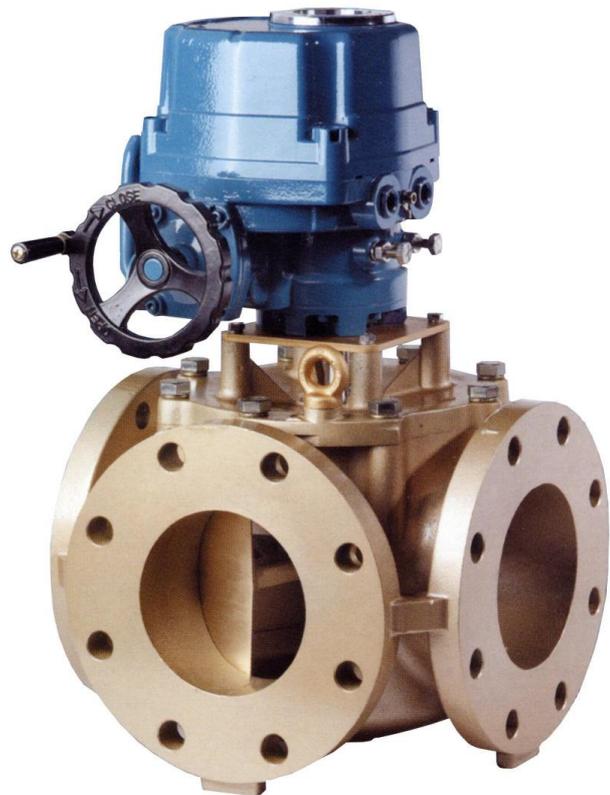




G-Valve

EA Actuator Addendum



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Section 1

Introduction

1.1 Scope

This Manual is an addendum to the GG Valve with EB type Actuator operation and maintenance manual. It provides operation and maintenance details for the EA type actuator.

For full details of the GG Valve body itself, including operation and maintenance instructions, consult the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve.

1.2 Safety

Certain operations within this manual are potentially hazardous and could cause injury to personnel or damage to equipment if the instructions are not carried exactly as described. Where a significant, potential hazard exists, the following text appears immediately before steps in the procedure that present a particular hazard:

WARNING

A Warning identifies a hazard that could cause injury to personnel. The text of the warning describes the hazard and details the precautions that must be applied before the next step of the procedure is carried out.

CAUTION

A Caution identifies a hazard that could cause damage to equipment. The text of the caution describes the hazard and details the precautions that must be applied before the next step of the procedure is carried out.

Note

A Note contains supplementary information that may be useful to the Operator before the next step of the procedure is carried out.

1.3 Maintenance

Maintenance of the actuator should only be carried out by suitably trained and competent persons, and only after they have read and understood all applicable sections of this addendum. Failure to observe this may result in damage to equipment or to injury of personnel.

1.4 Product Support

All necessary settings and, where appropriate, alterations inside the equipment are described in this Operating Manual. If any difficulties arise during start-up, you are asked not to carry out any unauthorised actions on the unit. You could endanger your rights under the equipment warranty.

For spares and service support, call the telephone number listed on the back cover of this Manual.

1.5 Typographical Conventions

Footnotes

Where space in the text or figures to place a note is restricted, a footnote is used. They consist of two parts:

- A mark indicating which part of the text or figure is affected by the note. This takes the form of a superscript number e.g. Abc ¹.
- A note in smaller font at the bottom of the affected page beginning with the corresponding number in the text (see bottom of page):

1.6 European Union Directives

A GG Valve fitted with EA type Actuator complies with the same Directives as the GG Valve fitted with EB type Actuator. Consult the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve for full details of EU Directive compliance.

¹ This footnote applies to the part of the text or figure, marked with a superscript number 1.

Section 2

EA Type Electric Actuator

2.1 Description

2.1.1 Mechanical

The Electric Actuator is a rugged, compact and lightweight quarter-turn actuator providing enclosure protection to IP67. The actuator is powered by an electric induction motor driving a double-worm gear chain. The double-worm drive construction of the gearbox provides high reliability gearing whilst preventing fluid forces in the valve from reverse – driving the actuator. Manual override is fitted as standard, enabling valve operation without electrical power. The manual override is automatically disengaged when electrical power is re-applied, preventing risk of injury from the handwheel.

2.1.2 Electrical

The actuator contains the following electrical equipment:

- Electric motor with integral bi-metallic cut-outs which disconnect the power to the motor if the temperature exceeds 150° C and reset when the motor cools to approx. 97° C.
- End of travel micro switches disconnect power to the motor when the end of travel is reached.
- Auxiliary micro switches operate just before the end of travel to provide indication signals.
- Torque limit micro switches disconnect power to the motor if a factory set torque is exceeded.
- Anti-condensation heater.
- Terminal strip for external connections.

The internal wiring for the standard actuator is illustrated in Fig 2(page9).

The external wiring is illustrated in the system wiring diagrams of Section 3 (System Integration).

2.1.3 Versions

The actuator is available in 115V ac and 230V ac, single phase. All versions have the option of a Positioner, which is fitted to the side of the actuator (see section 0).

The internal wiring for the various options are illustrated in Fig 2 (page 9) to Fig 4 (page 11).

The external wiring is illustrated in the system wiring diagrams of Section 3 (System Integration).

2.1.4 Optional Positioner

An optional Positioner Unit is available to control the actuator from a 4-20mA input signal.



Fig 1 External Positioner

The Positioner is a versatile, micro-processor controlled unit which is fully configurable for various control functions. The configuration of the unit is detailed in section 2.4.

The main features of the Positioner are:

- Control of the actuator by an externally generated 4 – 20 mA signal.
- Actuator position indication available as 4 – 20 mA output (position re-transmission).
- Status indicator LED.
- Error voltage signal to indicate actuator status:
 - Grounded for normal operation.
 - Pulled to input voltage by open collector during fault condition.

CAUTION

**The error voltage signal must not exceed any one of the following parameters:
30V or 100mA or 200mW.**

2.1.5 Actuator Internal Wiring

There are two very similar designs of EA actuator, each available with or without a Positioner. Where there are differences, these are minor, and the actuators are described as Type 1 and Type 2.

For versions with a Positioner, versions are available with either 4-20mA position control or switched live control. The internal and suggested external wiring for each is shown in the following figures.

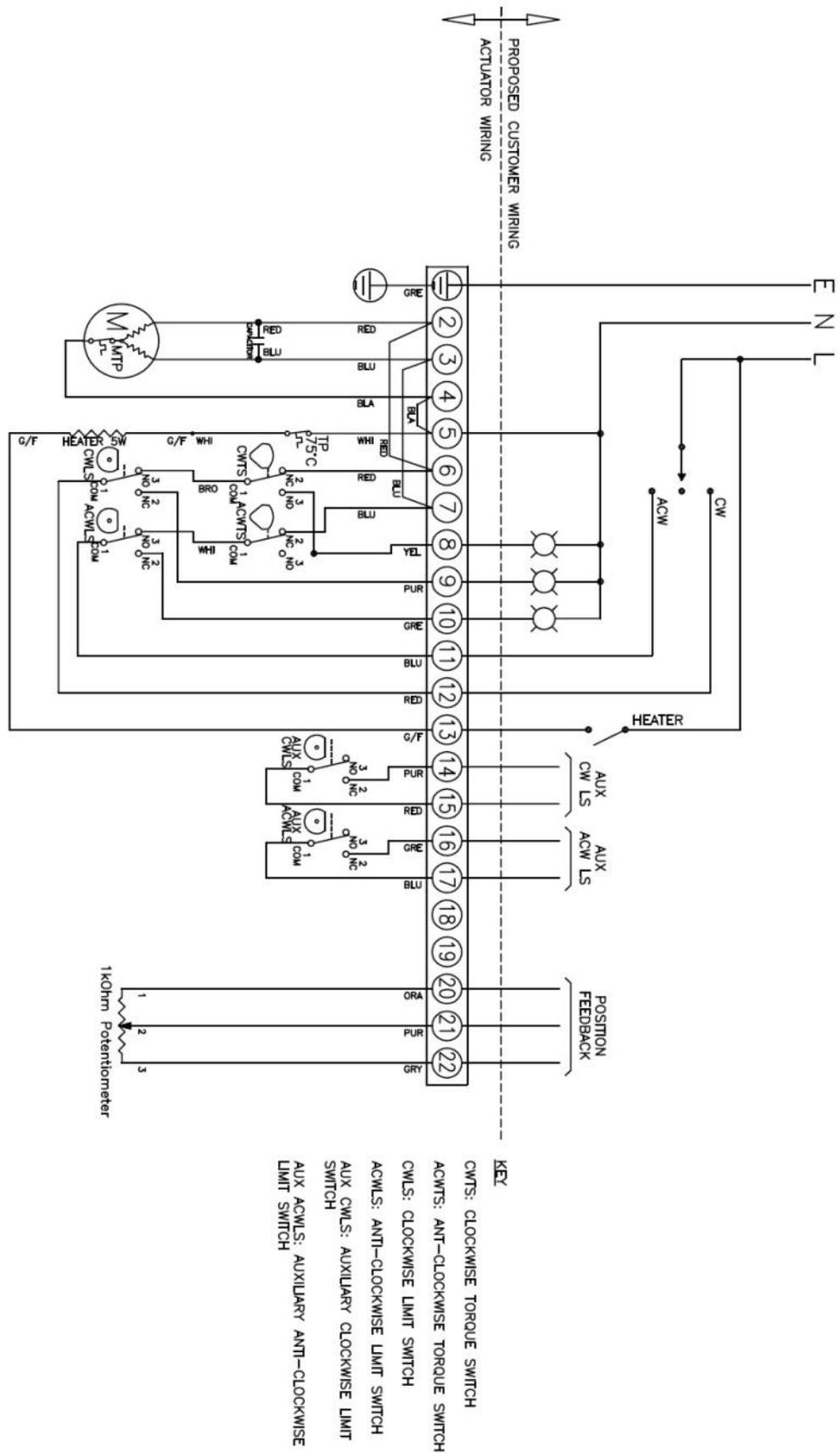


Fig 2 EA Actuator Internal Wiring – Without Positioner

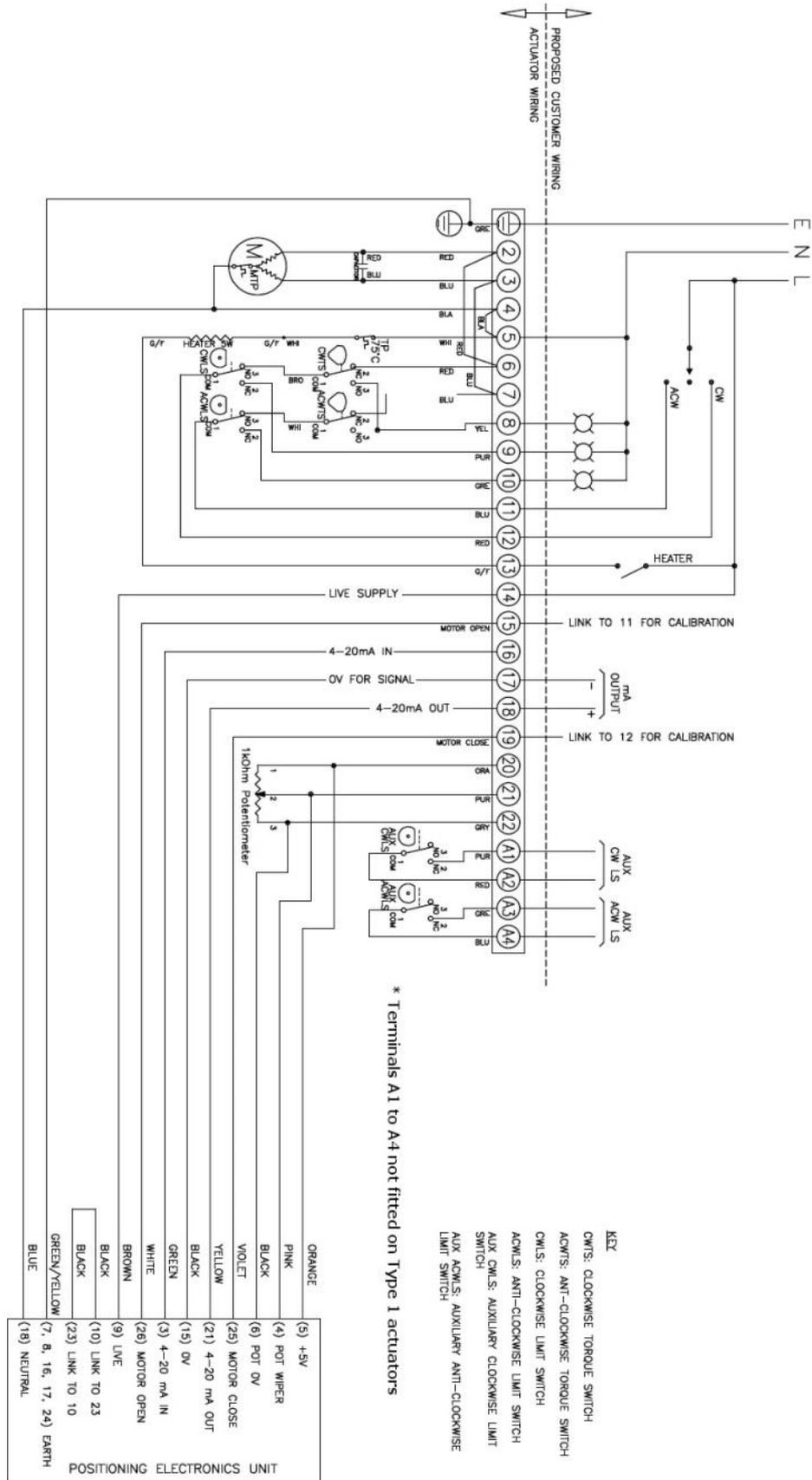


Fig 3 EA Actuator Internal Wiring – With Positioner for Switched Live Control

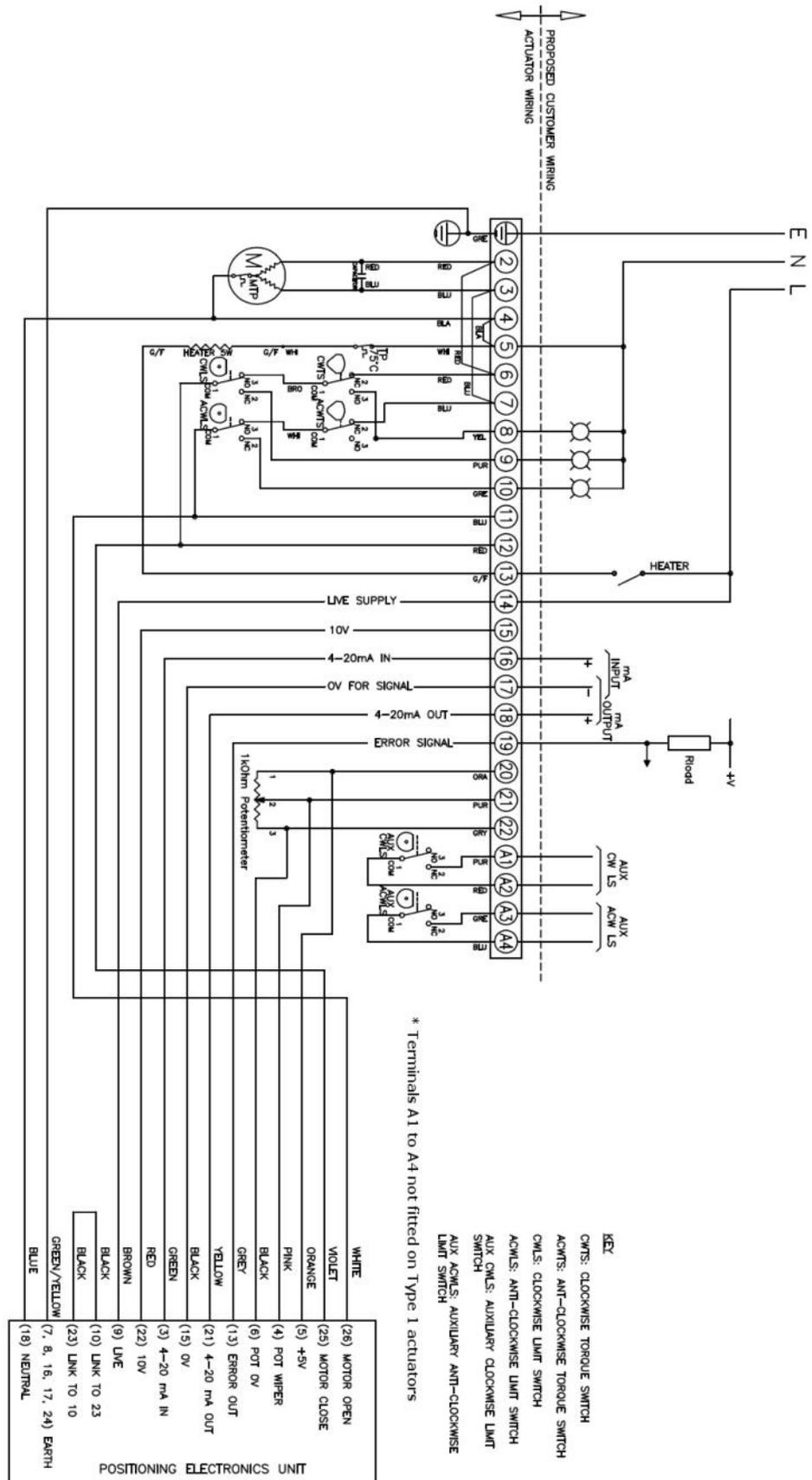


Fig 4 EA Actuator Internal Wiring – With Positioner

2.2 Identification of Model Number

	EA	100	17S	220	0	-AA
Size/Nominal Torque						
100 Nm		100				
200 Nm		200				
Shaft Connection						
17 mm square (EA 100 only)			17S			
22 mm square (EA 200 only)			22S			
Supply Voltage						
110 V ac				110		
220 V ac				220		
Features						
Standard (1 k Ω potentiometer)					0	
Standard (5 k Ω potentiometer)					1	
Direct Mode (Clockwise rotation with increasing demand current)						
4 – 20 mA electronic positioner with position re-transmission					A	
4 – 20 mA electronic positioner with demand re-transmission					B	
4 – 20 mA electronic positioner with position error output (4 mA ref)					C	
4 – 20 mA electronic positioner with position error output (12 mA ref)					D	
Reverse Mode (Anti-clockwise rotation with increasing demand current)						
4 – 20 mA electronic positioner with position re-transmission					E	
4 – 20 mA electronic positioner with demand re-transmission					F	
4 – 20 mA electronic positioner with position error output (4 mA ref)					G	
4 – 20 mA electronic positioner with position error output (12 mA ref)					H	
With electronic positioner for 4-20 mA position retransmission only					J	
As for "J" above but reverse acting					K	
Special Features (consult Manufacturer)						

2.3 Installation

The installation of the actuator to the valve body is achieved by the use of a mounting plate. It is attached to the underside of the actuator with bolts. The mounting plate, complete with actuator is then secured with bolts to the valve body.

In the case of the 2 in and 4 in valve, the mounting plate must be attached to the valve before the actuator is positioned and secured to the mounting plate.

WARNING

The actuator is heavy (EA100 – 16.6 kg and EA200 – 22 kg). The appropriate manual handling precautions must be applied to prevent personnel injury.

Mount the actuator onto the valve body in accordance with Sect 2.7.1 (page 19).

2.3.1 External Electrical Connection

The following precautions and limitations must be observed before electrical connection of the actuator.

CAUTION

Electrical power must not be supplied to both the open and close motor windings at the same time or overheating will occur. When power is applied to either the open or close windings, the other must be isolated.

If multiple actuators are controlled from the same DPDT control switch, it is possible that the first actuator to reach end of travel will reverse direction due to the supply being available from the common control switch. When several actuators need to be controlled in parallel with one 3 position control switch, each actuator must have separate contacts.

- Power supply must be free from excessive voltage transients (spikes).
- The power supply must be fused at 1.5 to 2 times the rated current.
- Check the motor nameplate and ensure the actuator voltage is correct for the local power supply.
- Use wire with the correct gauge and insulation (Follow standards prescribed by the relevant electrical regulations).
- The actuator chassis must be correctly grounded.
- Use the appropriate cable glands for weather proof or explosion proof environments.
- All unused electrical entries must be blanked off with the appropriate plug.
- Make all splices or connections using the correct pin connector of terminal strip.
- Ensure the connections comply with the system wiring diagram (Section 3).
- Control lines must be correctly shielded.
- Keep the motor compartment clean and dry at all times.
- Cable must be routed inside the actuator as illustrated in Fig 10 to avoid the possibility of interfering with moving parts.

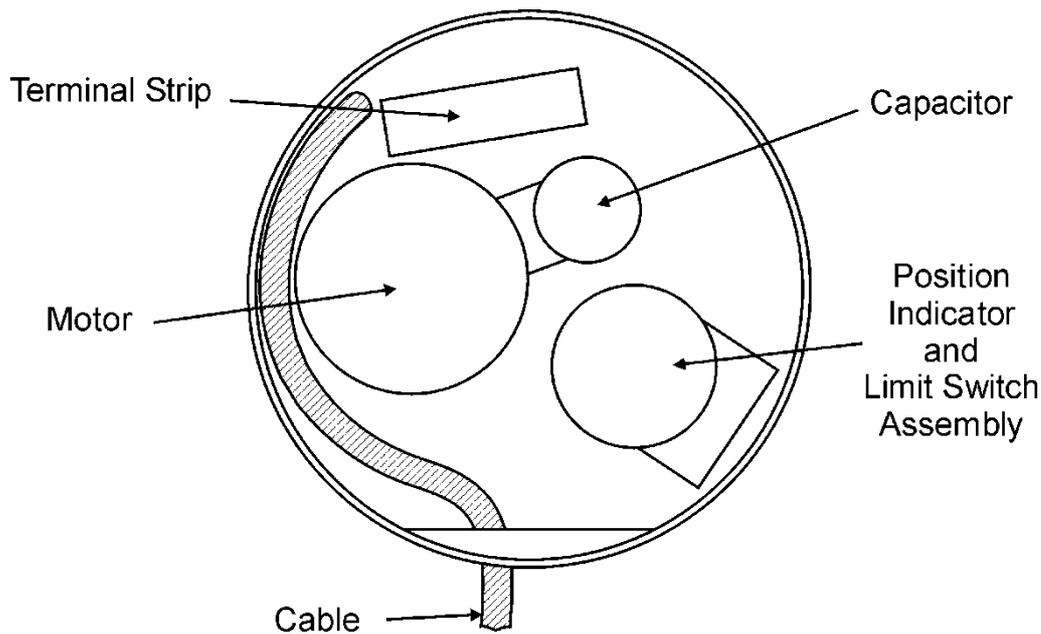


Fig 5 Actuator Internal Cable Routing

Electrically connect the actuator in accordance with the system wiring diagrams in Section 3 (System Integration). Schedule a periodic maintenance check to ensure proper performance and long service life. It is recommended that the actuator is checked for correct operation at least once per month.

Note

The terminal strip employs spring loaded connections. Apply pressure to the top of the terminal with a small, flat blade screwdriver to open the connector. Insert the wire and release the pressure on the screwdriver. The wire is then held in the connector by the spring.

2.3.2 Electrical Position Feedback

A potentiometer is fitted as standard, to all versions of the EA actuator. Where a Positioner is also fitted, the Positioner uses the potentiometer to determine the position of the actuator. With a Positioner fitted, 5V dc is applied across the track connections of the potentiometer, giving a voltage out of the wiper contact. This voltage is fed into the Positioner, but may also be used to give an external position indication, provided that the signal is not loaded significantly. An impedance to 0V of not less than 100k ohms is recommended.

When no Positioner is fitted, the three potentiometer terminals are not electrically connected to anything in the actuator, and may be used with any external circuit to give position indication.

The potentiometer is geared to the actuator output shaft such that it rotates about 270 degrees for a full quarter turn of the valve. This means that the wiper contact of the potentiometer will never get fully to either end of the potentiometer track.

2.4 Positioner Configuration and Calibration

The Positioner is provided fully calibrated and configured according to the model code of the valve that the actuator is fitted to. Changes can be made if required, but the method of making these changes varies depending on the version of Positioner fitted. Older versions require a Configurator box to be connected between the positioner and the actuator to access all calibration and configuration options, whereas newer positioners allow for some of the adjustments to be made without a Configurator. The following table shows the parameters which can be accessed, and the available means of changing them.

Table 1 Positioner Configuration Methods

	Standard Positioner	Enhanced Positioner	
Parameter	Configurator	Configurator	Switches on Positioner
CW / ACW on increasing mA	Yes	Yes	Yes
Action on loss of mA demand signal	Yes	Yes	Yes
Initiate actuator calibration	Yes	Yes	Yes
Deadband	Yes	Yes	No
4-20mA output	Yes	Yes	No

The options within each parameter are:

- CW / ACW on increasing mA
 - CW on increasing mA
 - ACW on increasing mA
- Action on loss of mA demand signal
 - Move to 4mA position
 - Move to 20mA position
 - No actuator movement (default)
- Initiate actuator calibration
 - Start actuator calibration
- Deadband
 - 1% to 9% in 1% steps

EA Type Electric Actuator

- 4-20mA output
 - Output equals current position
 - Output equals demand input
 - Output is scaled position error, 4mA is no position error
 - Output is scaled position error, 12mA is no position error

2.4.1 Configurator

Refer to OMM47962X00013 for details of how to use the 47962X Configurator to access and change the above parameters.

2.4.2 Changing Positioner Settings Using Built-in Switches

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator power supply.
- 2 Undo the four socket head screws which hold the Positioner on to the side of the actuator.
- 3 Gently pull the Positioner away from the actuator.

The switches are located inside the Positioner:

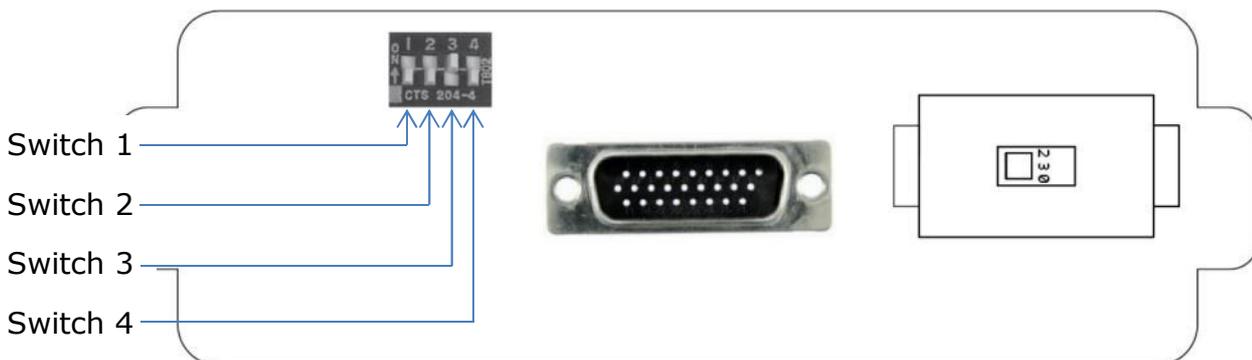


Fig 6 Positioner Switch Location

Set the switches in accordance with the following:

Direction of operation

For the actuator to turn clockwise on increasing mA, set Switch 3 to OFF.

For the actuator to turn anti-clockwise on increasing mA, set Switch 3 to ON.

Action on sensor fail

For the actuator to not move if the 4-20mA input fails, set Switch 2 to OFF and set Switch 1 to OFF.

For the actuator to move to the 4mA position if the 4-20mA input fails, set Switch 2 to ON and set Switch 1 to OFF.

For the actuator to move to the 20mA position if the 4-20mA input fails, set Switch 2 to on and set Switch 1 to ON.

- 4 Locate the Positioner back on to the side of the actuator, ensuring that it is the correct way up, and that it is not pushed on at an angle.
- 5 Tighten the four socket head screws which hold the Positioner to the side of the actuator.
- 6 Re-connect the power supply and check for correct operation.

2.4.3 Positioner Calibration Using Built-in Switches**WARNING**

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator power supply.
- 2 For versions where the Positioner is only used to give a 4-20mA output, and the actuator is controlled by a switched mains input, fit temporary link wires as follows:
 - Terminal 11 to terminal 28
 - Terminal 12 to terminal 27

These wires are already fitted for versions which use a 4-20mA input signal to control the valve position.

- 3 Undo the four socket head screws which hold the Positioner on to the side of the actuator.
- 4 Gently pull the Positioner away from the actuator.
- 5 Set Switch 4 to ON
- 6 Locate the Positioner back on to the side of the actuator, ensuring that it is the correct way up, and that it is not pushed on at an angle.
- 7 Tighten the four socket head screws which hold the Positioner to the side of the actuator.

- 8 Re-connect the power supply and wait for the actuator to complete calibration. This will take approximately 2 minutes.
- 9 When calibration is complete, the LED on the Positioner will flash.
- 10 Switch off and isolate the actuator power supply.
- 11 Undo the four socket head screws which hold the Positioner on to the side of the actuator.
- 12 Gently pull the Positioner away from the actuator.
- 13 Set Switch 4 to OFF.
- 14 Locate the Positioner back on to the side of the actuator, ensuring that it is the correct way up, and that it is not pushed on at an angle.
- 15 Tighten the four socket head screws which hold the Positioner to the side of the actuator.
- 16 If link wires were fitted in step 2, remove them.
- 17 Re-connect the power supply and check for correct operation.

2.5 Operation

CAUTION

Damage can be caused to the valve assembly if a cheater or extension bar is used on the handwheel. Do not use any mechanical aid to turn the handwheel.

The actuator operates as soon as electrical power is applied. Versions with a Positioner can be controlled by an 8071D PID controller based system or an externally generated 4 – 20 mA. Versions without a Positioner, and those where the Positioner is only provided to give a 4-20mA output signal are controlled directly by switching the power supply to either of the two switched live inputs.

Manual operation is possible at any time by disengaging electrical drive by pulling the actuator declutching lever and turning the handwheel. Once in Manual mode, the actuator returns to automatic mode as soon as the declutching lever is released and the motor starts.

On failure of the actuator to operate correctly, refer to the troubleshooting guide in Section 4.

2.6 Operation

CAUTION

Damage can be caused to the valve assembly if a cheater or extension bar is used on the handwheel. Do not use any mechanical aid to turn the handwheel.

The actuator operates as soon as electrical power is applied, controlled by either an 8071D PID controller based system or an externally generated 4 – 20 mA signal for the optional Positioning Electronics Unit. Manual operation is possible at any time by disengaging electrical drive with the actuator declutching lever and turning the handwheel.

On failure of the actuator to operate correctly, refer to the troubleshooting guide in Section 4.

2.7 Maintenance

The following maintenance tasks are described in this section:

- Removal and installation onto valve body (2.7.1 – page 19)
- Lubrication (2.7.2 – page 19)
- Limit switch replacement (2.7.3 – page 20)
- Limit switch adjustment (2.7.4 – page 22)
- Potentiometer replacement (2.7.5 – page 24)
- Potentiometer adjustment (2.7.7 – page 27)
- Anti-condensation heater replacement (2.7.8 – page 29)
- Capacitor replacement (2.7.9 – page 30)

Note

The torque switches are set by the manufacturer and require no adjustment.

2.7.1 Removal and Installation onto Valve Body

Consult the Electric Actuator Maintenance section of the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve for full details of mounting and removing the actuator from the GG Valve body. The EA Type actuator is mounted and removed in the same way as the EB type actuator.

2.7.2 Lubrication

To enable the actuator to be mounted in any position, a totally sealed and permanently lubricated gear case is used. During long periods of storage, it is not unusual for a very small amount of lubricant to weep from shaft seals. In this event, wipe up the weeping lubricant with a clean cloth. During operation, the weeping should disappear.

2.7.3 Limit Switch Replacement

CAUTION

During replacement of the limit switches, the actuator must be manually positioned. If the actuator is mounted on a valve which is installed in the pipework, it will affect the process flow of the system.

Replace the limit switches as follows (refer to Fig 7, page 21)

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Remove the socket head cap screws and carefully lift off the cover.
- 2 Unscrew the motor strap (16), pull apart and remove to clear the upper limit switch cam (11).
- 3 Unscrew the screw in the centre of the position indicator (1) and remove the indicator from the position indicator shaft (17).
- 4 Remove the cable ties securing the potentiometer wiring to the potentiometer bracket (3) and potentiometer bracket mounting pillar (18).
- 5 Remove the screw (30) and split washer (29) and pull off the potentiometer bracket (3) from the position indicator shaft.
- 6 Undo the grub screw (8) and pull off the large spur gear (7) from the position indicator shaft.
- 7 Turn the manual drive handle as necessary to access the grub screws (10 and 23) in both the upper and lower limit switch cams (11 and 13).
- 8 Undo the grub screws to loosen both upper and lower limit switch cams on the shaft.

CAUTION

When the two screws (22) securing the lower limit switch bracket (21) are unscrewed, they can damage the lower limit switch cam (13). The screws (22) must be undone evenly and in small increments whilst raising the limit switch assembly and cams to prevent the screws applying pressure to the underside of the cam.

- 9 Turn the cams to access the lower limit switch bracket screws (21). Undo the screws evenly and in small increments whilst raising the limit switch assembly and cams together to prevent the screws damaging the lower cam.
- 10 Remove the two screws (21) and slide the limit switch assembly, both cams and cam spacer (12) from the shaft.

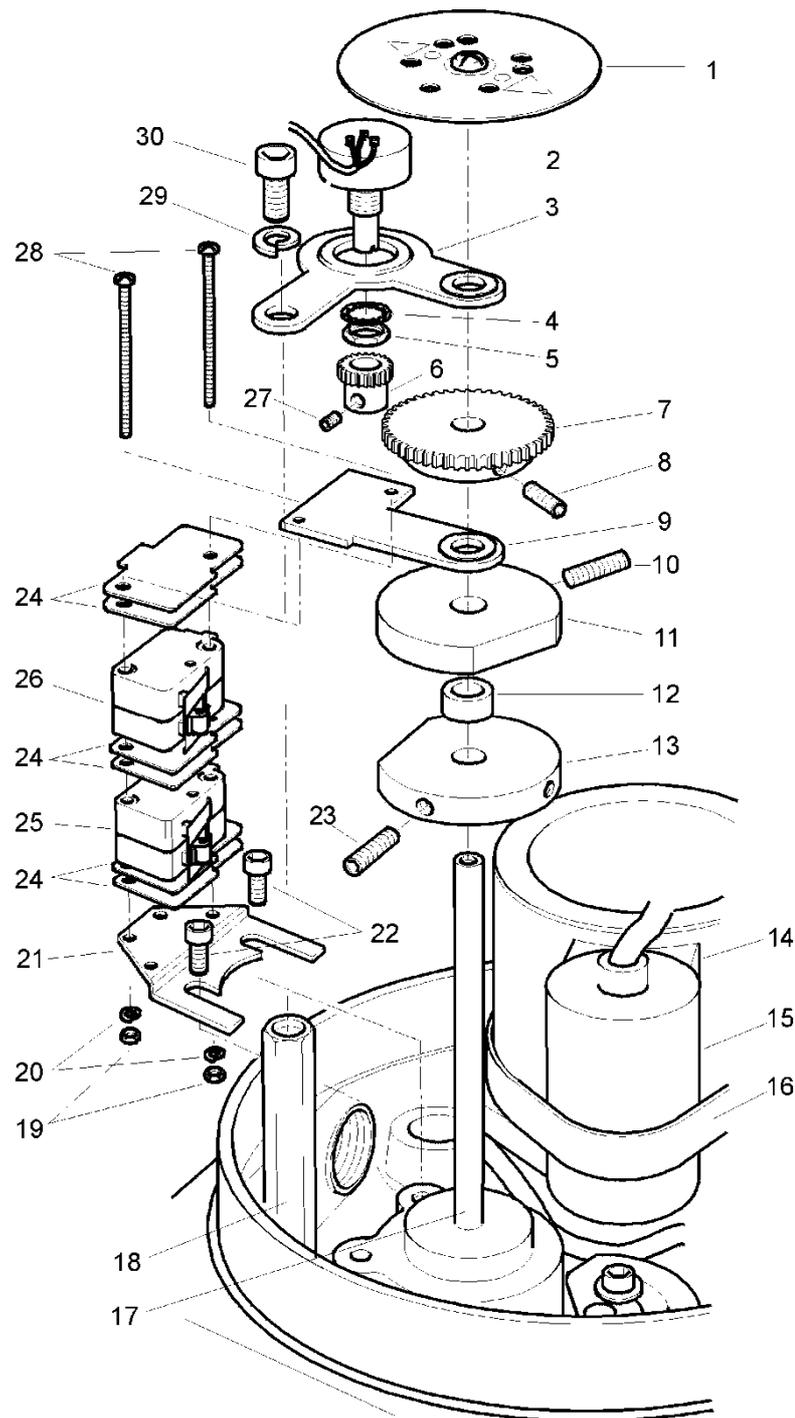


Fig 7 Limit Switch assembly

- 11 Disconnect the limit switch pair wires from the terminal strip (the switches identified as item 25 are the open switches and item 26 are the close switches).
- 12 Remove the two screws (28), nuts (19) and washers (20) and remove the switch pair to be replaced.
- 13 Reassemble the limit switches complete with limit switch spacers (24) and secure with the two screws (28), washers (20) and nuts (19).

- 14 Connect the replacement limit switch pair wires to the terminal strip.
- 15 Slide the cams and cam spacer (12) onto the position indicator shaft. Whilst viewing the actuator as illustrated, ensure the cam grub screws are facing you when the flats face the switches.
- 16 Position the upper limit switch bracket (9) and slide down the shaft with the cams.
- 17 Secure the limit switch assembly with the two screws (22).
- 18 Slide the large spur gear (7) onto the shaft. Do not tighten the grub screw at this point.
- 19 Slide the potentiometer bracket (3) onto the shaft and secure with screw (30) and washer (29).
- 20 Refit the motor strap (16) through the slot in the terminal strip bracket and around the motor and capacitor. Ensure the capacitor sits snugly against the motor on the anti-vibration block (14).
- 21 Refit the position indicator to the top of shaft. Manually wind the actuator to each end of travel and ensure the indicator aligns with the scale on the cover.
- 22 Use new cable ties to secure the potentiometer wires to the potentiometer bracket and potentiometer bracket mounting pillar.
- 23 Carry out limit switch adjustment in accordance with Sect 2.7.4
- 24 Carry out potentiometer adjustment in accordance with Sect 2.7.7.

2.7.4 Limit Switch Adjustment – Rotor Not Visible

The limit switches and mechanical end stops are set by the manufacturer and should not need adjustment unless the cams or switches are replaced or disturbed. During manufacture, the limit switches are set up relative to the valve fully open and closed positions. The mechanical end stops are then set in position, a further two complete turns of the manual operating handle.

This procedure assumes that observation of the valve rotor is not possible (installed in pipework) and sets the limit switches relative to the factory set mechanical end stop positions.

CAUTION

During adjustment of the limit switches, the actuator must be manually positioned. If the actuator is mounted on a valve which is installed in the pipework, it will affect the process flow of the system.

Adjust the limit switches as follows (refer to Fig 7, page 21):

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator electrical power supply.
- 2 Remove the socket head cap screws and carefully lift off the cover.

Note

The cams are adjusted until the limit switches operate (indicated by an audible click). In conditions of high noise levels, an electrical continuity circuit should be connected across the relevant switch to give a visible indication of switch operation (refer to Fig 2, page 9 for terminal numbers).

3 Open limit switch adjustment:

- 3.1 Manually wind the actuator fully counter-clockwise to the mechanical end stop.
- 3.2 Wind the manual handle clockwise to take up backlash (approx ¼ turn).
- 3.3 Wind the manual handle clockwise a further two complete turns.
- 3.4 Loosen the grubscrew (23) in the lower limit switch cam (13).
- 3.5 Turn the cam until the limit switch is on the flat of the cam (switch not pressed).
- 3.6 Slowly turn the cam clockwise until the first switch (Open limit switch 'OLS') just operates.
- 3.7 Tighten the grubscrew (23).
- 3.8 Repeat from step 3.1 without loosening the cam grubscrew to check that the first switch operates when the manual handle is turned two complete turns (after take-up of backlash).
- 3.9 Check that the second switch on the same cam (Aux open limit switch 'AOLS') operates after a further clockwise ½ turn of the manual handle.

Note

It is not possible to adjust the AOLS separately from the OLS.

4 Close limit switch adjustment:

- 4.1 Manually wind the actuator fully clockwise to the mechanical end stop.
- 4.2 Wind the manual handle counter-clockwise to take up backlash (approx ¼ turn).
- 4.3 Wind the manual handle counter-clockwise a further two complete turns.
- 4.4 Loosen the grubscrew (10) in the upper limit switch cam (11).
- 4.5 Turn the cam until the limit switch is on the flat of the cam (switch not pressed).
- 4.6 Slowly turn the cam counter-clockwise until the first switch (Close limit switch 'CLS') just operates.

- 4.7 Tighten the grub screw (10).
- 4.8 Repeat from step 4.1 without loosening the cam grub screw to check that the first switch operates when the manual handle is turned two complete turns (after take-up of backlash).
- 4.9 Check that the second switch on the same cam (Aux close limit switch 'ACLS') operates after a further counter-clockwise ½ turn of the manual handle.

Note

It is not possible to adjust the ACLS separately from the CLS.

- 5 Remove any electrical continuity circuits connected to the terminal strip.
- 6 Ensure that the actuator cover O ring is correctly fitted and undamaged.
- 7 Refit the actuator cover and secure with the socket head cap screws.

CAUTION

Adjustment of the limit switches affects the calibration of the optional Positioning Electronics Unit. If fitted, it must be re-calibrated before the actuator is brought into service (refer to OMM47962X00013).

- 8 If fitted, calibrate the positioning electronics unit (refer to the Positioning Electronics Unit Manual).
- 9 Energise the actuator power supply and control circuits and check for correct operation.

2.7.5 Limit Switch Adjustment – Rotor Visible

The limit switches and mechanical end stops are set by the manufacturer and should not need adjustment unless the cams or switches are replaced or disturbed. During manufacture, the limit switches are set up relative to the valve fully open and closed positions. The mechanical end stops are then set in position, a further two complete turns of the manual operating handle.

This procedure assumes that observation of the valve rotor is not possible (installed in pipework) and sets the limit switches relative to the factory set mechanical end stop positions.

Adjust the limit switches as follows (refer to Fig 7, page 21):

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator electrical power supply.
- 2 Remove the socket head cap screws and carefully lift off the cover.

Note

The cams are adjusted until the limit switches operate (indicated by an audible click). In conditions of high noise levels, an electrical continuity

circuit should be connected across the relevant switch to give a visible indication of switch operation (refer to Fig 2, page 9 for terminal numbers).

3 **Open limit switch and end stop adjustment:**

- 3.1 Manually wind the actuator fully counter-clockwise until the rotor just covers the valve port.
- 3.2 If the actuator has Positioner fitted, turn the handwheel a further $\frac{3}{4}$ of a turn.
- 3.3 Loosen the grubscrew (23) in the lower limit switch cam (13)
- 3.4 Turn the cam until the limit switch is on the flat of the cam (switch not pressed).
- 3.5 Slowly turn the cam clockwise until the first switch (Open limit switch 'OLS') just operates.
- 3.6 Tighten the grubscrew (23).

Note

It is not possible to adjust the AOLS separately from the OLS.

- 3.7 Slacken the nut on the mechanical end stop screw nearest to the handwheel, and turn the screw counter-clockwise by approximately 10 turns.
- 3.8 Turn the handwheel 2 turns counter-clockwise, and check that the port has not started to open. If it has, then turn the handwheel clockwise until the port is just closed.
- 3.9 On the mechanical end stop adjuster nearest to the handwheel, turn the screw clockwise until it stops.

4 **Close limit switch adjustment:**

- 4.1 Manually wind the actuator fully clockwise until the rotor just covers the valve port.
- 4.2 If the actuator has a Positioner fitted, turn the handwheel a further $\frac{3}{4}$ of a turn.
- 4.3 Loosen the grubscrew (10) in the upper limit switch cam (11).
- 4.4 Turn the cam until the limit switch is on the flat of the cam (switch not pressed).
- 4.5 Slowly turn the cam counter-clockwise until the first switch (Close limit switch 'OLS') just operates.
- 4.6 Tighten the grubscrew (10).

Note

It is not possible to adjust the AOLS separately from the CLS.

- 4.7 Slacken the nut on the mechanical end stop screw furthest from the handwheel, and turn the screw counter-clockwise by approximately 10 turns.
- 4.8 Turn the handwheel 2 turns clockwise, and check that the port has not started to open. If it has, then turn the handwheel counter-clockwise until the port is just closed.
- 4.9 On the mechanical end stop adjuster furthest from the handwheel, turn the screw clockwise until it stops. Tighten the nut.

CAUTION

Adjustment of the limit switches affects the calibration of the optional Positioning Electronics Unit. If fitted, it must be re-calibrated before the actuator is brought into service (refer to OMM47962X00013).

- 5 If fitted, calibrate the positioning electronics unit (refer to the Positioning Electronics Unit Manual).
- 6 Energise the actuator power supply and control circuits and check for correct operation.

2.7.6 Potentiometer Replacement

Replace the potentiometer as follows (refer to Fig 8, page 26):

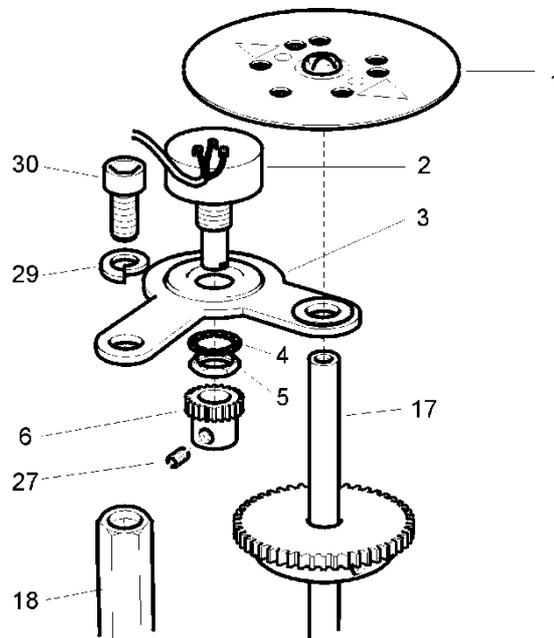


Fig 8 Potentiometer Assembly

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power

supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator electrical power supply.
- 2 Remove the socket head cap screws and carefully lift off the cover.
- 3 Release the potentiometer wires from the cable ties and disconnect from the terminal strip.

Note

To access the potentiometer connections on the terminal strip, it may be necessary to release the terminal strip bracket as described in the anti-condensation heater replacement procedure (Sect 2.7.8 – page 29).

- 4 Unscrew the screw in the centre of the position indicator (1) and remove the indicator from the position indicator shaft (17).
- 5 Remove screw (30) and washer (29) and slide potentiometer bracket (3) off the position indicator shaft (17).
- 6 Loosen grub screw (27) and withdraw the small spur gear (6) from the potentiometer shaft.
- 7 Remove nut (5) and washer (4) then remove the potentiometer (2) from the bracket.
- 8 Insert replacement potentiometer into the bracket with the connections orientated as illustrated and secure with washer (4) and nut (5).
- 9 Connect the potentiometer wires into the terminal strip (refer to Fig 2, page 9).
- 10 Slide the small spur gear (6) onto the potentiometer shaft and tighten the grub screw (27).
- 11 Slide the potentiometer bracket onto the position indicator shaft and secure to the potentiometer bracket mounting pillar (18) with screw (30) and washer (29).
- 12 Refit the position indicator (1) to the top of the shaft. Manually wind the actuator to each end of travel and ensure the indicator aligns with the scale on the cover.
- 13 Use new cable ties to secure the potentiometer wires to the potentiometer bracket and potentiometer bracket mounting pillar.
- 14 Carry out the potentiometer adjustment procedure (Sect 2.7.7).

2.7.7 Potentiometer Adjustment

The purpose of this procedure is to position the potentiometer gears so the potentiometer wiper operates over the centre section of the track.

Set the potentiometer as follows (refer to Fig 9, page 28):

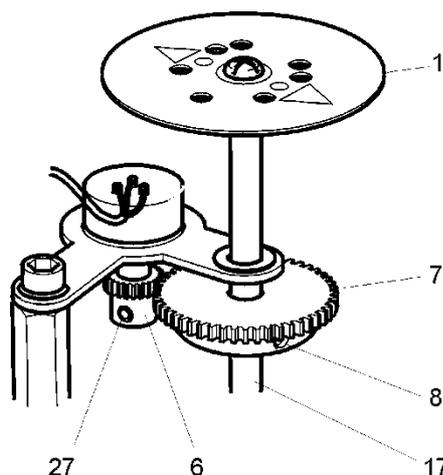


Fig 9 Potentiometer Adjustment

- 1 Loosen the grub screw (8) of the large spur gear (7) and slide the gear down the shaft (17) to disengage from the small spur gear (6).
- 2 Manually wind the actuator to mid position determined by counting the turns between the mechanical end stops and then winding the total number of turns divided by 2.
- 3 Connect an ohmmeter to terminals 20 and 22 on the terminal strip (whole track of potentiometer).
- 4 Determine the centre value of the potentiometer track by dividing the reading on the ohmmeter by two.
- 5 Connect the ohmmeter to terminals 21 and 22 on the terminal strip (pot wiper to end of track).
- 6 Rotate the potentiometer shaft until the ohmmeter indicates the centre value determined at step 4.
- 7 Rotate the large spur gear (7) on the shaft until the grub screw (8) is in an accessible position for tightening.
- 8 Slide the gear up the shaft until it engages with the small spur gear (6).
- 9 Ensure the ohmmeter still indicates the centre value. Adjust by rotating the large spur gear on the shaft as necessary.
- 10 Tighten the grub screw (8).
- 11 Manually wind the actuator to each end stop and record the ohmmeter indication.
- 12 Ensure that the centre section of the potentiometer track is being used by checking the ohmmeter readings at each end of travel eg. 40 Ω and 960 Ω readings indicate an even distribution on a 1 k Ω track.
- 13 Remove the ohmmeter connections.
- 14 Ensure that the actuator cover O ring is correctly fitted and undamaged.
- 15 Refit the actuator cover and secure with the socket head cap screws.

CAUTION

Adjustment of the limit switches affects the calibration of the optional Positioner. If fitted, it must be re-calibrated before the actuator is brought into service (refer to OMM47962X00013).

- 16 If fitted, calibrate the Positioner (refer to the Positioner Manual).
- 17 Energise the actuator power supply and control circuits and check for correct operation.

2.7.8 Anti-Condensation Heater Replacement

Replace the anti-condensation heater as follows (Refer to Fig 10, page 30):

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator electrical power supply.
- 2 Remove the socket head cap screws and carefully lift off the actuator cover.
- 3 Unscrew the motor strap, pull apart and unthread from the slot in the terminal strip bracket.
- 4 Slacken the two screws (2) securing the terminal strip bracket to the actuator base.
- 5 Slide the terminal strip bracket off the screws and raise to access the heater (3).
- 6 Disconnect the heater wires from the terminal strip (refer to Fig 2, page 9).
- 7 Undo the two screws (4) enough to withdraw the heater (3) from its mounting bracket (5).
- 8 Replace the heater in the mounting bracket and secure with the two screws (4).
- 9 Connect the heater wires to the terminal strip (refer to Fig 2, page 9).
- 10 Slide the terminal strip bracket under the two screws (2) and tighten.

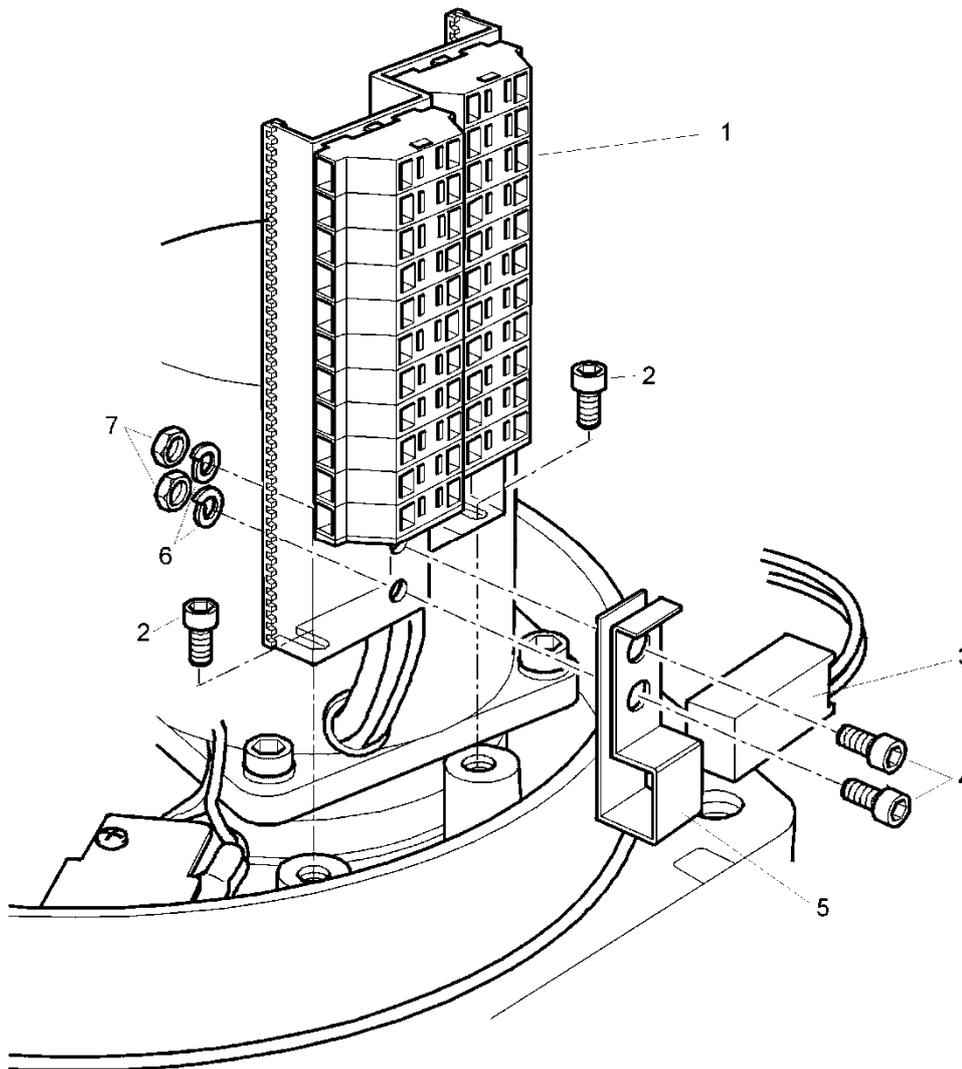


Fig 10 Anti-Condensation Heater

- 11 Refit the motor strap through the slot in the terminal strip bracket and around the motor and capacitor. Ensure the capacitor sits snugly against the motor on the anti-vibration block.
- 12 Ensure that the actuator cover O ring is correctly fitted and undamaged.
- 13 Refit the actuator cover and secure with the socket head cap screws.
- 14 Energise the actuator power supply and control circuits and check for correct operation.

2.7.9 Capacitor Replacement

WARNING

Lethal voltages are exposed when the actuator cover is removed, presenting an electric shock hazard to personnel. Electrical power supplies must be isolated from the actuator before the cover is removed.

- 1 Switch off and isolate the actuator power supply.

- 2 Remove the socket head cap screws and carefully lift off the actuator cover.
- 3 Disconnect the capacitor wires from the terminal strip.
- 4 Slacken the motor strap from around the motor and capacitor.
- 5 Remove the capacitor and the anti-vibration block.
- 6 Fit a new capacitor and position against the motor ensuring that it sits snugly on the anti-vibration block against the motor.
- 7 Connect the capacitor wires to the terminal strip.
- 8 Tighten the motor strap ensuring that it does not obstruct the upper limit switch cam.
- 9 Ensure that the actuator cover O ring is correctly fitted and undamaged.
- 10 Refit the actuator cover and secure with the socket head cap screws.
- 11 Energise the actuator power supply and control circuits and check for correct operation.

2.8 Storage

2.8.1 On-Site Storage

The following conditions must be applied when storing the actuator on site:

- Storage location must be clean, dry and free from excessive vibration and rapid temperature change.
- Permitted temperature range -20°C to $+70^{\circ}\text{C}$.
- All covers must be fitted and secured.
- If electrical power is not connected, place a packet of desiccant in the motor compartment as follows:
 - Ensure that electrical power to the actuator is isolated.
 - Loosen the socket headed cap screws and carefully lift off the cover.
 - Place a packet of desiccant in the motor compartment.
 - Refit the cover and tighten the socket headed cap screws.
- Replace plastic conduit plugs with appropriate pipe plugs.

2.8.2 Warehouse Storage

The following conditions must be applied when storing the actuator in a warehouse:

- Storage location must be clean, dry and free from excessive vibration and rapid temperature change.
- All covers must be fitted and secured.
- Actuators must not be stored on any floor surface.
- Actuators must be stored upright with the motor compartment facing upwards.

EA Type Electric Actuator

- In areas of high humidity, place a packet of desiccant in the motor compartment as follows:
 - Ensure that electrical power to the actuator is isolated.
 - Loosen the socket headed cap screws and carefully lift off the cover.
 - Place a packet of desiccant in the motor compartment.
 - Refit the cover and tighten the socket headed cap screws.

2.9 Recommended Spares

The following is a list of recommended spares for the actuator.

Description	Part Number
Actuator lid O ring	82434X001
Potentiometer, 1k	82434X003
Potentiometer, 5k	82434X004
Heater (115V)	82434X006
Heater (230V)	82434X007
Capacitor (115V)	82434X011
Capacitor (230V)	82434X009
Position limit switch set (without wires)	82434X012
Torque limit switch set (without wires)	82434X013
Torque and position limit switch set (pre-wired)	82434X014
Handwheel kit	82434X015

Section 3

System Integration

3.1 Installation Guidance Notes

Consult the System Integration - Installation Guidance Notes section of the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve for full installation guidelines.

3.2 System Wiring Diagrams

The system wiring depends on the controller components selected for use. The following options are available:

8071D controller with 2 solid state relays



Fig 11, page 35

8071D controller with an 8073C solid state relay module



Fig 12, page 36

8072D controller



Fig 13, page 37

Positioning Electronics Unit
(4 – 20 mA input)



Fig 14, page 38

Positioning Electronics Unit
(switched mains voltage input, retransmission only)



Fig 15, page 39

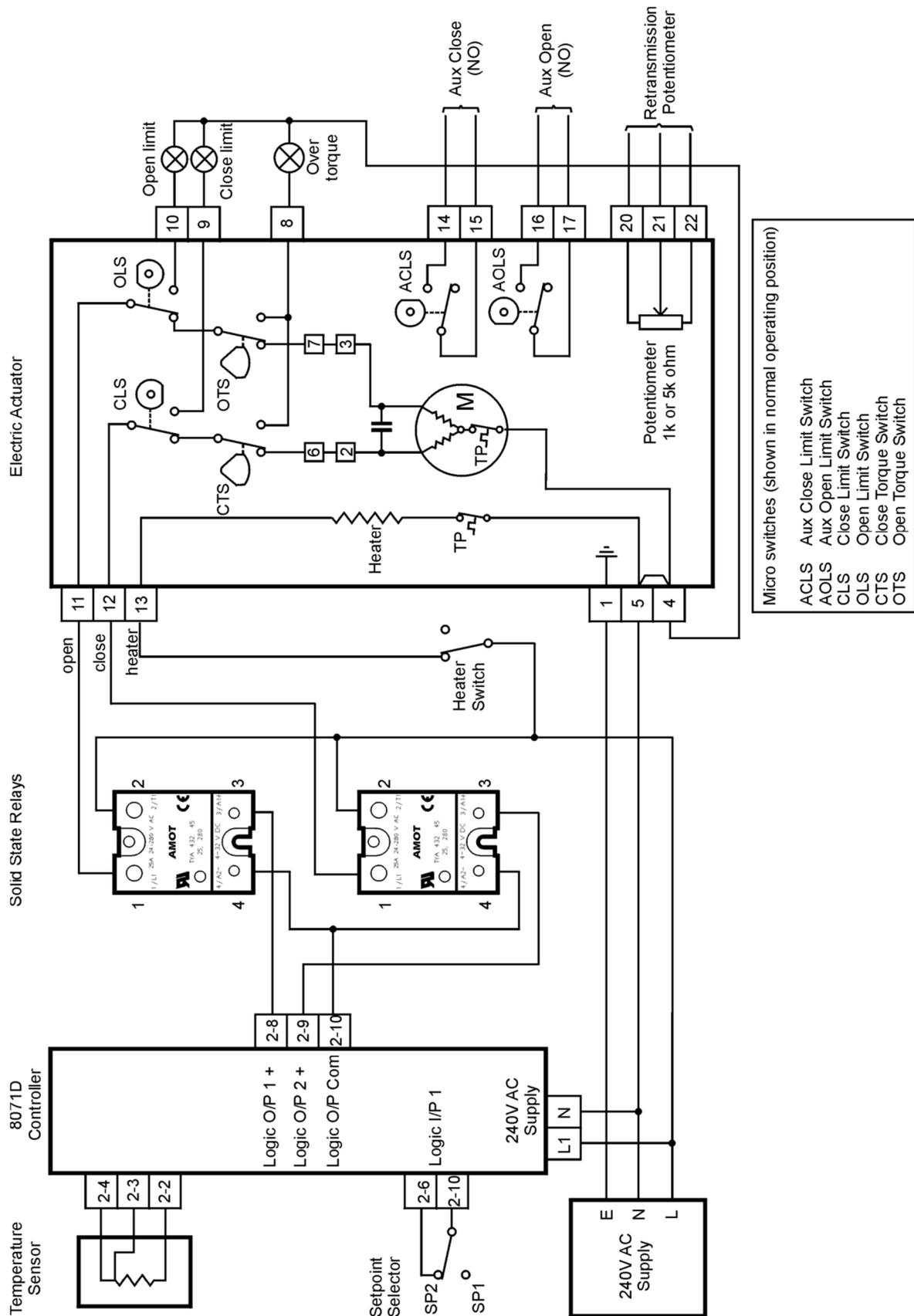


Fig 11 System Wiring Diagram 8071D Controller with two Solid State Relays

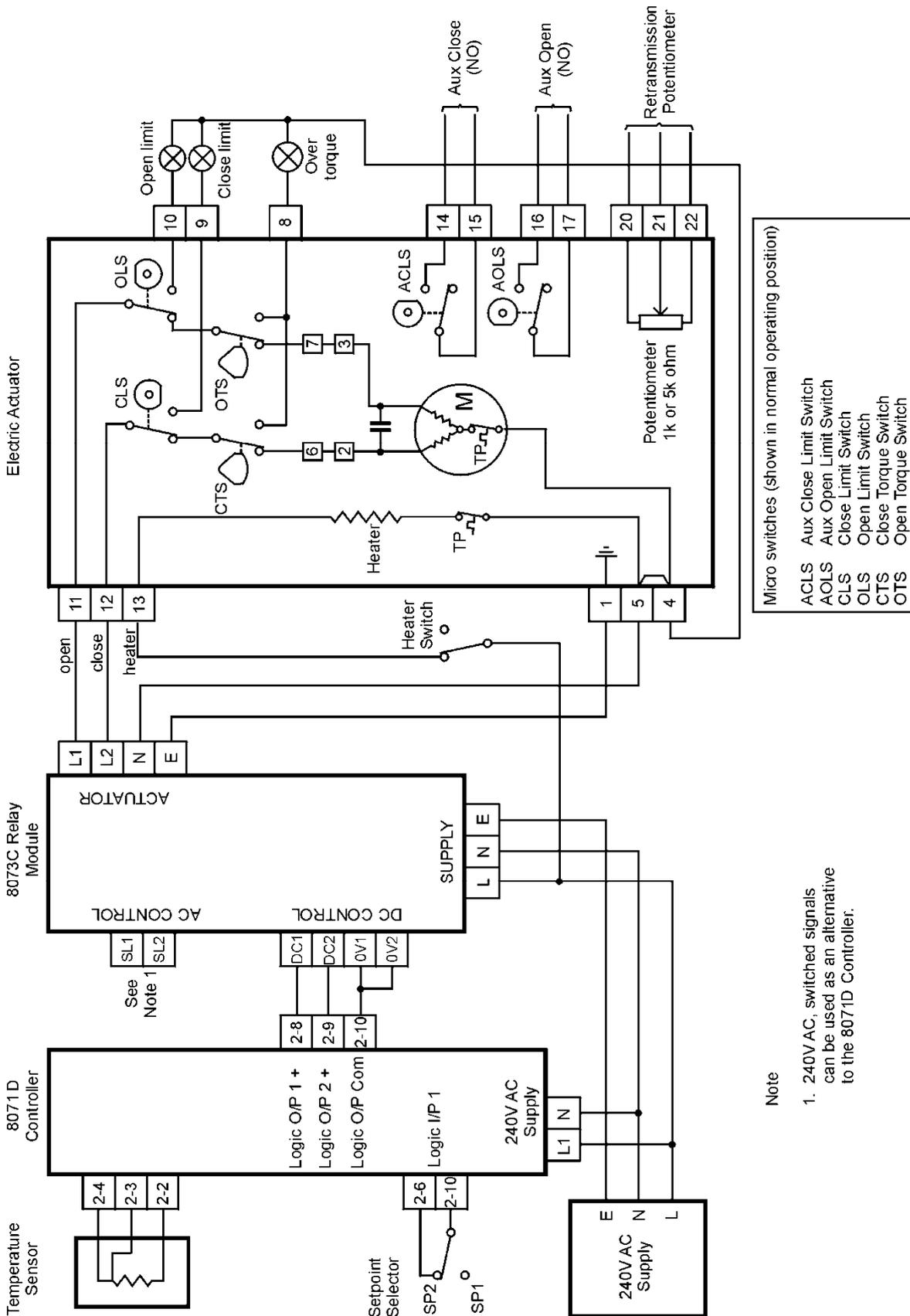


Fig 12 System Wiring Diagram 8071D Controller with 8073C Relay Module

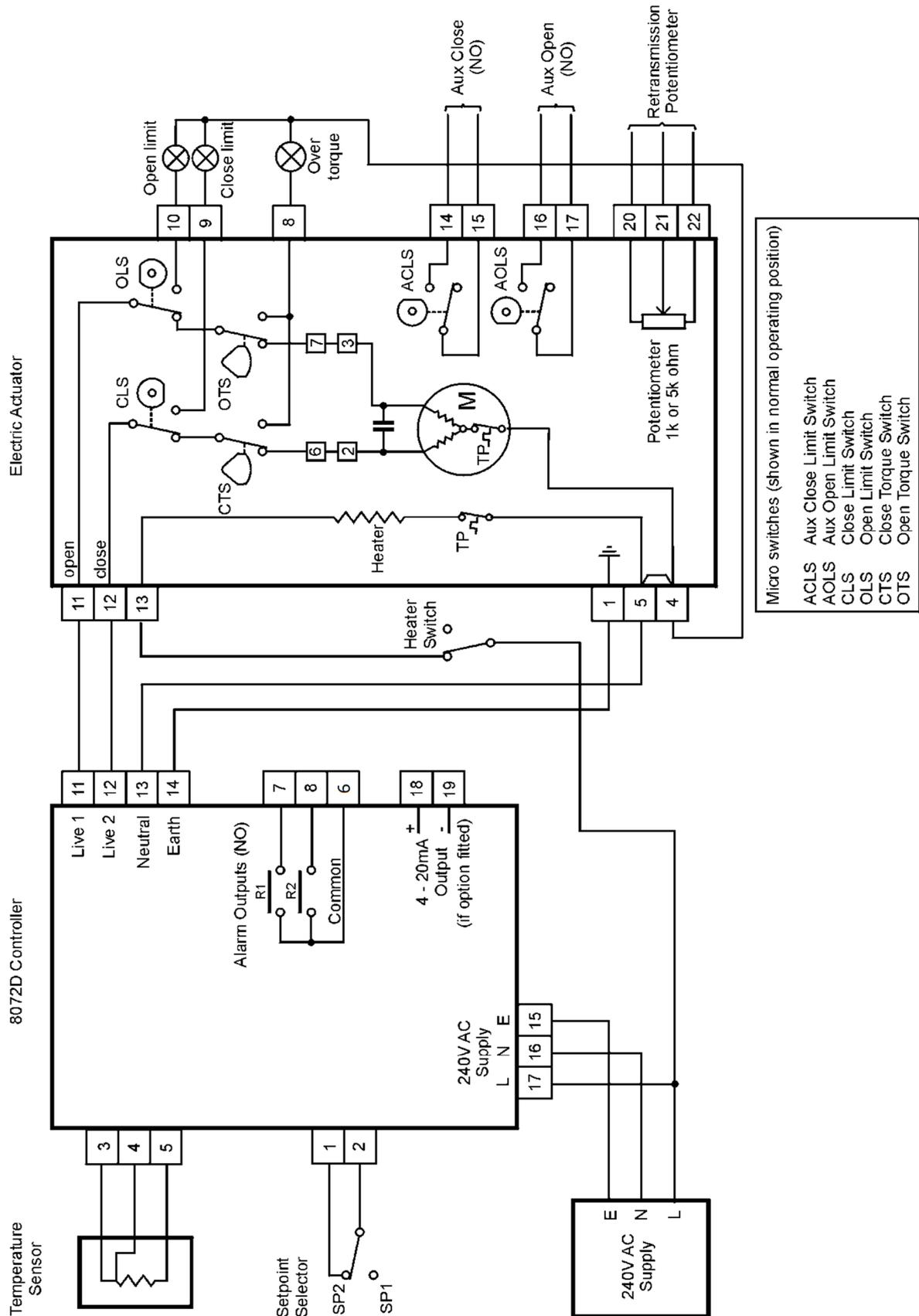


Fig 13 System Wiring Diagram 8072D Controller

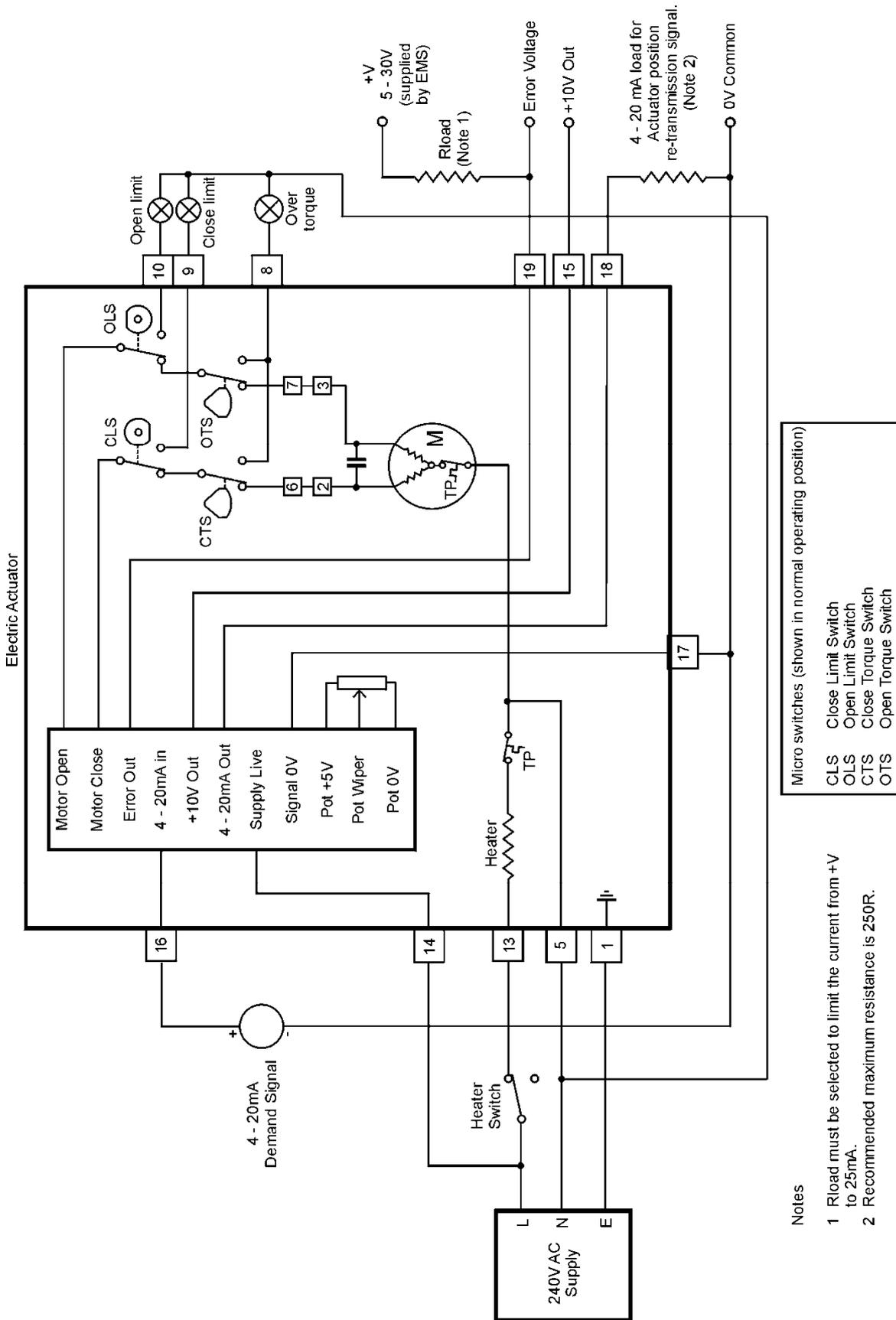


Fig 14 System Wiring Diagram Electronic Positioning Unit 4-20 mA input

Section 4

Troubleshooting

4.1 Checklist

The following table lists a number of possible faults that could be observed in the system, with the relevant diagnostic and remedial actions.

Fault Indication	Diagnostic Action	Remedial Action
Valve is oscillating or moving in large steps	Check PID values on PID Controller	Adjust PID values
	Check dead band settings on PID Controller	Adjust dead band settings
	Check location of temperature sensor is away from bends and junctions (section 3.1, page 33)	Move temperature sensor
	Check deadband setting of actuator (section 2.4, page 15)	Adjust deadband setting
	Switch off power, remove actuator lid, and check that gears are tight (Fig 7, page 21)	Adjust gears
	Check coupling pin (Fig 6, page 16, item 6)	Replace pin
Valve drives in one direction only	Check electrical connections	
	Check operation of relays	Replace relay
	Check power to actuator	
	Check control system and temperature sensor	
	Check setting of Potentiometer (2.7.7, page 27)	Adjust position feedback sensor
	On Actuators with a Positioner, Check status of LED	
Valve will not drive in either direction	Check power supply	
	Check actuator motor running	If motor running, replace shear pin between valve and actuator If not running, ensure local power supply is compatible with nameplate voltage and current rating.

Troubleshooting

	Check if motor overheated	Refer to "Motor overheating" below
	Check motor run capacitor	Replace capacitor
	Check Positioner	Replace Positioner
Valve operates slowly	Check mains voltage matches rating plate	
Incomplete travel	Check limit switch setting	Adjust
	Check for obstructions in valve	Clear obstructions
	Check mechanical stops on actuator	Adjust
	Check setting of Potentiometer (2.7.7, page 27)	Adjust position feedback sensor
Motor overheating	Check if valve is oscillating	See "Valve is oscillating" above
	Check for obstructions in valve	Clear obstructions
	Check ambient temperature	Reduce ambient temperature
	Ensure local power supply is compatible with nameplate voltage and current rating.	
	Check electrical connections	
Moisture/Condensation	Check heater in actuator connected	Connect heater
	Check heater continually powered, not just when motor is running	Provide separate power supply
	Check actuator cover seal	Replace if required
	Check indicator window and seal	Replace if required
	Check all cable entries	Tighten if loose
	Ensure unused cable entries are plugged	Plug as required

4.1.1 Positioner Status Indicator

The status indicator on the Positioner indicates the status of the Positioner and Actuator as follows. Further diagnostic checks are described in OMM47962X00013.

Status Indication	Probable Cause	Diagnostic Action
Not lit	Normal operation	None required
Flashing at 2 Hz	Input 4 – 20 mA signal out of range	Check that 4 – 20 mA input signal is connected and operating within limits.
	Internal actuator fault	Investigate
Flashing at 10 Hz	Actuator cannot meet input demand	Check that motor thermal trip not operated
	Internal actuator fault	Investigate

4.1.2 Positioner Error Signal

The error signal indicates the status of the positioner and actuator. It is an open collector output which switches as follows:

- **Normal operation** – Error signal connection is connected to 0 V common.
- **Fault condition** – Error signal rises to input voltage supplied by the EMS.

Section 5

Servicing Schedule

5.1 Overview

To obtain maximum trouble-free life from the G Valve, AMOT recommends that a regular service schedule is adhered to.

5.2 Service Intervals

There is only one level of servicing defined, with servicing occurring every two years.

5.3 Service (every 2 years)

The GG Valve body with EA type actuator should be inspected and maintained in the same way as shown in the Service section in the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve.

Note that the capacitor within the EA type actuator should be replaced in accordance with this Addendum (2.7.9 – page 30), not the capacitor replacement section in the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve.

Note that GG Valves fitted with EA type actuators, as described in this addendum, have different spare kit part numbers to GG Valves fitted with EB type actuators. Table 2 shows which spares kit to order. Replace '**' with the valve size. E.g. 80243X**035** for 3" standard flow, 115 V ac kit.

Table 2 Spares Kit required

Kit description	Kit part number
Standard flow, 115 V ac	80243X**5
Standard flow, 230 V ac	80243X**7
High flow, 115 V ac	80243X**6
High flow, 230 V ac	80243X**8

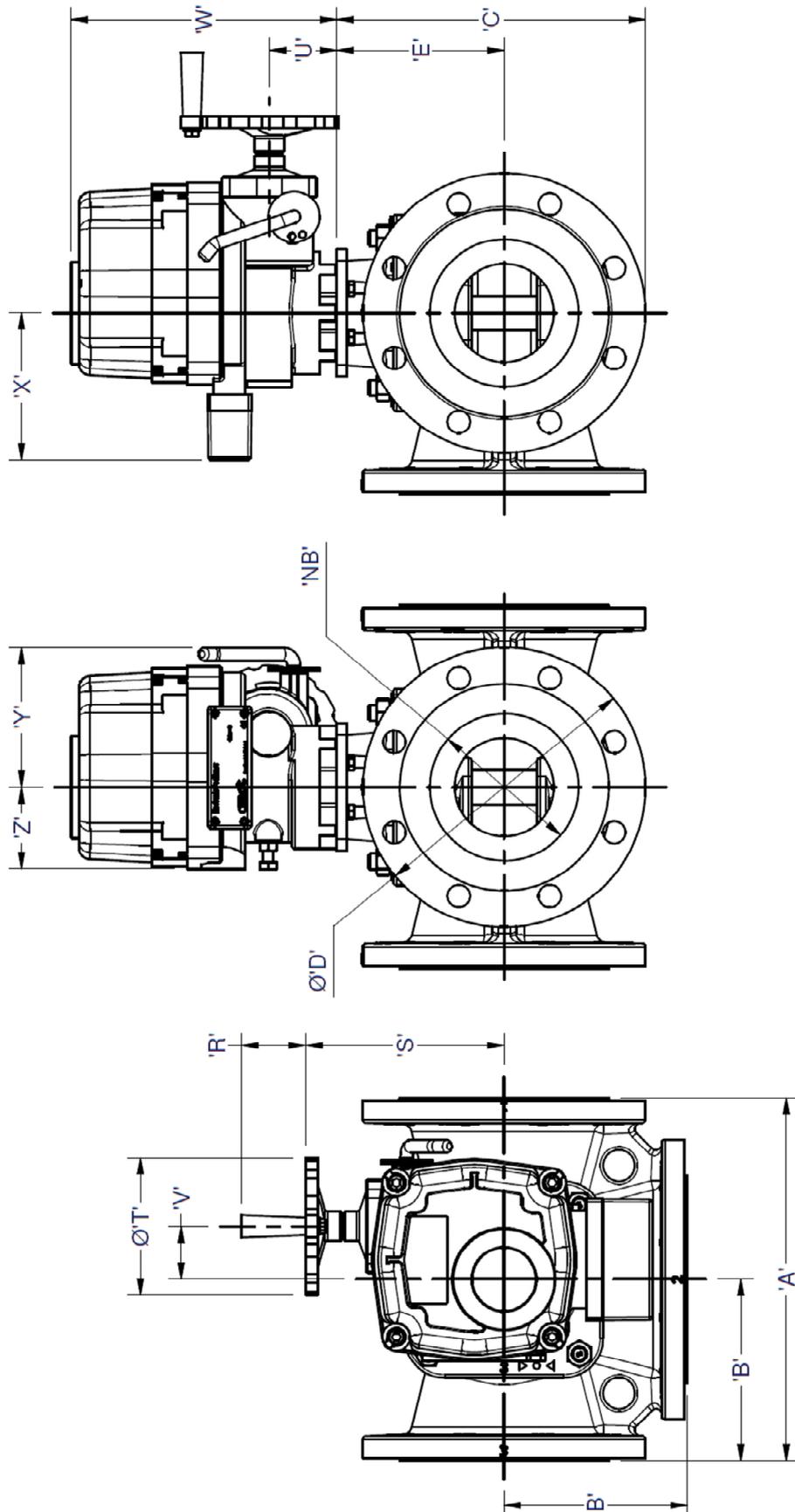
Section 6

Technical Data

6.1 Selection of G-Valve options

The selection of the G-Valve for a particular application will have been completed during the original customer's purchasing procedure. A quick reference guide giving an overview of the G-Valve selection options is provided in the relevant section of the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve, covering Valve Flow Rate Selection, Viscosity Correction, Valve Sizing Calculations, and Bypass Flowrate information.

The following technical data is specific to GG Valves fitted with EA actuators.

6.1.1 Valve Dimensions

Dimensions in mm

Valve Type	Valve Body							Actuator							
	NB	A	B	C	D	E	R	S	T	U	V	W	X	Y	Z
02GGH	50	230	115	170	165	87	65	200	140	68	54	268	83 (without positioner) 150 (with positioner)	142	83
03GGS	80	280	140	207	200	107									
03GGH				227	200	127									
04GGS	100	300	150	242	229	128									
04GGH				281	224	169									
05GGS	125	340	170	296	254	169									
06GGS	150	370	185	312	285	169									
06GGH				346	285	191									
08GGS	200	450	225	371	343	191									
08GGH				418	340	235									
10GGS	250	520	260	455	406	235									

Dimensions in Inches

Valve Type	Valve Body							Actuator							
	NB	A	B	C	D	E	R	S	T	U	V	W	X	Y	Z
02GGH	2	9.055	4.528	6.693	6.496	3.425	2.559	7.874	5.512	2.677	2.126	10.551	3.268 (without positioner) 5.906 (with positioner)	5.591	3.268
03GGS	3	11.024	5.512	8.150	7.874	4.213									
03GGH				8.937	7.874	5.000									
04GGS	4	11.811	5.906	9.528	9.016	5.039									
04GGH				11.063	8.819	6.657									
05GGS	5	13.386	6.693	11.654	10.000	6.654									
06GGS	6	14.567	7.283	12.283	11.220	6.654									
06GGH				13.622	11.220	7.520									
08GGS	8	17.717	8.858	14.606	13.504	7.520									
08GGH				16.457	15.984	9.252									
10GGS	10	20.472	10.236	17.913	15.984	9.252									

Note that bolt hole dimensions meet the requirements of the individual flange standard selected in the model code.

6.1.2 Valve Weights

Consult the Technical Data - Valve Weights section of the main GG Valve with EB type Actuator operation and maintenance manual supplied with the valve for valve weights. The equivalent EA type and EB type actuators have the same approximate weight.

6.2 Technical Specifications

6.2.1 Actuator

Power supply

115 V/230 V ac \pm 10%
50/60 Hz single phase

Motor thermal protection

Open 150° nominal

Potentiometer

1 k Ω standard, 5 k Ω option
Life: 10 million revolutions
Linearity: $<\pm$ 2%

Limit Switches

Two x open/close SPDT
250 V ac, 10 A

Operating angle

110° max

Duty cycle

65% at 20° C

Conduit entry

CM25 x 1.5 mm

Mechanical stop

Two adjustable screws

Manual override

Automated declutching mechanism

Materials

Steel, Aluminium alloy,
Bronze, Polycarbonate

External coating

Dry powder polyester

Weatherproof enclosure

IP67, NEMA 4 and 6

Ambient temperature

-20° C to +70° C

Ambient humidity

90% RH max (non-condensing)

Anti-condensation heater

7 – 10 W

Performance

Model	Valve size	Max output torque	Stroke time (seconds)		Max current (Amps)	
			50 Hz	60 Hz	220 V	110 V
EA100	2, 3, 4, 6, 8 in	100 Nm	25	21	0.88	1.7



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