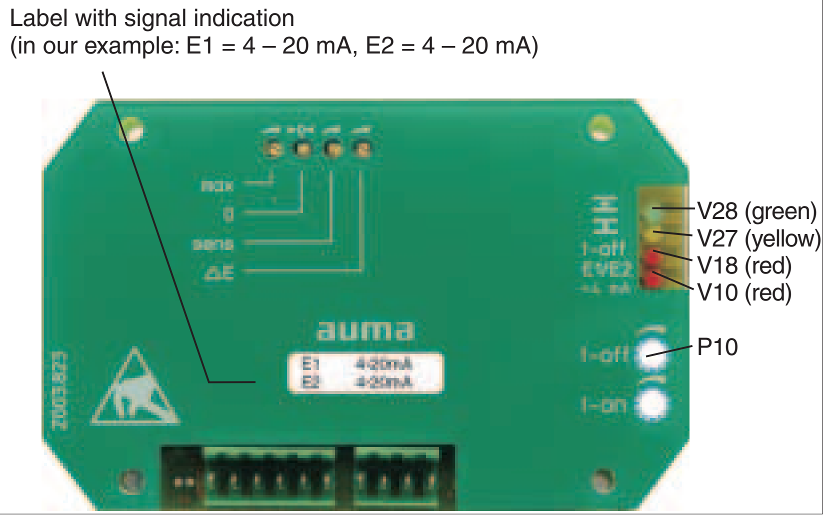
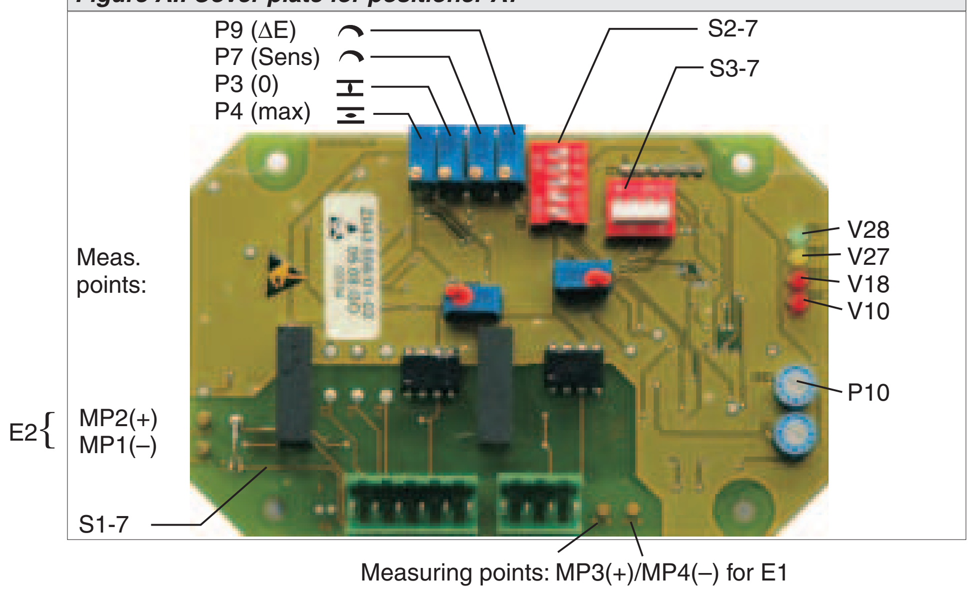


Figure AI: Cover plate for positioner A7



21.6 Positioner adjustment for end position OPEN (inverse operation)

In standard version the maximum input signal (E1 = 20 mA) results in operation to end position OPEN.

- By switching the code switch S3-7 (figure AJ) to position “1”, an inversion of this signal definition (inverse operation) can be achieved.
- In case an RWG (option) is installed, the connections 7 (red) and 5 (black) on the positioner board (figure W) of the actuator have to be exchanged.
- In case a potentiometer is installed, (option) the connections 21 (red) and 22 (black) at XA (connection for actuator) must be interchanged.

Before beginning the setting of the positioner, it has to be ensured that the limit and torque switching of the actuator as well as the feedback have been set (clauses 16. and 17.).

- Set selector switch (local controls) to position LOCAL.
- Run actuator with push button to **end position OPEN** .
- Supply nominal value E1 of 0 or 4 mA (see wiring diagram).
- Turn potentiometer “t-off” (P10) counterclockwise to the stop (figure AJ).

Missing signals E1/ E2 or wrong polarity are indicated by LED (V10) “E1/E2 < 4 mA" (figures AH or AJ)

- Connect voltmeter to measuring points MP3 and MP4 (figure AJ) for measuring the nominal value (0 – 5 V).
  For a nominal value E1 of 0 mA, the voltmeter shows 0 V.
  For a nominal value E1 of 4 mA, the voltmeter shows 1 V.
  In case nominal value (0 V or 1 V) is not correct:
  Correct nominal value signal in control room.
- Connect voltmeter to measuring points MP2 and MP1 for measuring the actual value signal.
  For an actual value E2 of 0 V, the voltmeter shows 0 V.
  For an actual value E2 of 5 V, the voltmeter shows 1 V.
  Adjust position feedback according to clause 16. and 17. and repeat “positioner adjustment”.

Table 10

If	**Possible LED display:** (refer to figures AH and AJ)	Then	**Required setting in end position OPEN:** (refer to figures AH and AJ)
If	the LEDs are not illuminated	Then	Turn potentiometer “0” (P3) slowly clockwise until LED (V28 green) is illuminated
	LED (V27 yellow) is illuminated		Turn potentiometer “0” (P3) slowly clockwise until LED (V27 yellow) is no longer illuminated and LED (V28 green) is illuminated
	LED (V28 green) is illuminated		Turn potentiometer “0” (P3) counterclockwise until LED (V28 green) is no longer illuminated. Then turn potentiometer “0” (P3) slowly clockwise until LED (V27 yellow) is illuminated

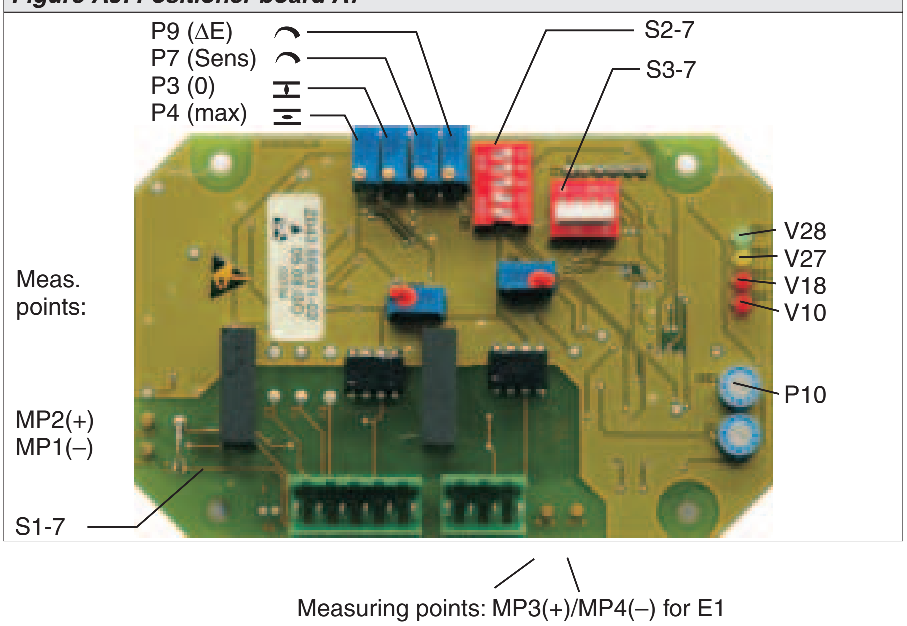
21.7 Positioner adjustment end position CLOSED (inverse operation)

- Run actuator with push button (local controls) to **end position CLOSED.**
- Connect voltmeter to measuring points MP2 and MP1 for measuring the actual value E2:
  When position feedback is set correctly, the voltmeter shows 5 V.
  If measured value is not correct:
  Adjust position feedback according to clauses 16. and 17. and repeat "positioner adjustment".
- Connect max. command signal (nominal value E1) = 20 mA.
- Connect voltmeter to measuring points MP4 and MP3 for measuring the nominal value E1:
  For a nominal value of 20 mA, the voltmeter shows 5 V.
  If measured value is not 5 V:
  Check the externally supplied command signal E1.

Table 11

	LED display: (refer to figures AH and AJ)		**Required setting in end position CLOSED:** (refer to figures AH and AJ)
If	the LEDs are not illuminated	**Then**	Turn potentiometer "max" (P4) slowly counterclockwise until LED (V27 yellow) is illuminated
	LED (V27 yellow) is illuminated		Turn potentiometer "max" (P4) clockwise until LED (V27 yellow) is no longer illuminated. Then turn potentiometer "max" (P4) slowly counterclockwise until LED (V27 yellow) is illuminated.
	LED (V28 green) is illuminated		Turn potentiometer "max" (P4) slowly counterclockwise until the LED (V28 green) is no longer illuminated and LED (V27 yellow) is illuminated.

Figure AJ: Positioner board A7



21.8 Positioner in Split Range version (option)

For Split Range, a modified version of the positioner is used. The standard version is not suitable for Split Range operation.
Split Range operation is only possible with the position transmitter RWG.

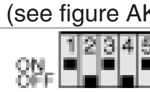
21.8.1 Split Range: description of functions

In Split Range operation, a setpoint is shared by up to four positioners. A typical example is a pipeline with a bypass. The actuator mounted on the bypass reacts in the lower range (0 – 10 mA), the actuator on the main valve in the upper range (10 – 20 mA). Other values such as 4 – 12 mA and 12 – 20 mA can also be set.

21.8.2 Programming

DIP 5 at code switch S1-7 must always be in position ON for Split Range version.

Table 12: Possible settings for Split Range operation

Command signal Setpoint E1	Feedback[1] Actual value E2	**Programming** via DIP switch S1-7 (see figure AK)
4 – 12/12 – 20 mA 0 – 10/10 – 20 mA	4 – 20 mA 0 – 20 mA	
4 – 12/12 – 20 mA 0 – 10/10 – 20 mA	0 – 5 V	

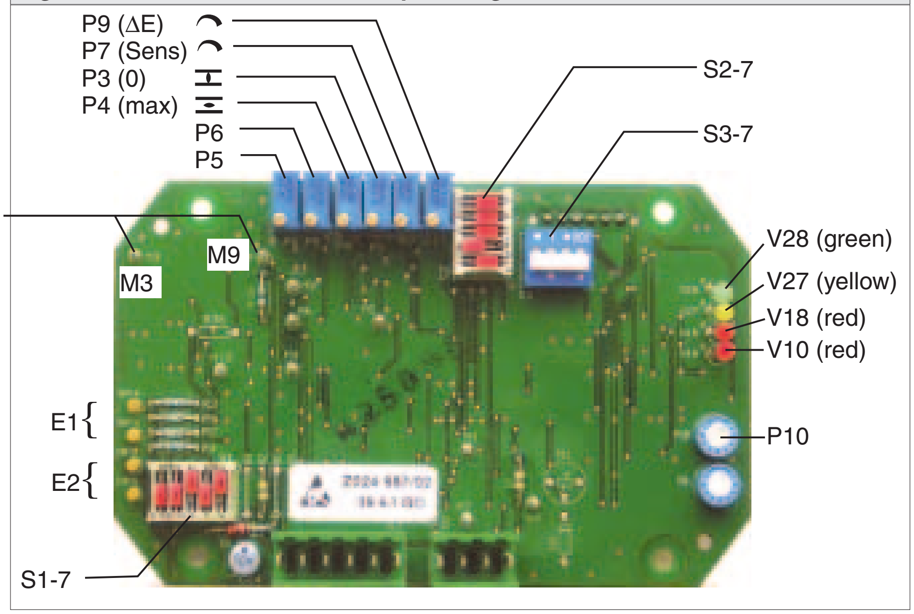
1) Signals for internal feedback:
0/4 – 20 mA from electronic position transmitter

The further programming of the positioner via the code switch S2-7 can be made in the same way as during normal operation.

21.8.3 Positioner adjustment for Split Range (see also example further down the page)

- Supply the specified minimum command signal (nominal value E1) for the positioner and check by measuring with voltmeter at the measuring points MP3 and MP4 (figure AK).
- Connect voltmeter between measuring point M3 and measuring point MP1.
  Calculate setting value:
  Initial value = $E\,1_{min}$ [in Ampere] x 250 Ohm
  Set initial value with potentiometer P5.
- Supply specified maximum command signal (nominal value E1) and check by measuring at the measuring points MP3 and MP4.
- Connect voltmeter between measuring point M9 and measuring point MP1.
  Set potentiometer P6 to 5 V.
- Supply input signal E1 from minimum to maximum value and check the set range 0 – 5 V at measuring point M9. If necessary, readjust with P5 or P6.
- Apply the same procedure to the second actuator's positioner and set according to the specified nominal values E1.
- After setting the Split Range operation, perform further readjustment as described on page 41.

Figure AK: Positioner board A7, Split Range version



Example:
Two actuators are to be operated in Split Range version. Actuator 1 must be in position CLOSED with a nominal value signal E1 of 0 mA and in position OPEN with a signal of 10 mA.
Actuator 2 must be in position CLOSED with a nominal value signal of 10 mA and in position OPEN with a signal of 20 mA.

- Positioner actuator 1:
  Supply E1 = 0 mA, set with P5 = 0 V at M3 (measured against MP1),
  supply E1 = 10 mA, set with P6 = 5V at M9 (measured against MP1).
- Positioner actuator 2:
  Supply E1 = 10 mA, set with P5 = 0 V at M3 (measured against MP1),
  supply E1 = 20 mA, set with P6 = 5V at M9 (measured against MP1).
- Perform adjustments and settings for E2, etc. Afterwards the nominal value E1 can be transmitted through both actuators (connected in series). When operating within range E1 = 0 – 10 mA, actuator 1 moves, actuator 2 remains in end position CLOSED. When operating within range
  E1 = 10 – 20 mA, actuator 2 moves, actuator 1 remains in end position OPEN.

22. Timer (option)

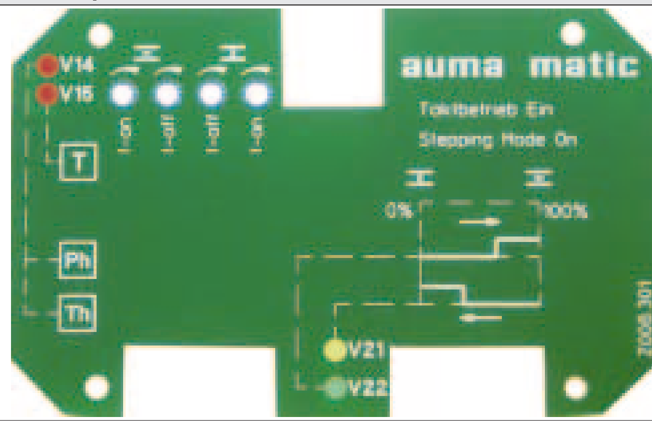
The timer board is used to increase the operating time for the entire or any portion of the valve travel.

Example:
In order to avoid water hammer in long pipelines, stepping mode can be chosen for any part of the travel.

- The timer is installed in the actuator controls AUMA MATIC instead of the interface board.
- Electronic timer is not possible in combination with positioner.

22.1 Functions of the diagnosis LEDs (timer)

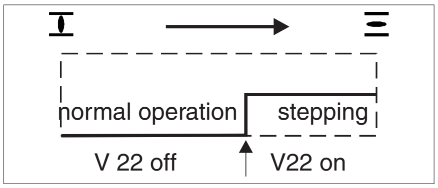
Figure AL: Cover plate for timer A1.6



V14 is illuminated:	Phase failure and/ or motor protection tripped. For version with PTC thermistor: reset by selector switch position III at local controls.
V15 is illuminated:	Torque fault: Tripping torque was exceeded before reaching the end position.
V21 is illuminated:	Stepping mode in direction CLOSE is switched on.
V22 is illuminated:	Stepping mode in direction OPEN is switched on.

22.2 Setting start and end of stepping mode via DUO limit switching (option)

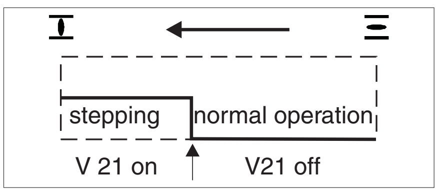
Start and end of stepping mode can also be set via external switches (use potential-free contacts).



Start stepping mode OPEN

Direction OPEN, first normal operation then stepping mode

- Run valve in direction OPEN to the desired start of stepping mode.
- **Press down** and turn setting spindle K (figure AM) with screw driver in direction of arrow, thereby observe LED V22 (figure AL).
  Start of stepping mode in direction OPEN is set correctly if the LED changes from off to on (see sketch on the left).

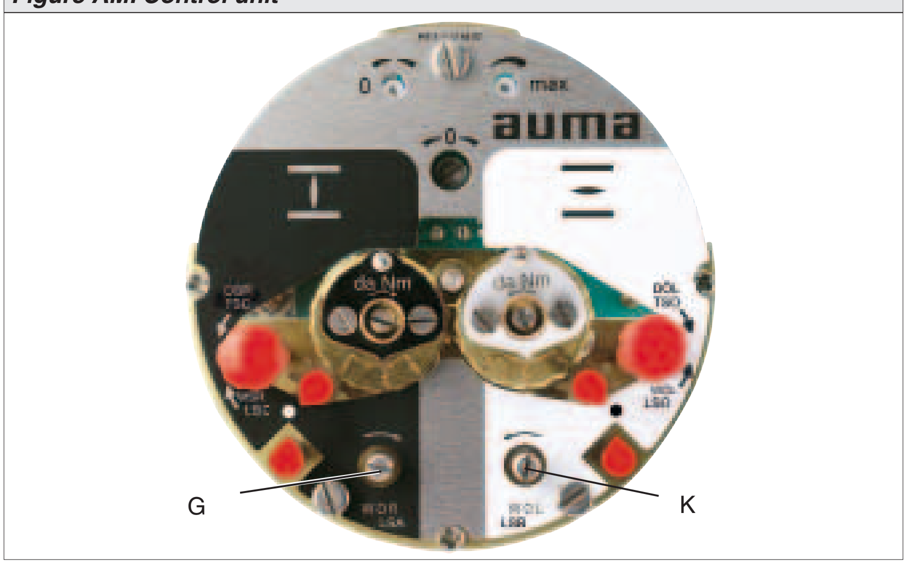


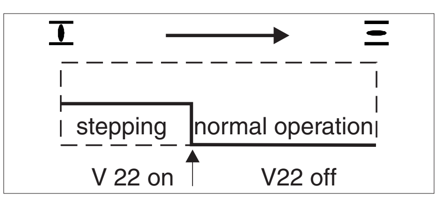
Start stepping mode CLOSED

Direction CLOSE, first normal operation then stepping mode

- Run valve in direction CLOSE to the desired start of stepping mode.
- **Press down** and turn setting spindle G (figure AM) with screw driver in direction of arrow, thereby observe LED V21 (figure AL).
  Start of stepping mode in direction CLOSE is set correctly if the LED changes from off to on (see sketch on the left).

Figure AM: Control unit

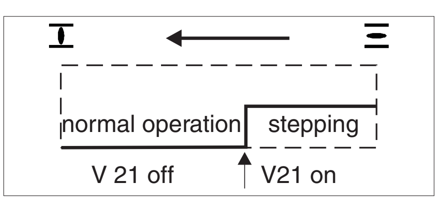




End stepping mode OPEN

Direction OPEN, first stepping mode then normal operation

- Run valve in direction OPEN to the desired end of stepping mode.
- **Press down** and turn setting spindle K (figure AM) with screw driver in direction of arrow, thereby observe LED V22 (figure AL).
  End of stepping mode is correctly set if the LED changes from on to off (see sketch on the left).



End stepping mode CLOSED

Direction CLOSE, first stepping mode then normal operation

- Run valve in direction CLOSE to the desired end of stepping mode.
- **Press down** and turn setting spindle G (figure AM) with screw driver in direction of arrow, thereby observe LED V21 (figure AL).
  End of stepping mode is correctly set if the LED changes from on to off (see sketch on the left).

22.3 Setting ON and OFF times

ON and OFF times can be set independently of each other between 1 – 30 seconds at the 4 potentiometers R10 to R13.

Clockwise rotation: Time extension
Counterclockwise rotation: Time reduction

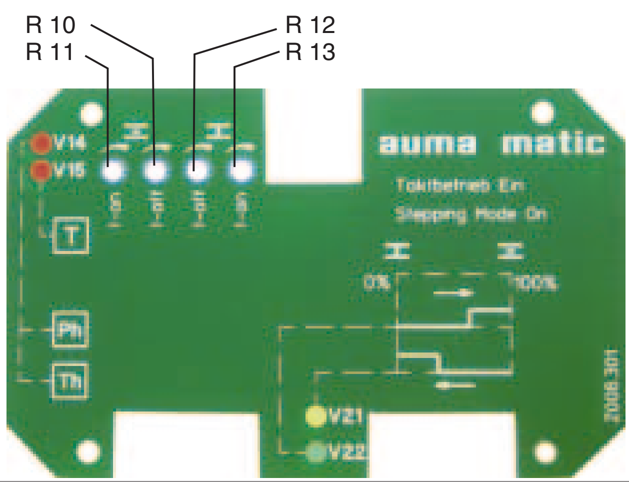
R10 (t-off) : OFF time in direction OPEN

R11 (t-on) : Running time in direction OPEN

R12 (t-off) : OFF time in direction CLOSE

R13 (t-on) : Running time in direction CLOSE

Figure AN: Cover plate for timer A1.6



23. Fuses

- **Switch off the mains before changing the fuses.**
- **When replacing fuses, only fuses according to table 13 may be used.**

23.1 Fuses within the actuator controls

Fuses (figures AP and AO) are accessible after removal of the local controls.

Figure AP: Fuses on signal and control board

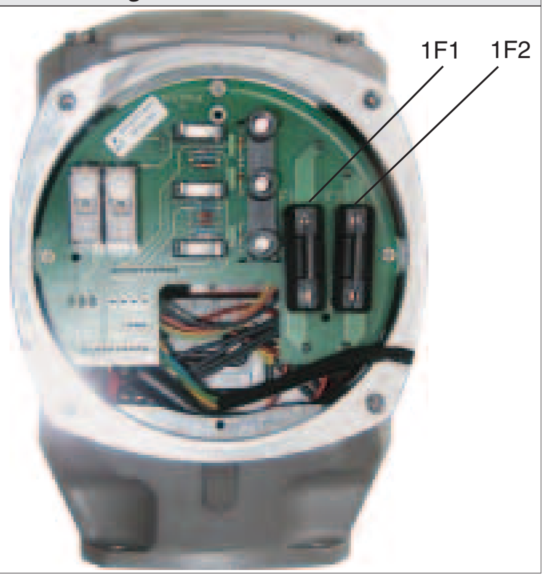


Figure AO: Fuses on power supply board

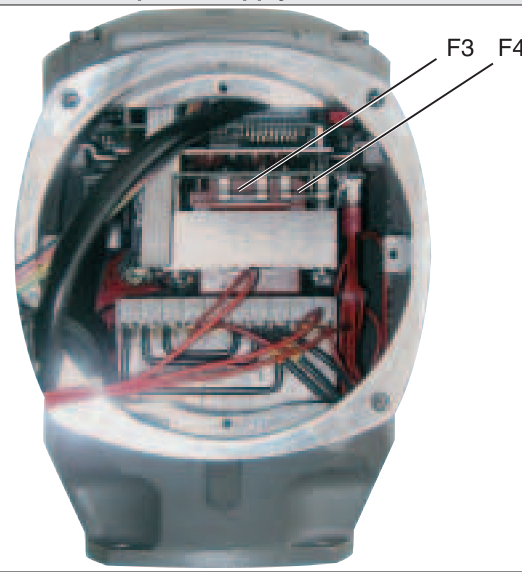


Table 13

Switchgear	**Voltage supply** (mains voltage)	**Voltage output** (power supply unit)	**G fuses:** (figures **AP** and **AO**)		
			F 1/F 2 (Board A20, refer to wiring diagram)	**F 3*)** (Boards A2, refer to wiring diagram)	**F 4*)** (Boards A8, refer to wiring diagram)
Reversing contactors	≤ 500 V	24 V	1 A T; 500 V AUMA article no.: K002.277	500 mA T; 250 V	1.6 A T; 250 V
		115 V			0.4 A T; 250 V
	> 500 V	24 V	2 A FF; 660 V AUMA article no.: K002.665		1.6 A T; 250 V
		115 V			0.4 A T; 250 V
Thyristors	≤ 500 V	24 V	16 A FF; 500 V AUMA article no.: K001.189		1.6 A T; 250 V
		115 V			0.4 A T; 250 V
Size			6.3 x 32 mm	5 x 20 mm	5 x 20 mm

*) according to IEC 60127-2/III

F1/ F2: Primary fuses on power supply unit

F3: Internal 24 V DC supply, RWG, logic board

F4: Internal 115 V AC supply (optional: 24 V AC); Heater, tripping device for PTC thermistors, control of reversing contactors, remote operation

- After replacing the fuses, screw local controls back on again.

Carefully lead cables back into the housing to prevent them from pinching.

23.2 Motor protection

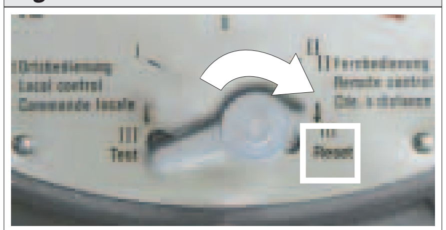
In order to protect against overheating and impermissibly high temperatures at the actuator, PTC thermistors or thermoswitches are embedded in the motor winding. The thermoswitch is tripped as soon as the max. permissible winding temperature has been reached.
The actuator is stopped and the yellow indication light on the local controls is illuminated.
The motor has to cool down before the operation can be resumed.

Version with thermoswitch (standard)
The actuator can be controlled again after the motor has cooled down.
As soon as the actuator receives a run command (OPEN - CLOSE), the fault signal (yellow indication light) is no longer illuminated.

Version with thermoswitch and additional thermal overload relay within the controls (option):
The operation can only be continued after the fault signal (yellow indication light) has been reset. The fault signal is reset automatically via an overload relay integrated in the actuator controls after the motor has cooled down.

Version with PTC thermistor (option)
The operation can only be continued after the fault signal (yellow indication light) has been reset. The fault signal is reset via selector switch position RESET (figure AQ) of the local controls.

Figure AQ: Selector switch RESET



24. Enclosure protection IP 68 (option)

Definition

According to EN 60 529, 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.

Further notes

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 to the bearings. The output drive types A and AF should therefore not be used during submersion for this application.

25. Maintenance

After commissioning, check multi-turn actuator for damage to paint finish. Do a thorough touch-up to prevent corrosion. Original paint in small quantities can be supplied by AUMA.

AUMA multi-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 fastened 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 multi-turn actuator and valve/ gearbox for tightness. If required, tighten applying the torques given in table 1, page 12.
- 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 2, page 13).

26. 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.

27. 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:

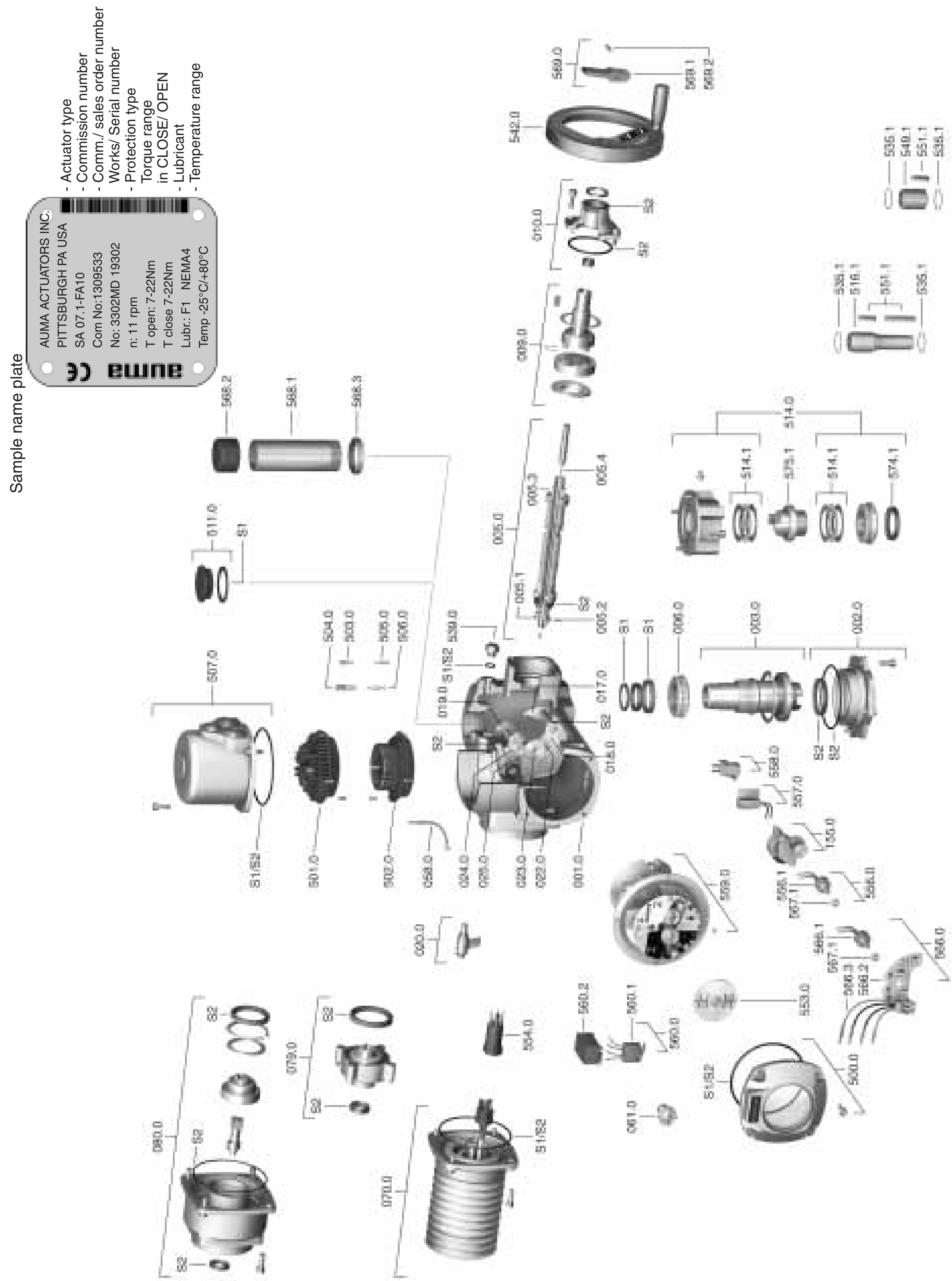
- Collect greases and oils during disassembly. As a rule, these substances are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the regional regulations for waste disposal.

28. Service

AUMA offers extensive services such as maintenance and inspection for actuators as well as various training courses. Addresses of AUMA offices and representatives can be found on page 64 and on the Internet (www.auma.com).

Notes

29. Spare parts list Multi-turn actuator SA 07.1 – SA 16.1/SAR 07.1 – SAR 16.1

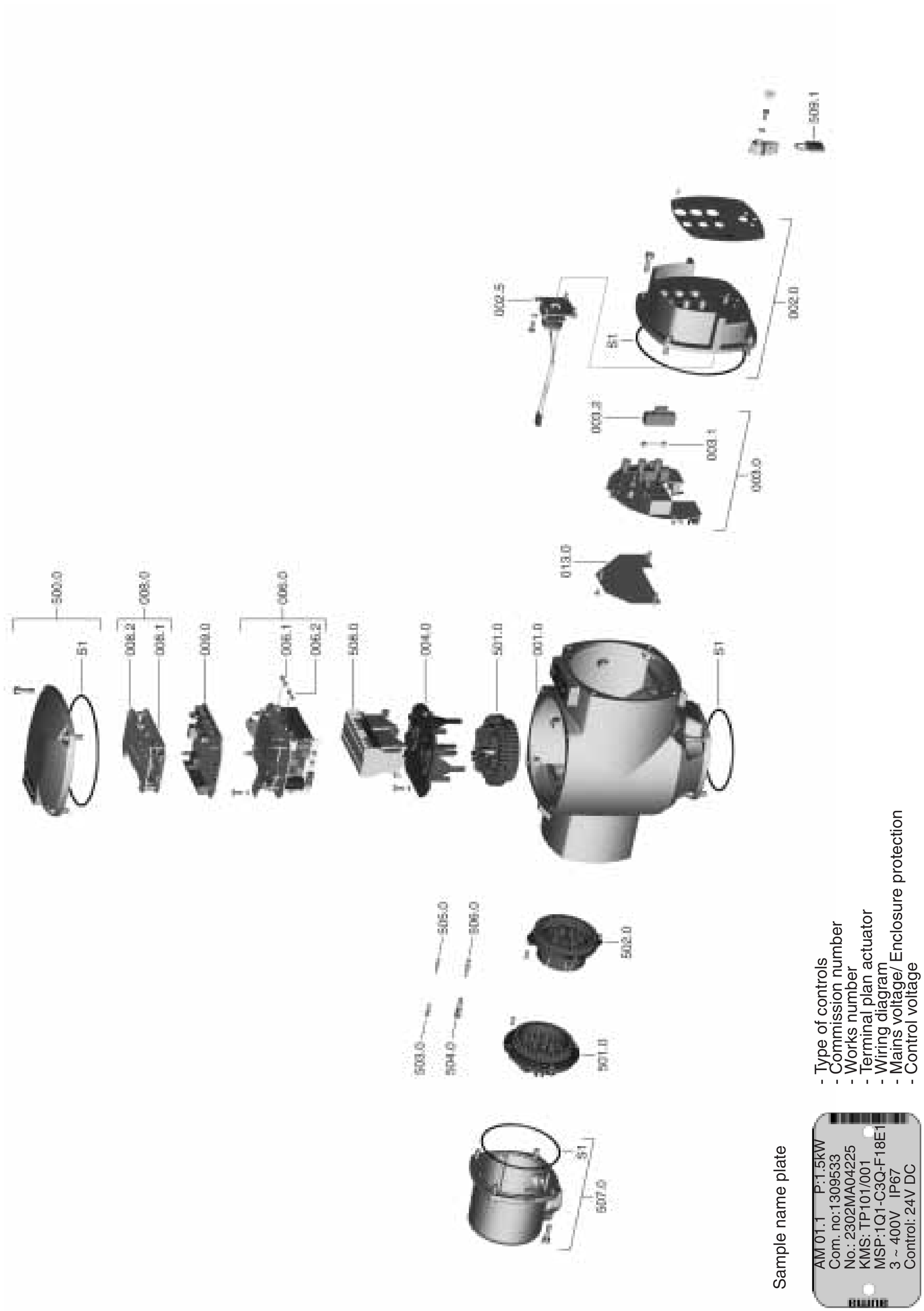


Note:
Please state type and commission no. of the device (see name plate) when ordering spare parts. Only original AUMA spare parts should be used. Failure to use original spare parts voids the warranty and exempts AUMA from any liability. Delivered spare parts may slightly vary from the representation.

No.	Designation	Type
001.0	Housing	Sub-assembly
002.0	Bearing flange	Sub-assembly
003.0	Hollow shaft without worm wheel	Sub-assembly
005.0	Worm shaft	Sub-assembly
005.1	Motor coupling	
005.2	Coupling pin	
005.3	Manual drive coupling	
005.4	Pull rod	
006.0	Worm wheeel	
009.0	Planetary gear for manual drive	Sub-assembly
010.0	Retaining flange	Sub-assembly
017.0	Troque lever	Sub-assembly
018.0	Gear segment	
019.0	Crown wheel	Sub-assembly
020.0	Swing lever	Sub-assembly
022.0	Drive pinion II for torque switching	Sub-assembly
023.0	Output drive wheel for limit switching	Sub-assembly
024.0	Intermediate wheel for limit switching	Sub-assembly
025.0	Locking plate	Sub-assembly
058.0	Wire for protective earth (pin)	Sub-assembly
061.0	Torque switching head	Sub-assembly
070.0	Motor (VD motor incl. no. 079.0)	Sub-assembly
079.0	Planetary gear for motor drive (SA/SAR) 07.1 – 14.1 for VD motor)	Sub-assembly
080.0	Planetary gear for motor drive (SA/SAR 16.1 for AD90 motor)	Sub-assembly
155.0	Reduction gearing	Sub-assembly
500.0	Cover for switch compartment	Sub-assembly
501.0	Socket carrier (complete with sockets)	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly
503.0	Socket for controls	Sub-assembly
504.0	Socket for motor	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Plug cover	Sub-assembly
511.0	Screw plug	Sub-assembly
514.0	Output drive form A (without stem nut)	Sub-assembly
514.1	Axial needle roller bearing	Sub-assembly

No.	Designation	Type
516.1	Output drive shaft D	
535.1	Snap ring	
539.0	Screw plug	
542.0	Handwheel with ball handle	Sub-assembly
549.1	Output socket B3/B4/E	
551.1	Parallel key	
553.0	Mechanical position indicator	Sub-assembly
554.0	Socket carrier with motor cable harness	Sub-assembly
556.0	Potentiometer for position transmitter	Sub-assembly
556.1	Potentiometer without slip clutch	Sub-assembly
557.0	Heater	Sub-assembly
558.0	Blinker transmitter including pins at wires (without impulse disc and insulation plate)	Sub-assembly
559.0-1	Control unit without torque heads swit-ching and switches	Sub-assembly
559.0-2	control unit with magnetic limit and torque transmitter (MWG) for Non-intrusive versi-on in combination with AUMATIC integral controls	Sub-assembly
560.0-1	Switch stack for direction OPEN	
560.0-2	Switch stack for direction CLOSE	Sub-assembly
560.1	Switch for limit/torque switching	
560.2	Switch case	
566.0	Positioner transmitter RWG	Sub-assembly
566.1	Potentiometer for RWG without slip clutch	Sub-assembly
566.2	Electronic board RWG	Sub-assembly
566.3	Wire harness for RWG	Sub-assembly
567.1	Slip clutch for potentiometer/RWG	Sub-assembly
568.1	Stem protection tube (without cap)	
568.2	Cap for stem protection tube	
568.3	V-seal	
569.0	Change-over lever assy	
569.1	Change-over lever	
569.2	Notched pin	
574.1	Radial seal output drive A for ISO flange	
575.1	Stem nut type A	
S1	Seal kit, small	Set
S2	Seal kit, large	Set

30. Spare parts list controls AUMA MATIC



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

No.	Designation	Type
001.0	Housing	
002.0	Local controls	Sub-assembly
002.5	Selector switch	Sub-assembly
003.0	Local controls board	Sub-assembly
003.1	Primary fuse	
003.2	Fuse cover	
004.0	Carrier for contactors	
006.0	Power supply including mounting plate	Sub-assembly
006.1	Mounting plate for power supply	Sub-assembly
006.2	Power supply	
006.2-1	Secondary fuse F3	
006.2-2	Secondary fuse F4	
008.0	Interface board	Sub-assembly
008.1	Interface board	
008.2	Cover plate for interface board	
009.0	Logic board	Sub-assembly
013.0	Adapter board	Sub-assembly
500.0	Cover	Sub-assembly
501.0	Socket carrier (complete with sockets)	Sub-assembly
502.0	Pin carrier without pins	Sub-assembly
503.0	Socket for controls	Sub-assembly
504.0	Socket for motor	Sub-assembly
505.0	Pin for controls	Sub-assembly
506.0	Pin for motor	Sub-assembly
507.0	Plug cover	Sub-assembly
508.0	Motor power board	Sub-assembly
509.0	Padlock	
S1	Seal kit	Set

Index

A
Ambient temperature 8

B
Blinker transmitter 35

C
Collective fault signal 34,35
Command signal 37,39,40
Corrosion protection 10,56
Cross sections 18
Current consumption 6,15

D
Direction of rotation 26
Disconnect switches 15
Disposal and recycling 56
DUO limit switching 24

E
Electrical connection 15
Electronic position transmitter RWG 30
  2-wire system 31
  3-/ 4-wire system 32
EMERGENCY signal 36
Enclosure protection IP 68 55

F
Finish machining of the stem nut 13
Fuses 52

H
Handwheel 19
Heater 15

I
Indicator disc 22,33
Interface board 34
Internet 5
Inverse operation 45,46

L
Limit switching 23,24,27
Local controls 27
Logic board 35
Loss of signal 40
Lubrication 56

M
Mains frequency 6
Maintenance 4
Manual operation 19
Mechanical position indicator 33
Motor protection 54
Mounting positions of the local controls 14
Mounting to valve/ gearbox 12

N
Name plate 61

O
Output drive types 12
Overvoltage category 6

P
Packaging 10
Pause time 37,51
Position indicator 33
Position transmitter RWG 15,30
Positioner 37
Potentiometer 29
Power supply 6
Protection tube 13
Protective earth 18
PTC thermistors 54
PTC tripping device 27
Push-to-run operation 21,35

R
Rate power 6
Remote indication 29,30
RESET (Selector switch position) 27
Running time 37,51

S
Safety instructions 4
Selector switch 27
Self-retaining 21,35
Sensitivity 43
Service 57
Short description 5
Short-circuit protection 15
Signals 9
Spare parts list 59
  Multi-turn actuator 59
  Controls 61
Split Range Version 47
Stepping mode
  Operating time 49
  Pause time 51
Storage 10

T
Technical data 6
TEST (Selector switch position) 27
Test run 26
Thermoswitches 54
Timer 49
Torque setting 25
Transport 10
Tripping torque 25
Type of duty 6
Type of seating 35

W
Wall bracket 16

auma®

Solutions for a world in motion

North American Sales and Service:

US Headquarters and Factory:
AUMA Actuators, Inc.
100 Southpointe Blvd.
Canonsburg PA 15317
Tel: 724-743-AUMA (2862)
Fax: 724-743-4711
email: mailbox@auma-usa.com
www.auma-usa.com

Regional Offices:
Northeast (Maryland and New York)
Southeast (South Carolina)
Midwest (Illinois)
Midwest (Kansas)
Houston (Texas)
West Coast (Northern and Southern California)

Representatives and Distributors
Anchorage
Atlanta
Baltimore
Baton Rouge
Birmingham
Boston
Charlotte
Chicago
Cincinnati
Corpus Christi
Dallas
Denver
Detroit
Hawaii
Houston
Indianapolis
Kansas City
Los Angeles
Mexicali (Mexico)
Mexico City
Milwaukee
Minneapolis
Montana
Monterrey (Mexico)
New York
Omaha
Orlando
Philadelphia
Phoenix
Pittsburgh
Rochester
Salt Lake City
San Diego
San Francisco
San Juan
Seattle
St. Louis
Toronto
Tulsa

International Headquarters:
AUMA Riester GmbH & Co. KG
Muellheim/ Germany
www.auma.com

International Sales and Service:

South America:
Argentina
Brazil
Chile
Colombia
Peru
Venezuela

Europe:
Austria
Benelux
Czech Republic
Denmark
Finland
France
Greece
Hungary
Italy
Norway
Poland
Portugal
Russia
Spain
Sweden
Switzerland
Turkey
Ukraine
United Kingdom

Africa
Egypt
South Africa

Asia, Australia
Australia
China
Hong Kong
India
Japan
Korea
Kuwait
Oman
Qatar
Singapore
Taiwan
Thailand
UAE

For the name and phone number of the office nearest you, call us at 724-743-2862 or visit our website at www.auma-usa.com/saleserv.htm

2005-06-27

Y000.176/047/us/1.08