

# **auma<sup>®</sup>**

## **OPERATION INSTRUCTIONS**

### **MODEL SG 05.1 – SG 12.1**

### **Quarter-Turn Actuators**

# **auma<sup>®</sup>**

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## 1. EQUIPMENT DESCRIPTION

AUMA quarter-turn actuators are high quality electro-mechanical devices. The AUMA Model SG is a quarter turn electric actuator, designed in accordance with AWWA Standards. Four sizes are available:

<b>Model</b>	<b>Output Torque Range (Ft.-Lbs.)</b>
SG 05.1	66-110
SG 07.1	88-220
SG 10.1	220-440
SG 12.1	440-880

The power train consists of a single phase or three phase motor, driving through a three-stage planetary gear set to a worm gear unit, through a splined coupling to the valve stem.

Electrical connections are made either directly to an electrical plug and socket, or a terminal strip in an integrally mounted NEMA 4 enclosure. Always refer to the proper electrical diagram before wiring.

The convention of “clockwise-to-close” has been used throughout this manual. A “clockwise-to-open” valve or damper configuration represents a reversal of limit switch and torque switch position. When setting the limit and torque switches, note on the cover plate that the *black* area represents *open* and the *white* area represents *closed*.

<b>SG Unit</b>	<b>Approximate Weight</b>
SG 05.1	42 lbs.
SG 07.1	42 lbs.
SG 10.1	55 lbs.
SG 12.1	64 lbs.

## 2. TRANSPORTATION

Possible damage can be avoided by observing the following items.

- Transport to place of installation in sturdy packing.
- Do not lift the actuator by the handwheel.
- Store in well ventilated, dry room.
- Protect against humidity from the floor by storing on a shelf or on a wooden frame.
- Cover to protect against dust and dirt.
- Apply corrosion protection agent to machined surfaces.

### 3. SERVICE CONDITIONS

AUMA quarter-turn actuators can be used at following ambient conditions:

Model	Temperature
SG 05.1 – 12.1 1-Phase	-20°F to +160°F
SG 05.1 – 12.1 3-Phase	-20°F to +175°F

For other conditions, consult factory.

### 4. MOUNTING TO THE VALVE/GEARBOX

Mounting and operation can be in any position.

- Check whether output drive flange suits the valve/gearbox.
- Check whether bore and keyway correspond with the input shaft of the valve or gearbox.
- Degrease mounting surfaces at actuator and valve/gearbox thoroughly.
- Apply lubricant to input shaft of the valve/gearbox.
- Install splined coupling on valve shaft.

**NOTE:** Fix or support coupling to maintain engagement with actuator.

- Place actuator on the splined coupling and use bolts with a minimum quality of SAE Grade 5 to fasten. Tighten diagonally.

### 5. MANUAL OPERATION

The SG handwheel uses an anti-rotation locking system.

- To release, pull the handwheel away from the actuator approximately ¼”.

**CAUTION:** Damage to the locking system may occur if handwheel is not released prior to operating.

- Rotate handwheel as required. Each time the handwheel is used, it must be disengaged.
- Release handwheel when finished. It will re-latch automatically.

Approximate number of handwheel turns between open and closed (or 90° of travel):

<b>Model</b>	<b>No. of Turns</b>
SG 05.1	58
SG 07.1	58
SG 10.1	107
SG 12.1	110

## **6. ELECTRICAL CONNECTIONS**

**CAUTION:** Observe safety regulations. Check whether the power supply (voltage, phase and frequency) complies with the motor nameplate.

### **Terminal Access**

- Take off the terminal compartment cover.
- Loosen cheese head screws inside the cover and remove multi- socket carrier.
- Attach conduit to terminal compartment cover.

**CAUTION:** Appropriate conduit and sealing methods must be followed to ensure the type of enclosure furnished.

### **Wiring Connections** - *Refer to drawing inside terminal compartment cover*

**NOTE:** The drawing contains the required information for correct actuator electrical connection. Typical customer controls are also shown.

- Connect motor wires to the designated terminals. Connect ground to designated terminal.
- Connect control wires to designated terminals in accordance with drawing.

**CAUTION:** The following must be considered when wiring an AUMA actuator:

- ◆ The time delay (i.e., from limit or torque switch tripping until the motor is switched off) should not exceed 20 ms. We strongly recommend switching off the motor directly by installing the corresponding switches in the control wiring to the contactor. This concern is especially important when using PLC's. Switch output to a PLC should be for indication only.
- ◆ Each switch has contacts which are not completely isolated and therefore are suitable only for the same voltage potential. (See drawing for detailed information.)
- ◆ The valve manufacturer decides whether switching off in the end position should be by limit switch (limit seating) or torque switch (torque seating).

- ◆ AUMA motors have thermostiches as standard equipment. These switches must be directly wired into the control circuit to protect the motor. If these are not connected, the warranty for the motor is not valid.

## Completion of Electrical Connection

- Clean the sealing faces at plug or cover for terminal compartment, check to ensure that the O-ring is not damaged.
- Apply a thin film of non-acid grease (e.g., Vaseline) to sealing faces.
- Place cover and fasten the 4 bolts. Tighten diagonally.

## 7. TEST RUN

Remove cover to the control unit compartment (3.7) and, if provided, the MDPI disc (1.55).

- Bring the valve manually to an intermediate position.
- Check phase rotation.
- Run the actuator briefly in the open direction. If the direction of rotation is incorrect, switch off immediately and rewire motor connections U1 and W1.
- The red test knobs on the control unit provide a way to manually operate the limit and torque switches.

While running the actuator in the open direction, turn the red test knob OPEN toward the DOL arrow.

- ◆ If the motor stops, the control circuit is correct.
- ◆ If the motor does not stop, turn off the motor power immediately. Check control circuit and correct wiring.

## Operating Direction for Test Knobs

	Torque Switch	Limit Switch
open	DOL Arrow	WOL Arrow
close	DSR Arrow	WSR Arrow

- Determine overrun in both directions (overrun is turns/travel from switching off until the actuator movement stops).

## 8. SETTING OF LIMIT SWITCHING

### Setting the Closed Limit Switch (LSC)

To set limit switch LSC, refer to Figures 1 and 2, and complete the setting instructions below.

**NOTE:** If the SG is not mounted to a valve when received, stop housing retainer plate bolts (03) are loose. Stops must be set and bolts tightened prior to limit switch setting.

**NOTE:** If the mechanical stop was previously set at the valve manufacturer, it is not required to loosen the stop assembly to reset the limit switches. The mechanical stops must be loosened only if the actuator must run beyond the previous stop setting.

**CAUTION:** DISCONNECT ELECTRICAL POWER FROM THE ACTUATOR BEFORE PROCEEDING.

- Loosen the four (4) cover bolts, and remove the control cover.

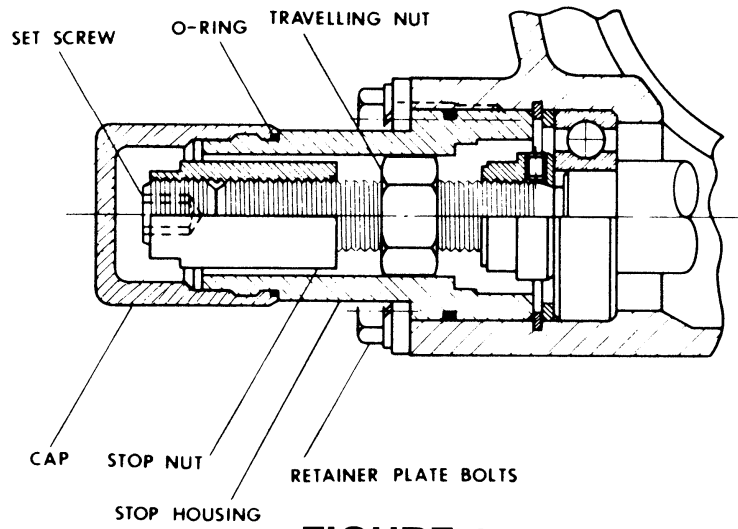
Remove the indicator disc, pulling upwards, to expose the cover plate (refer to Figure 2). The black side of the cover plate provides adjustment for the closed-clockwise (CW) limit switch LSC.

- From the closed position, rotate the handwheel counter-clockwise to locate the valve in a mid-position.
- Rotate the handwheel clockwise, until the valve is seated or previous mechanical stop setting is reached, and back-off (counter-clockwise) four (4) full turns.
- Press down and turn spindle (A) in direction of the arrow. A ratchet will be felt and heard, the pointer (B) turns for every 90 degrees.

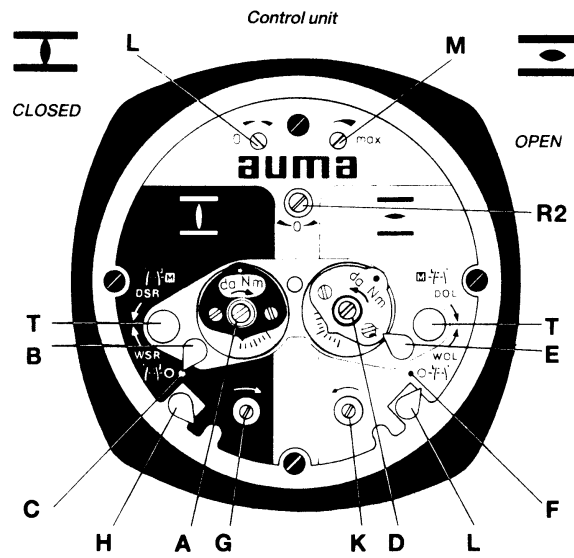
**CAUTION:** DAMAGE MAY RESULT TO THE COUNTER GEAR MECHANISM IF THE SLOTTED SHAFT IS NOT PUSHED DOWN WHILE TURNING TO ADJUST THE LIMIT SWITCH.

When pointer moves towards point (C), the spindle should not be turned any further. If the spindle has been turned beyond that point inadvertently, continue turning and approach the setting point again.

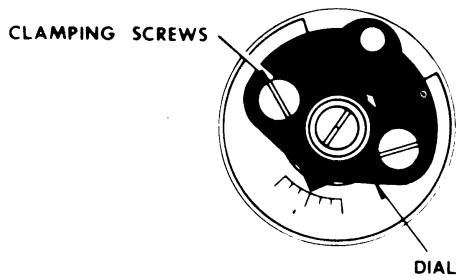
**CAUTION:** Make sure that spindle (A) springs up to its original position.



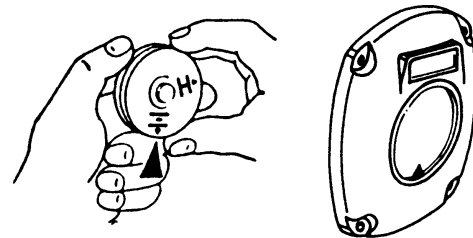
**FIGURE 1**



**FIGURE 2**



**FIGURE 3**



**FIGURE 4**

**NOTE:** Distinct “clicks” will be heard and felt while turning the slotted shaft. When the pointer points toward the *switch tripped* indicator, no additional clicks should be felt or heard. If additional clicks are heard or felt, the setting instructions (above) must be repeated.

- The limit switch is now properly set. Release the slotted shaft (to re-engage the counter gearing) by removing the screwdriver blade. Ensure that the shaft returns to the previous upright position.

## Setting The Open Limit Switch (LSO)

To set limit switch LSO, refer to Figure 2, and complete the following setting instructions:

**CAUTION:** DISCONNECT ELECTRICAL POWER TO THE ACTUATOR BEFORE PROCEEDING.

- Disengage and rotate the handwheel counter-clockwise, until resistance from the mechanical stop is felt, and back-off (clockwise) five (5) full turns.

**NOTE:** The white side of the cover plate provides adjustment for the open-counter-clockwise (CCW) limit switch LSO.

- Repeat the setting procedure as described for the closed position using Spindle D, Pointer E and Point F.

## 9. SETTING MECHANICAL STOPS

### Setting the Closed End Stop

- Loosen the retainer plate bolts (03) at the stop housing, at least two (2) full turns only if stop is to be reset (refer to Figure 1).

**NOTE:** Do not rotate the handwheel from the closed position, or otherwise disturb the LSC setting.

- With LSC set, and/or the valve seated, rotate the stop housing clockwise, until resistance is felt, and back-off (counter-clockwise) 1/8 turn (refer to Figure 1).
- Retighten the retainer plate bolts.

### Setting the Open End Stop

**CAUTION:** OPEN END STOP ADJUSTMENT IS NOT REQUIRED IF VALVE STROKE IS 90°. THE OPEN END STOP IS FACTORY SET, AND SHOULD NOT NEED ADJUSTMENT.

AUMA SG Actuators may be set for 80° to 110° of rotation, by repositioning the open end stop.

To adjust the open end stop, refer to Figure 1, and complete the following instructions:

- Rotate the handwheel to locate the valve in a mid-position.

- Remove the cap, place a 3/4" open-end wrench on the flats of the stop nut, and insert a 5/16" allen wrench into the set screw. While holding the open-end wrench steady on the stop nut, loosen the set screw.

**CAUTION:** DO NOT BREAK THE SET SCREW LOOSE BY STRIKING THE ALLEN WRENCH. DAMAGE MAY RESULT.

- Rotate the handwheel, as required, counter-clockwise, until the valve reaches the open (CCW) position desired.
- Rotate the stop nut counter-clockwise to increase, or clockwise to decrease valve stroke as required.
- Once the new open (CCW) stop position is reached, rotate the stop nut clockwise, until it contacts the traveling nut; then back off ¼ turn.
- Retighten the set screw to 75 ft-lbs., while holding the open-end wrench steady on the flats of the stop nut.
- Inspect the cap o-ring (replace if damaged), apply a thin coat of a non-acid grease, and re-install the cap onto the stop housing.
- Set Open Limit Switch per instructions above.

## 10. SETTING TORQUE SWITCHES

- Loosen the clamping screws and rotate the dial, until the torque value desired coincides with the pointer, and retighten the clamping screws (refer to Figure 3).


**NOTE:** Dial readings correspond to the following torque values:

Model	Dial Reading	Ft-lbs.
SG 05.1	9 - 15	66 - 110
SG 07.1	12 - 30	88 - 220
SG 10.1	30 - 60	220-440
SG 12.1	60 - 120	440-880

## 11. SETTING OF MECHANICAL DIAL POSITION INDICATOR (Figure 4)

The indicator disc rotates approximately 180 degrees at full travel from OPEN to CLOSE or vice versa.

- Run actuator to the CLOSED end position.
- Turn dial  $\mp$  CLOSED until the arrow is in alignment with the mark on the indicator glass.
- Run Actuator to the OPEN end position.

- Turn dial  OPEN while holding the other dial in position until the arrow is in alignment with the mark.

## 12. SINGLE-PHASE MOTOR SPEED ADJUSTMENT

The SG single-phase actuator operating time is field-adjustable.

- To access the speed adjustment, remove the cap from the end of the motor housing using the 15/16" (24mm) hex provided.
- Turn adjusting pot counter-clockwise to increase closing time. Clockwise decreases closing time.

Inspect the o-ring on cover and replace if required.

- Apply a light coating of non-acid grease to o-ring and threads on cover.
- Install the cover and tighten.

## 13. OPTIONAL EQUIPMENT

AUMA SG Actuators equipped with four gear train limit switches, LSA and LSB, may be set for valve mid-position control signaling.

LSA may be set to trip at a selected valve position as the actuator is operated in the closing (CW) direction.

LSB may be set to trip at a selected valve position as the actuator is operated in the opening (CCW) direction.

To set LSA and LSB, refer to Figure 2, and complete the following setting instructions:

### Setting Limit Switch LSA

**CAUTION:** DISCONNECT ELECTRICAL POWER TO THE ACTUATOR BEFORE PROCEEDING.

- Rotate the handwheel to locate the valve in a mid-position.
- Rotate the handwheel clockwise to position the valve at the desired LSA tripping point, and back-off (counter-clockwise) four (4) full turns.
- Apply the setting instructions as outlined in Section 8 to set limit switch LSA using Spindle G, Pointer H and Point C.

**NOTE:** The black side of the cover plate provides adjustment for limit switch LSA.

## Setting Limit Switch LSB

- Rotate the handwheel to locate the valve in a mid-position.
- Rotate the handwheel counter-clockwise to position the valve at the desired LSB tripping point, and back-off (clockwise) four (4) full turns.
- Apply the setting instructions as outlined in Section 7 to set limit switch LSB using Spindle K, Pointer L and Point F.

**NOTE:** The white side of the cover plate provides adjustment for limit switch LSB.

## Potentiometer Zero Adjustment

- Operate the actuator to locate the valve in the fully closed position.
- Using a 3/16" screwdriver blade, gently rotate the potentiometer shaft R2 counter-clockwise, until resistance is felt. The potentiometer is now set at zero, in the closed position (refer to Figure 2).

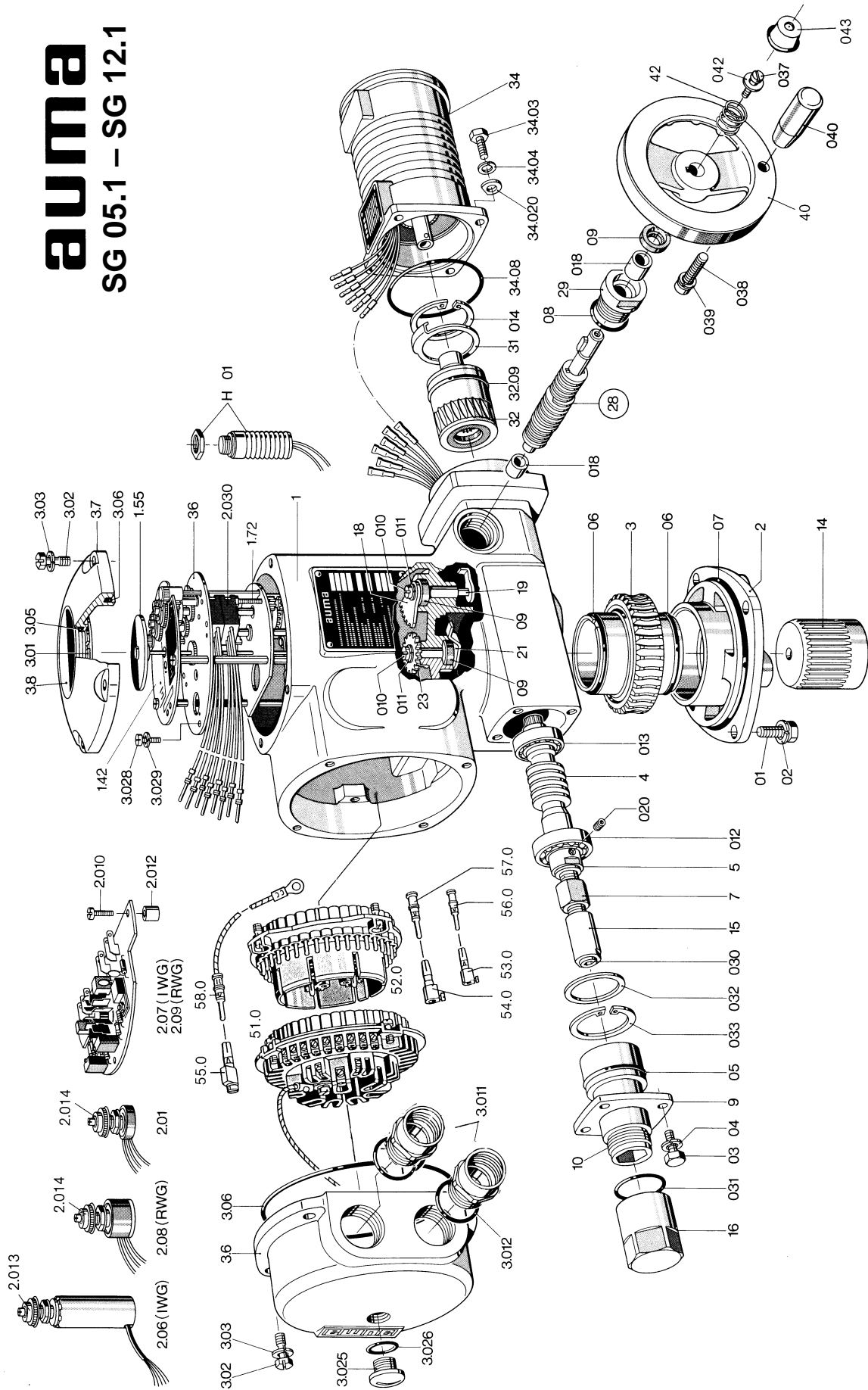
**NOTE:** For clockwise-to-open applications, rotate potentiometer shaft clockwise.

## Current Transmitter Adjustment

- Adjustments to the current transmitter zero, and maximum are made, as required, by using a 1/8" screwdriver blade to rotate the "0" and "max." shafts (refer to Figure 2).

# auma

## SG 05.1 – SG 12.1



**When placing your order for parts, please state model number and S. O. number (refer to name plate).  
Part numbers written in brackets will be supplied as an assembly only.**

Part No.	Designation	Part No.	Designation
1	Housing	020	Set screw
2	Mounting flange	030	Set screw
3	Worm wheel	031	O-ring (cap)
4	Worm shaft	032	Spacer
5	Bearing lock-nut	033	Circlip
7	Travelling nut	037	Screw
9	Retainer plate	038	Allen head cap screw
10	Stop housing	039	Lock washer
14	Coupling	040	Handle
15	Stop nut	042	Washer
16	Cap	043	Cap
18	Torque switch segment gear	1.42	Cover plate
19	Torque drive lever	1.55	Indicator disc
21	Limit drive lever	1.72	Stud bolt
23	Limit drive gear	2.01*	Potentiometer (state resistance required)
(28)	Handwheel worm assembly	2.06*	Transducer — IWG (LVDT)
29	Handwheel drive retainer	2.07*	Electronic board for LVDT
31	Insulation guard	2.08*	Transducer — RWG (mylar pot.)
32	Planetary gearing	2.09*	Electronic board for RWG
	Key (handwheel shaft)	2.010*	Screw
34	Motor (Nameplate information required)	2.012*	Spacer
(36)	Control unit assembly	2.013	Slip clutch for IWG (LVDT)
40	Handwheel	2.014	Slip clutch for potentiometer/RWG (mylar pot)
42	Compression spring	2.030	Limit switch (state 4 or 8 wire)
51.0	Socket carrier (complete with sockets)	2.0301	Torque switch
52.0	Pin carrier (without pins)	3.6	Plug cover
53.0	Socket for control pin	3.7	Control cover
54.0	Socket for motor pin	3.8	Indicator glass
55.0	Socket for ground pin	3.01	Snap ring
56.0	Control pin	3.02	Captive hex. head bolt
57.0	Motor pin	3.03	Lock washer
58.0	Ground pin with wire and terminal	3.05	O-ring (indicator glass)
01	Hexhead bolt	3.06	O-ring (control cover/plug cover)
02	Lock washer	3.011	Conduit entry adaptor (¾ in. NPT)
03	Hexhead bolt	3.012	O-ring (conduit entry)
04	Lock washer	3.025	Plug
05	O-ring (stop housing)	3.026	O-ring (plug)
06	O-ring (worm wheel)	3.028	Screw
07	O-ring (mounting flange)	3.029	Lock washer
08	O-ring (handwheel retainer)	32.09	O-ring (planetary gearing)
09	Grease seal (handwheel shaft, TS drive, LS drive)	34.03	Hex head bolt
010	Screw	34.04	Lock washer
011	Lock washer	34.08	O-ring (motor)
012	Ball bearing	34.020	Washer
013	Ball bearing	H 01	Space heater
014	Circlip		
018	Bushing		
			* Optional Equipment

## 14. STORAGE

The following are short-term storage instructions (Less than 12 Months):

- Actuators should be stored in a clean, dry, protected environment, free from excessive vibration and rapid temperature changes. If actuators must be stored outdoors, they must be stored high enough off the ground to prevent being immersed in water or buried in snow.
- All covers must remain in place and retaining bolts tightened.
- Conduit entries must be sealed with threaded metal plugs.
- O-ring seals must remain intact and undisturbed.
- Desiccant should be placed in the limit switch compartment and the control compartment, if supplied, and replaced as necessary according to the desiccant manufacturer's instructions. Desiccant is not supplied with the actuator as shipped unless prior arrangements have been made.
- The actuators must be covered with an unsealed dust cover with breather holes to allow air to move around the actuator.
- Failure to comply with recommended storage will void warranty.
- For long-term storage (more than 12 months), consult the factory.

## 15. TROUBLESHOOTING GUIDE

- Symptom:** Valve does not turn during manual or electrical operation (handwheel hard to turn).  
**Problem:** Traveling nut jammed against an end stop.  
**Solution:** Remove the retainer plate bolts, and the stop housing (refer to Figure 1). Using a 15/16" off-set box wrench on the traveling nut, and a 3/4" open-end wrench on the stop nut, loosen the traveling nut.  
**CAUTION:** DO NOT LOOSEN THE STOP NUT.
- Symptom:** Valve does not open fully.  
**Problem:** Open end stop not properly positioned.  
**Solution:** Set the open end stop (refer to Section 9).
- Symptom:** Indicator disc not operating.  
**Problem:** Indicator disc assembled against control cover.  
**Solution:** Loosen cover bolts, remove control cover, and push down to seat the indicator disc.
- Symptom:** Limit switches do not function - valve torques out at either end, and indicator disc does not operate.  
**Problem:** Limit switch drive arm broken or bent (part number 21).  
**Solution:** Contact AUMA representative.
- Symptom:** Valve will not turn with motor running, but operates manually.  
**Problem:** Damaged planetary gear set.  
**Solution:** Contact AUMA representative.
- Symptom:** Indicator light is not illuminated when motor stops at an end position.  
**Problem:** Defective light bulb.  
**Solution:** Replace bulb.
- Symptom:** Indicator light is not illuminated when motor stops at an end position.  
**Problem:** Actuator is stopping on torque switch.  
**Solution:** Reset and retest limit switch, as described in Sections 7 and 8.
- Symptom:** Indicator light is not illuminated when motor stops at an end position.  
**Problem:** Limit switch LSC and/or LSO wires reversed in actuator.  
**Solution:** LSC - interchange wires 9 & 10 with 33 & 34; 11 & 12 with 35 & 36.  
LSO - interchange wires 13 & 14 with 37 & 38; 15 & 16 with 39 & 40.

For professional start-up and reliable service in the field, AUMA has factory specialists for:

- Shipping of original spare parts
- Commissioning
- Maintenance/repair
- Trouble-shooting assistance

Before calling for our support, please have the following information

1) For Parts:

- Original S.O. Number or Serial Number of Actuator (on name tag)
- Part Number (on exploded view)

2) For Service:

- Original S.O. Number or Serial Number of Actuator
- Brief Description of Problem

Contacts:

- Factory: AUMA Actuators, Inc.  
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Web site: www.auma-usa.com

This operation instruction has been prepared to the best of our knowledge in order to inform our customers. It is the result of our practical experience and extensive testing.

Our quarter-turn actuators were designed principally for the operation of valves. Before using them for other purposes, we recommend checking whether our products perform the functions desired. Further knowledge about their suitability may be obtained by testing. We are prepared to assist in the performance of these tests.

For special applications please consult the factory.

When using our quarter-turn actuators for applications not intended by us, we cannot be held responsible. Necessary precautions to prevent injury to persons or damage to materials are the sole responsibility of the user.

*All information is subject to change without notice.*