

# rotork

## 'Q' Range electric direct-drive quarter turn valve actuators

### Instruction manual

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## Contents

	page
<b>1 Identifying Actuator Parts</b>	2
1.1 Weights	2
<b>2 Mounting Actuator and Setting Instructions</b>	3
2.1 Drive Bush	3
2.2 Mounting Actuator onto Valve	3
2.3 Setting Mechanical Stops	3
2.4 Electrical Wiring-Up	3
2.5 Switch Settings	4
2.6 Selection of Remote Control Functions	5
<b>3 Replacement of Top Cover and Indication</b>	5
3.1 Checking Electrical Operation	6
<b>4 Final Checks</b>	6
<b>5 Optional Extras</b>	6
5.1 Potentiometer Transmitter	6
5.2 Current Position Transmitter (C.P.T.) 4-20mA output	6
5.3 Folomatic Proportional Control	8
<b>6 Final Checks</b>	9
<b>7 Lubrication and Maintenance</b>	10
Appendix 1 Folomatic Range Switches	10

## Rotork actuator is supplied

- Fully rig and performance tested
- Torque output set to maximum
- Cable entries sealed for transit protection
- Inclusive of commissioning kit
- Inclusive of wiring diagram

Rotork actuator type is identified by a stainless steel label fitted to the main body.

## Health and Safety

This manual is produced to enable a competent user to install, operate, adjust and inspect Rotork 'Q' Range valve actuators.

The electrical installation, maintenance and use of these actuators should conform to the requirements of the "Electricity at Work Regulations 1989" and the guidance given in the IEEE Wiring Regulations". For the USA: NFPA70, Electrical code ® is applicable. Also any other national legislation applicable.

The mechanical installation should be carried out as outlined in this manual and also in accordance with the relevant British Standard Codes of Practice.

Only persons competent by virtue of their training and experience should be allowed to install, maintain and repair these actuators, and they should carry out this work in accordance with the instructions given in this manual. The user and those persons working on this

equipment should be familiar with their responsibilities under the Health and Safety at Work Act 1974 and relevant Statutory Provisions relating to their work.

Should further information and guidance relating to the safe installation, maintenance and use of the Rotork 'Q' Range actuator be required, this will be provided on request.

**Warning: With respect to handwheel operation of Rotork electric actuators, under no circumstances should any additional lever device such as a wheel-key or wrench be applied to the handwheel or in order to develop more force when closing or opening the valve as this may cause damage to the valve and/or actuator or may cause the valve to become stuck in the seated/backseated position.**

<b>rotork</b>	
ROTORK CONTROLS LIMITED BATH, ENGLAND.	
Serial no.	<input type="text"/>
Wiring diagram	<input type="text"/>
Actuator type	<input type="text"/>
Enclosure	<input type="text" value="IP68"/>
Speed	<input type="text"/> secs
Max. torque setting	<input type="text"/> Nm
Lubricant	<input type="text"/>
Motor rating	<input type="text"/> kW <input type="text" value="20%"/> duty cycle
Power supply	<input type="text"/>
Current at rated torque	<input type="text"/> Amp
Auxiliary switch rating	<input type="text" value="15"/> A <input type="text" value="240"/> Vac <input type="text" value=".25"/> A <input type="text" value="110"/> Vdc
<input type="text"/>	
<input type="text"/>	
<b>CE</b>	

Nameplate

## 1 Identifying actuator parts

### 1 Drive Bush

Steel Drive Bush supplied blank. Valve manufacturer to machine to suit valve spindle.

### 2 Hand Auto Lever

Returns to auto position when motor is engaged unless it is locked in the hand position. Note: more effort will be required to operate this lever when it has 'torqued off' at end of travel.

### 3 Hand Wheel

Handwheel is for manual operation and is engaged by pulling hand auto lever up towards the handwheel. See health and safety warning on page 1.

### 4 Mechanical Stops

Two stop bolts are provided with a setting range of 80° to 100° of output movement.

### 5 Top Cover

Top cover secured with 6 fixing bolts and sealed with a special seal.

### 6 Conduit Entries

Two cable entries are provided for power and control cables.

### 7 Terminal Cover

Terminal Cover secured with 4 fixing bolts sealed with 'O' Ring.

### 8 Name Plate

Name plate states serial number and technical specification.

### 9 Motor

**Warning:** With excessive use motor surface temperature could reach 132°C.

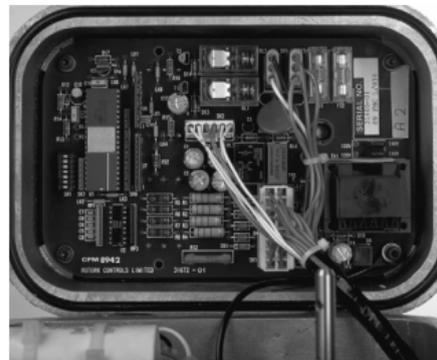
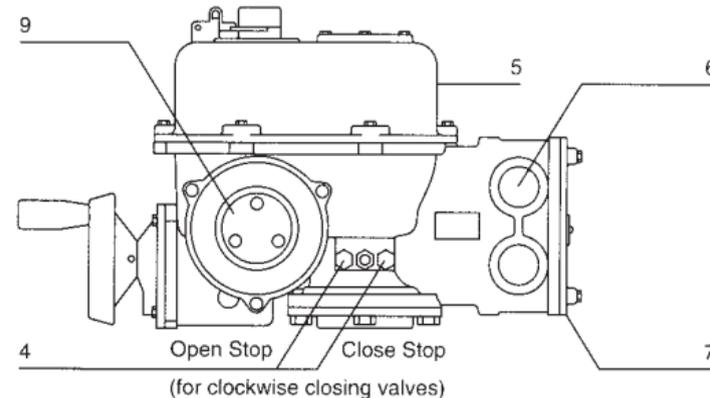
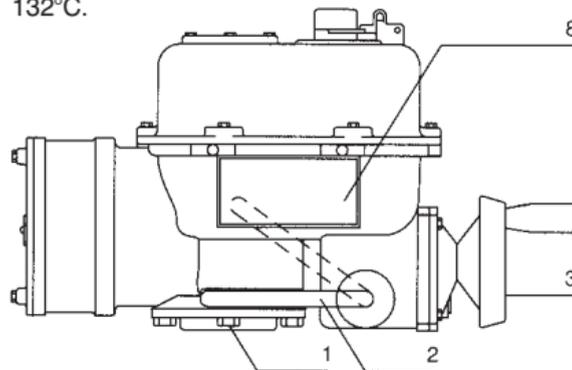


Fig. 2. Top cover in secured position.

## 1.1 Weights

Q100	Standard	11kg
Q100	Pak	12kg
Q300	Standard	21kg
Q300	Pak	22kg



## 2 Mounting actuator and setting instructions

### 2.1 Drive bush

To remove Drive Bush from the Q100 actuator base first remove circlip.

To remove Drive Bush from the Q300 actuator base first remove retaining screw.

Determine keyway position in Drive Bush with valve fully open.

Machine drive bush to suit valve spindle. Re-assemble drive bush to actuator base and secure with circlip or retaining screw.

### 2.2 Mounting actuator onto valve

Refer to page 2 for actuator weights. Ensure that the valve is secured firmly before fitting actuator to it as the combination once bolted together may be top heavy and therefore unstable.

If it is necessary to lift the actuator with a sling then please refer to the photograph fig. 1 showing the

mounting onto a vertical valve shaft. Trained and experienced personnel should be used to ensure safe lifting particularly when mounting actuators at other angles.

A suitable mounting flange conforming to ISO 5211 must be fitted to the valve.

Ensure that the position of both valve and actuator are the same, i.e. both open or both closed.

Lower the actuator onto the valve aligning the drive nut keyway or machined square onto the valve shaft. Bolt down the actuator onto the flange using 4 studs or bolts of the appropriate size and material conforming to ISO Class 8.8 yield stress 628 N/SQmm.

**Warning:** Do not lift the actuator and valve combination from the actuator. Always lift the actuator and valve assembly via the valve. Each assembly must be assessed on an individual basis for safe lifting.



Fig.1

### 2.3 Setting mechanical stops

(Assuming valve is clock to close).

The 'Q' Range of actuators are designed to stop on torque at each end of travel onto these mechanical stops. There are 10° or adjustment at each end giving 80° to 100° of valve movement.

Either direction may be set first, the left hand stop is for the open position and the right for closed.

#### Procedure

Back out both mechanical stops by two turns. Engage hand/auto clutch lever by pulling lever up towards actuator handwheel, manual mode of operation is now selected and will remain in hand until the actuator is operated electrically.

Hand wind the valve to the exact position that you wish the valve to stop. Screw in the appropriate mechanical stop as far as it will go and tighten lock nut, repeat this procedure in the other direction.

### 2.4 Wiring up

First remove the terminal cover. Inside will be a commissioning bag containing terminal screws and washers, spare cover seals, also the appropriate wiring diagram and instruction book.

### Cable Entries

Remove the two red plastic transit plugs, make cable entries appropriate to the cable type and size. Ensure that any threaded adaptors and cable glands are tight and fully watertight. Seal off unused entry with a steel or brass blank.

**Warning: Ensure that all cables to be terminated are electrically isolated.**

### Connections

Referring to both site and actuator wiring diagrams connect power supply and control cables using the screws, spring and plain washers supplied. Replace wiring diagram and instruction book back into the terminal compartment for future reference.

Refit the terminal cover after checking that 'O' ring seal is fully serviceable. Secure the cover with its four fixing screws.

## 2.5 Switch settings

Please note, the 'Q' range of Actuators are designed to stop on torque at each end of travel onto the pre-set stop bolts (Refer to Para 2.3) therefore there are no end of travel limit switches to set.

### Auxiliary switches

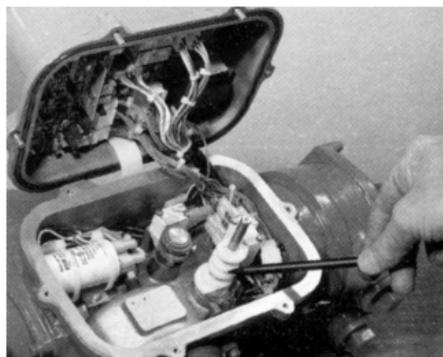


Fig. 3

Dependant on the actuator electrical specification there will be two or four auxiliary switches available for the customer to use (Fig. 3).

it is suggested that the lower pair of switches, Close Aux Switch (CAS) and Open Aux Switch (OAS) should be used for remote end of travel indication. If there is a bank of four switches the top two are Intermediate Aux Switches (IAS 1 & 2) which can be set independently to operate at any point of travel.

**Setting Warning: Actuator should be electrically isolated from main power and control supplies.**

If required a continuity meter may be connected across the appropriate switch terminals to assist in switch settings.

To gain access to switches first remove top cover from main Gearcase. To secure cover during settings there are two threaded holes in the side of the Gearcase (Fig 2).

Auxiliary Switch Cam adjustment is by finger tip rotation in each direction, cams are compression spring loaded and held in position by taper centres.

**For clockwise to close actuators.**

### Closed auxiliary switches (CAS)

Move valve to the fully closed position. Locate bottom cam on the shaft, lift and turn cam clockwise until switch just operates, release cam. Switch is now set.

### Open auxiliary switches (OAS)

Move valve to fully open position. Locate second cam up from bottom of shaft. Push cam down and rotate anti-clockwise until switch just operates, release cam. Switch is now set.

**For Anti-clock to close actuators.**

### Closed auxiliary switches (CAS)

Move valve to the fully closed position. Locate bottom cam on the shaft, lift and turn cam anti-clockwise until switch just operates, release cam. Switch is now set.



Fig. 4

### Open auxiliary switches (OAS)

Move valve to fully open position. Locate second cam up from bottom of shaft. Push cam down and rotate clockwise until switch just operates, release cam. Switch is now set.

### Torque output adjustment

Torque cams are factory set to give maximum rated torque in both directions. Torque can be reduced down progressively if required, as follows:

#### For clockwise to close actuators

##### Close - Green cam

Release locking screw, rotate cam anti-clockwise to reduce torque. Re-tighten locking screw.

##### Open - Red cam

Release locking screw, rotate cam clockwise to reduce torque. Re-tighten locking screw.

#### For anti-clock to close actuators

##### Close-Red cam

Release locking screw, rotate cam.

Anti-clockwise to reduce torque. Re-tighten locking screw.

##### Open-Green cam

Release locking screw, rotate cam clockwise to reduce torque.

Re-tighten locking screw.

## 2.6 Selection of remote control functions

The 8 Switch Selector on the main (larger) PCB enables different remote control functions to be chosen, also on 'Local' control the option of "maintained" control or "push to run".

PCB switch	On	Off
1 ESD	ESD	No ESD
2 TBP	Stat by-pass	No stat by-pass
3 PTR	Maintain in Local	No maintain in local
4 C/A	Clockwise close	Anti-clock close
5 ESD	ESD close	ESD open
6 P2	Both switches 'On'	Both switches 'Off'
7 P1		
	gives 'Close' priority	gives 'Open' priority
	One switch 'On' and one 'Off' gives 'Stayput' mode	

## 3 Replacement of top cover and local indication

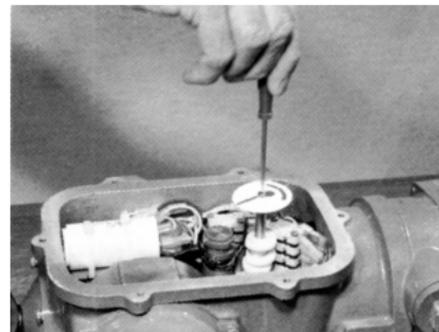


Fig. 5. Q' Standard Indicator Disc

### 'Q' Standard

Before replacing the top cover run actuator to one end of travel, adjust the indicator disc to this position and re-tighten securing screw, ensure that the cover seal is serviceable and in it's correct position, flange faces should be clean and lightly greased.

### 'Q' Pak

The Pak cover contains the local indication. Re-fit the pak cover ensuring the seal is serviceable and in it's correct position, flange faces

should be clean and lightly greased. Run actuator to one end of travel, this will re-align the indicator pointer.

### 3.1 Warning

**If possible electrical operation should only be carried out with the top cover fitted.**

#### Checking electrical operation

##### Q-Standard Specification

Switch on power supply.

Operate actuator open and closed using remote control if available.

##### Q-Pak Specification

Switch on power supply.

Rotate remote/stop/local selector knob clockwise to 'Local' control.

Use open/close control knob on actuator to check operation. Also check that stop position on selector stops the actuator.

## 4 Final checks

Check stop bolt lock nuts are tight.

Check terminal cover fixing bolts are tight.

Check conduit entries are correctly made off.

Check indication is correct.

Check cast groove in actuator base is not obstructed. Its purpose is to protect the actuator in the event of a product leak from the valve spindle/gland packing.

Check base to valve fixing bolts/nuts are tight.

## 5 Optional extras

### 5.1 Potentiometer transmitter

**Actuator should be electrically isolated from main power and control supplies before the top cover is removed.**

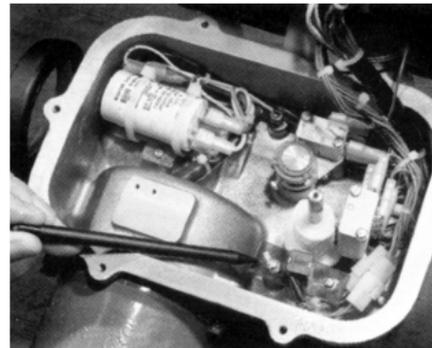


Fig. 6

The Potentiometer is used for position feedback and may be directly connected to a voltmeter type indicating instrument.

#### Setting

Move the valve to the fully closed position, loosen the two screws securing the potentiometer bracket to the gearcase and rotate the assembly so that a nominal 50 ohms resistance is measured between terminals 23 and 32 (or 14 and 23 for anti-clockwise closing valves). Re-tighten fixing screws.

### 5.2 Current Position Indication (C.P.T.) 4-20mA output

The CPT gives continuous indication with adjustment for span and zero settings.

#### Electrical connections

1 The CPT can be either internally or externally powered. Use the Wiring Diagram supplied with the actuator to check this.

2 Check whether valve is clock or anti-clock to close.

**Warning:** The C.P.T. can only be set-up with the actuator top cover removed and the C.P.T. power supply switched on. Where the C.P.T. is externally powered then only this supply (15-40 VDC) need be switched on, valve movement to set 'zero' and 'span' can be achieved using the actuator handwheel.

If the C.P.T. is internally powered then the mains supply must be switched on to do the settings. The C.P.T. printed circuit board is situated inside the actuator top cover. All electrical connections in this area are well insulated. However, only a fully insulated trimming tool should be used for adjustment and great care taken not to touch mains voltage connection in the electrical compartment.

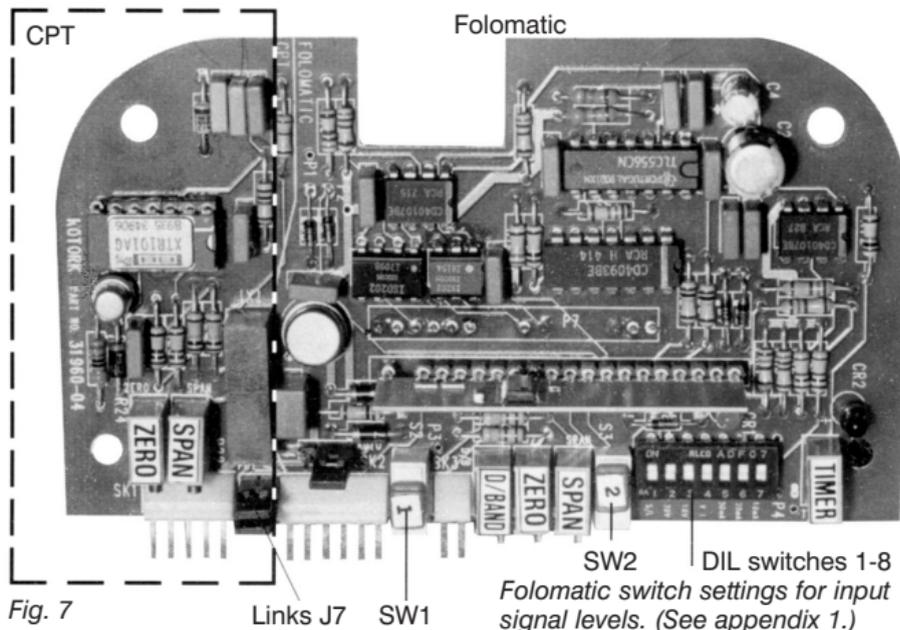


Fig. 7

### Setting of CPT

#### 1 Signal direction

- a Using Fig 7 locate the duel links J7. For a clock to close valve and low signal at closed and  
For an anti-clock to close valve and low signal at open.  
Links J7 must be positioned parallel to the edge of the board.

- b For a clock to close valve and low signal at open  
and  
For anti-clock to close valve and low signal at closed.  
Links J7 must be positioned at right angles to the edge of the board.

Folomatic switch settings for input signal levels. (See appendix 1.)

- 2 Move valve to the low signal end of travel.

- 3 Locate socket 2 (SKT 2) on folomatic CPT printed circuit board and remove socket. Socket pins are marked 1-6 using a multi-meter reading ohms, test between appropriate pins (see table below). Adjust potentiometer described in section 5.1 until approximately 50 ohms is measured. Lock potentiometer. Reconnect socket into CPT circuit board.

Indication system	Socket Pin number	ohms
Clockwise to close Low output at close or Anti-clockwise to close Low output at open	4 to 5 =	50
Clockwise to close Low output at open or Anti-clockwise to close Low output to close	4 to 6 =	50

4 Adjust the CPT zero trimmer potentiometer to required minimum signal.

5 Move valve to the high signal end of travel.

6 Adjust the CPT span trimmer to give required maximum signal.

7 Move valve back to the low signal end of travel and re-check the minimum reading and adjust if necessary.

## 5.3 Folomatic proportional control

### Zero/Span/Timer/Dead band

The Folomatic Proportional Control Module sets the valve position relating to an input signal with adjustments for Zero and Span setting. Refer to the Wiring Diagram supplied in the actuator and also the customers instructions for exact setting.

When the actuator Local/Off/Remote selector is set to 'Local' the actuator

functions like any other with Open/Stop/Close local control. The actuator should therefore be set to work initially under local control in accordance with this Instruction Book.

**WARNING: The Folomatic module can only be set-up with the top cover removed, main power supply on and the customers instrumentation signal (normally 4-20mA) applied.**

**The Folomatic printed circuit board is situated inside the actuator top cover. All electrical connections in this area are well insulated. However, only a fully insulated trimming tool should be used for adjustment and great care taken not to touch mains voltage connections in the electrical compartment.**

### Setting the folomatic

1 Determine whether the valve is clock or anticlock to close and also whether it is to open or close on a low demand signal.

Using Fig 7 locate switches 1 and 2, select as follows:

**a For Clockwise closing valves**  
Input signal low to close, SW1 selected towards edge of board, SW2 selected away from board.

Input signal low to open, SW1 selected away from edge of board, SW2 towards edge of board.

**b For anti-clockwise closing valves**

Input signal low to close, SW1 and SW2 away from edge of board.

Input signal low to open, SW1 and SW2 towards edge of board.

2 Determine what control input signal is going to be used, refer to Fig. 7 and locate the block of DIL switches and select range required.

**Note:** If the range required was indicated at the time of ordering - correct range will be set. If not then folomatic will be set for 4-20mA.

3 When using a 4-20mA control loop signal it is possible to select whether the actuator will "stay put" or fail to the 4mA end of travel on loss of signal. Switch No 1 on folomatic DIL switches to be selected 'on'. Switches P1 and P2 on **Main Board DIL Switches** (Fig. 7). Both selected 'on' gives fail to the close end of travel. Both selected 'off' gives fail to the open end of travel. One switch 'off' and one 'on' will give 'stay put'.

4 Check that incoming control cables are connected to the following terminals:

- a Current or voltage signal to 9 (-VE) and 12 (+VE), or alternatively.
- b Customers Potentiometer derived signal to 9,12 (Wiper) and 18.

**5** With actuator set to local control run the valve to the nominated low signal end of travel.

**6** Set input signal to required minimum value.

**7** Locate the 'Zero' trimmer and adjust until the green indicator (if valve is at closed position) or red indicator (if valve is at open position) on the PCB just lights either flashing or steady, clockwise movement of zero trimmer will illuminate the appropriate indicator.

**8** Operate the valve to the opposite end of travel (High Signal) using local control.

**9** Set input signal to it's required maximum level

**10** Locate the 'Span' trimmer and adjust until the red indicator (if valve is at the open position) or green indicator (if valve is at the close position) on the PCB just lights either flashing or steady, anticlockwise

movement of span trimmer will illuminate the appropriate indicator.

**11** Set Local/Remote Selector to "Remote". The actuator is available for Folomatic remote control to give full valve stroke with maximum input signal.

#### **12 Deadband adjustment**

If the actuator overshoots or responds unnecessarily to small changes in signal, increase the deadband by turning the deadband control clockwise. If greater sensitivity is required reduce deadband by turning anticlockwise. Check that hunting does not occur e.g. when the actuator is moving in the increasing signal direction, it should stop when the balance between the input signal and the actuator feedback potentiometer is achieved without the green light flashing on after the red lamp had extinguished. If hunting does occur, increase the deadband as necessary.

#### **Motion inhibit timer adjustment**

The Red and Green indicators on the PCB indicate a change of signal state:

Red = opening direction signal  
Green = closing direction signal

If either indicator is flashing it indicates a change of signal state that is being held off from operating the actuator for a predetermined length of time. This motion inhibit time is adjustable between 2 seconds and 40 seconds to suit site conditions. However it is advisable to reduce the delay time (anticlockwise adjustment of the trimmer) to minimum during the setting up procedure.

Refit top cover ensuring that the indicator rod is aligned, that the cover seal is in good condition and lightly greased, tighten down the 6 fixing screws.

## **6 Final Checks**

Check stop bolt lock nuts are tight.

Check terminal cover fixing bolts are tight.

Check conduit entries are correctly made off.

Check indication is correct.

Check cast groove in actuator base is not obstructed. Its purpose is to protect the actuator in the event of a product leak from the valve spindle/gland packing.

Check base to valve fixing bolts/nuts are tight.

## 7 Lubrication and maintenance

Rotork 'Q' range actuators are dispatched with gearboxes filled with oil to DEXRON 2 specification plus the addition of 20% paraffin, suitable for ambient temperatures ranging from -22°F / -30°C to 160°F / 70°C.

For applications where "foodgrade" lubrication is specified Q range actuators despatched with 13-426 oil medium and 13-427 grease medium.

If oil is replaced, DEXRON 2 should be used, however the addition of 20% paraffin is not required unless ambient temperatures below -4°F / -20°C are likely to be encountered.

### Oil Capacities

Q100 1/2 pint/0.25l.

Q300 1 1/4 pint/ 0.85l.

### Mechanical maintenance

After six months operation tighten mounting bolts.

If your Rotork actuator has been properly installed and sealed normal valve operation produces little wear and tear so no routine maintenance is recommended.

If the motorised valve is rarely operated a routine operating schedule should be set up.

If your actuator cannot be installed immediately store it in a dry place until required - do not remove transit plugs until you are ready to wire up.

A comprehensive "Maintenance and Spare Parts Manual" (publication number E680E) is available. Please apply to your nearest Rotork office or agent.

## Appendix 1

### Folomatic PCB DIL switch settings volatage or current ranges

Range	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
0-5mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0-10mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
0-20mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
4-20mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
0-50mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
0-5mA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0-10mA	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0-20mA	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Off

On

Off/On

SW1 Off - actuator runs to low signal end of travel on loss of signal.

SW1 On - actuator responds on loss of signal according to priority setting on main board switches P1 and P2.

Refer to page 8 para. 3.

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