rotork®

Controls

AWT Range
Installation and
Maintenance Instructions

⚠ **This manual contains important safety information. Please ensure it is thoroughly read and understood before installing, operating or maintaining the equipment.**

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This manual provides instruction on:

* Manual and electrical (local and remote) operation.
* Preparation and installation of the actuator onto the valve.
* Subsequent commissioning and adjustment of the position limit and torque switches for correct valve operation.
* Commissioning and adjustment of the actuator settings to suit site-specific control and indication requirements.
* Maintenance – Troubleshooting.
* Sales and Service.

CONTENTS

1 Health and Safety

This manual is produced to enable a competent user to install, operate, adjust and inspect Rotork AWT range valve actuators.

The electrical installation, maintenance and use of these actuators should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

For the UK: Electricity at Work Regulations 1989 and the guidance given in the applicable edition of the 'IEE Wiring Regulations' should be applied. Also the user should be fully aware of his duties under the Health and Safety Act 1974. For the USA: NFPA70, National Electrical Code® is applicable.

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

Only persons competent by virtue of their training or experience should be allowed to install, maintain and repair Rotork actuators. Work undertaken must be carried out in accordance with instructions in the manual. The user and those persons working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the health and safety of their workplace.

⚠ 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 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.

1.1 Motor Temperature

With excessive use the motor surface temperature could reach 132°C (270°F).

Where appropriate the user must ensure the actuator is suitably protected against its operating environment. Should further information and guidance relating to the safe use of the Rotork AWT range of actuators be required, contact Rotork.

2 Storage

If your actuator cannot be installed immediately, store it in a dry place until you are ready to connect incoming cables. If the actuator has to be installed but cannot be cabled it is recommended that the plastic transit cable entry plugs are replaced with metal plugs which are sealed with PTFE tape.

The Rotork double-sealed construction will preserve internal electrical components perfectly if left undisturbed.

Rotork cannot accept responsibility for deterioration caused on site once the covers are removed.

Every Rotork actuator has been fully tested before leaving the factory to give years of trouble-free operation, providing it is correctly installed, commissioned and sealed.

3 AWT Actuators

3.1 Syncroset Actuators

Each standard Syncroset consists of four basic sub-assemblies:

1. Motor.
2. Oil-filled worm gearbox with handwheel and de-clutch mechanism.
3. Limit and torque switch mechanism.
4. Terminal box.

The user must provide motor reversing contactors and associated control equipment.

Fig. 3.0 AWT Syncroset, Standard Sealed

Fig. 3.1 AWT Syncroset with Local Controls, Doubled Sealed

As an optional extra, syncroset actuators can be supplied with local controls.

Note: 40A to 95A Syncrosets are always double sealed.

Fig. 3.2 AWT Doubled Sealed Syncroset

Fig. 3.3 AWT Syncropak

3.2 Syncropak Actuators

Each standard Syncropak consists of four basic sub-assemblies:

1. Motor.
2. Oil-filled worm gearbox with handwheel and de-clutch mechanism.
3. Limit and torque switch mechanism
4. Integral starter with associated control equipment and double-sealed terminal box.

4 Operating your AWT

4.1 Operating by Hand

See warning in Health and safety Section 1.0 page 3 regarding handwheel operation

To engage handwheel drive, depress the Hand/Auto lever into Hand position and turn the handwheel to engage the clutch. The lever can now be released and it will return to its original position. The handwheel will remain engaged until the actuator is operated electrically when it will automatically disengage and return to motor drive. If required the Hand/Auto lever can be locked in either position using a padlock with a 6.5 mm hasp.

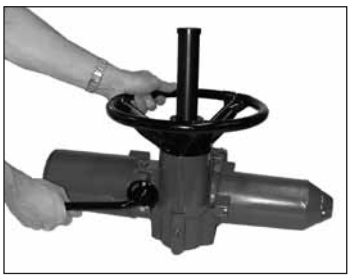


Fig. 4.0 Hand Operation

4.2 Operating Electrically – Syncroset

For all Syncroset actuators, it is vital that electrical connections to the control equipment and phase rotation are correct before allowing the actuator to operate the valve (refer to Section 12).

The basic syncroset actuator does not have actuator mounted local open/close or local/remote selectors. Control will be via control equipment remote to the actuator.

4.3 Operating Electrically – Syncroset with Local Push Button Control

The black selector switch can be turned to select either: Local, Remote, or Stop.When selecting Stop, note that the selector switch rides over and automatically depresses the red push button into the Stop position.

The red pushbutton on the starter cover has two functions: push-to-stop and turn-to-start, in either direction.

Fig. 4.1 Syncroset Push Button Controls

4.4 Operating Electrically – Syncropak

Check that power supply voltage agrees with that stamped on the actuator nameplate. Switch on power supply. **It is not necessary to check phase rotation.**

4.5 Selecting Local/Stop/Remote Operation – Syncropak

The red selector enables either Local or Remote control, lockable in each position using a padlock with a 6.5 mm hasp. When the selector is locked in the Local or Remote positions the Stop facility is still available. The selector can also be locked in the Stop position to prevent electrical operation by Local or Remote control.

Fig. 4.2 Syncropak Controls

4.6 Local Control – Syncropak

With the red selector positioned at Local (anti-clockwise) the adjacent black knob can be turned to select Open or Close. For Stop turn red knob clockwise.

4.7 Remote Control – Syncropak

Rotate the red selector to the Remote position (clockwise), this gives remote control only for Open and Close but local Stop can still be used by turning the red knob anti-clockwise.

4.8 Valve Position Indication

Valve position is indicated mechanically by a pointer as detailed in Figure 4.3 and Figure 4.4. Note that the pointer stays central during valve travel. When the Add-on-pak is fitted, pointer movement is continuous between Shut and Open.

Fig. 4.3 Valve Position Indicator

Syncropak type actuators also provide illuminated cover indication (mains power on) as shown in Figure 4.4.

Valve Position	Lamp (Syncropak)	Symbol
Open	Red	
Mid-Travel	White	
Shut	Green	

Fig. 4.4. Valve Position Indication

5 Preparing the Drive Bush

5.1 10A to 35A – Thrust Base Types A and Z

Removal of Drive Bush for Machining

Turn actuator onto its side, remove the two caphead screws holding base plate onto thrust base, pull out the drive bush complete with its bearing assembly. Before machining the drive bush, remove the thrust bearing from it as follows:

1. Locate and loosen the two set screws in the steel bearing stop ring.
2. Unscrew the bearing stop ring from the drive bush, slide the bearing off the drive bush. Keep the stop ring and beaing in a safe, clean place ready for re-assembly.
3. Machine the drive bush to suit the valve stem, allowing generous clearance on screw thread for rising stem valves. Ensure that the male thread on the bush is not damaged.

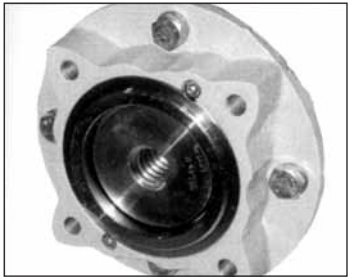


Fig. 5.0 Base Assembly

Re-assembly

1. Remove all swarf from the drive bush, ensuring that the 'O' rings on the drive bush and bearing stop rings are in good condition, clean and greased.
2. Slide bearing onto drive bush and ensure that it is fitted down to the shoulder.
3. Grease the bearing.
4. Screw bearing stop ring with the set screws uppermost onto the drive bush, tighten down hand tight. Lock with the two set screws.
5. Refit the drive bush assembly into the base casting on the actuator, ensuring that the slots in the drive bush are located into the drive dogs of the hollow output shaft.
6. Refit the base plate and secure with caphead screws.

Fig. 5.1 Type A Thrust Base Components

5.2 10A to 35A – Non-Thrust Base Type B

Undo the four capscrews securing the base plate to the gearcase and remove the base plate. The drive bush and its retaining clip can now be seen.

Types B3 and B4 removal

Using external circlip pliers, expand the circlip while pulling on the drive bush. The drive bush will detach from the actuator centre column with the circlip retained in its groove. This can be seen in Figure 5.2.

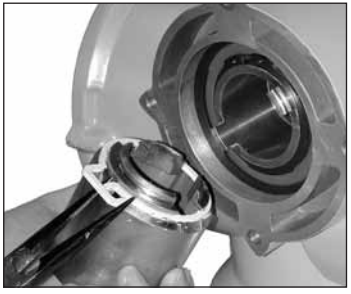


Fig. 5.2 B Type Bushes

5 Preparing the Drive Bush cont.

Types B3 and B4 re-assembly

Grease drive bush and circlip. With the circlip fitted in its groove offer the drive bush up to the actuator centre column ensuring the drive dogs are aligned. Expand the circlip while pushing the drive bush into the centre column. The drive bush will move further in. Release circlip pliers ensuring the circlip is correctly seated in both the drive bush and centre column grooves. Replace the base plate and fix with four capscrews.

5.3 40A to 95A – Thrust Base Types A and Z

Removal of Drive Bush for Machining

Engage Hand and turn handwheel until retainer set screw is visible through hole in actuator base.

Fig. 5.3 Type A Thrust Base Components

Loosen setscrew and unscrew retainer using hammer and punch. Remove drive bush and machine to suit valve stem or gearbox input shaft. Allow generous clearance on screw thread for rising stem valves.

Fig. 5.4 Type A Thrust Base Components

If the actuator has a type A drive bush, it can be fitted in position 1 or 2 to suit the position of the valve mounting flange.

Fig. 5.5 Type A Drive Bush

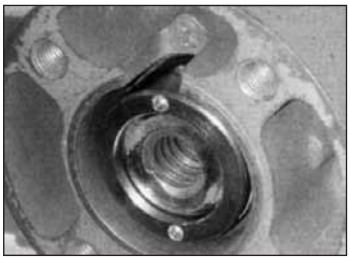


Fig. 5.6 Type A Drive Bush Position 1

Fig. 5.7 Type A Drive Bush in Position 2

Fig. 5.9 Tightening Retainer Set Screw

Fig. 5.8 Type Z3 Drive Bush

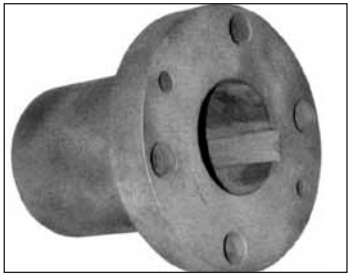


Fig. 5.10 B3/B4 Drive Bush

5.4 40A to 95A – Non -Thrust Base

Type B and B1.

For type B and B1 the output shaft can be bored and keyed to ISO 5210 standard. There is no drive bush to machine.

Types B3 and B4.

These are identical drive bushes secured by cap-headed screws. B3 is supplied pre-machined to ISO 5210 standard. B4 is supplied blank and must be machined to suit the input shaft of the gearbox or valve that it will drive.

6 Mounting the Actuator

(Refer to Section 13 for actuator weights.)

Ensure the valve is secure before fitting the actuator as the combination may be top heavy and therefore unstable.

If it is necessary to lift the actuator using mechanical lifting equipment certified slings should be attached as indicated in Figure 6.0 for vertical valve shafts and Figure 6.1 for horizontal shafts.

Fig. 6.0 Vertical Lifting

Fig. 6.1 Horizontal Lifting

At all times trained and experienced personnel should ensure safe lifting, particularly when mounting actuators.

⚠ **WARNING: The actuator should be fully supported until full valve shaft engagement is achieved and the actuator is secured to the valve flange.**

A suitable mounting flange conforming to ISO 5210 or USA Standard MSS SP101 must be fitted to the valve. Actuator to valve fixing must conform to Material Specification ISO Class 8.8, yield strength 628 N/sq mm.

⚠ **WARNING: Do not lift the actuator and valve combination via the actuator. Always lift the valve/ actuator assembly via the valve.**

Each assembly must be assessed on an individual basis for safe lifting.

6.1 Rising Stem Valves – Top Mounting

a) Fitting the Actuator and Base as a Combined Unit – All Actuator Sizes

Fit the machined drive bush into the thrust base as previously described, lower the actuator onto the threaded valve stem, engage Hand and wind the handwheel in the opening direction to engage the drive bush onto the stem. Continue winding until the actuator is firmly down on the valve flange. Wind two further turns, fit securing bolts and tighten fully.

b) Fitting Thrust Base to Valve – Actuator Sizes 10 to 35 only

Fit the machined drive bush into the thrust base as previously described. Remove the thrust base from the actuator, place it on the threaded valve stem with the slotted end of the drive bush uppermost and turn it in the opening direction to engage the thread. Continue turning until the base is positioned onto the valve flange. Fit securing bolts but do not tighten at this stage. Lower the actuator onto the thrust base and rotate the complete actuator until the drive dogs on the actuator output shaft engage into the drive bush. Actuator flange should now be flush with base flange.

Continue to turn actuator until fixing holes align. Using bolts supplied fix actuator to thrust base and tighten down. Open valve by two turns and firmly tighten down fixings onto valve flange.

6 Mounting the Actuator cont.

6.2 Valve with Gearbox – Side Mounting

Check that the mounting flange is at right angles to the input shaft, and that the drive bush fits the shaft and keyway with adequate axial engagement. Engage Hand, offer up actuator to the input shaft and turn handwheel to align key way and key. Slide on to shaft and tighten fixing bolts.

6.3 Non-Rising Stem Valves – Top Mounting

Treat as for side mounting except that when thrust is taken in the actuator, a thrust nut must be fitted above the drive bush and securely tightened.

6.4 Handwheel Sealing

Ensure that sealing plug in centre of handwheel (or spindle cover tube depending on which is fitted) is sealed with PTFE tape and fully tightened, ensuring that moisture does not pass down the centre column of the actuator.

7 Cable Connections

⚠ WARNING: Ensure all power supplies are isolated before removing actuator covers.

Check that the supply voltage agrees with that stamped on actuator nameplate.

A switch or circuit breaker must be included in the wiring installation of the actuator. The switch or circuit breaker shall be mounted as close to the actuator as possible and shall be marked to indicate that it is the disconnecting device for that particular actuator. The actuator must be protected with overcurrent protection devices rated in accordance with Rotork publication E330E electric motor performance data for AWT type actuators.

7.1 Earth/Ground Connections

A lug with a 6mm diameter hole is cast adjacent to the conduit entries for attachment of an external earthing strap by a nut and bolt. An internal earth terminal is also provided.

Fig. 7.0 Earthing Point

Fig. 7.1 Removing the terminal cover-Syncropak

7.2 Removing Terminal Cover

Using a 6mm Allen key loosen the four captive screws evenly. Do not attempt to lever off the cover with a screwdriver as this will damage the 'O' ring seal.

A plastic bag in the terminal compartment contains spare cover 'O' ring seal, wiring diagram and instruction book and terminal screws where applicable.

Fig. 7.2 Commissioning Kit

7 Cable Connections cont.

7.3 Cable Entry

Remove red plastic transit plugs. Make cable entries appropriate to the cable type and size. Ensure that threaded adapters, cable glands or conduit are tight and fully waterproof. Seal unused cable entries with a steel or brass threaded plug.

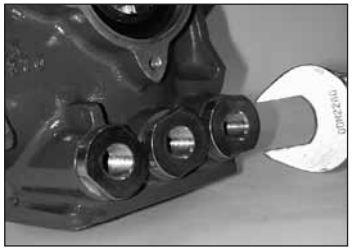


Fig. 7.3 Conduit Entries

7.4 Connecting to Terminals

Refer to the wiring diagram inside the terminal cover to identify functions of terminals. Check that supply voltage is the same as that marked on the actuator nameplate. Remove power terminal screen.

Begin by connecting these cables and replace screen. When all connections are made ensure wiring diagram is replaced in the terminal compartment.

Note: with AWT Syncroset correct phase rotation is essential for electrical operation and must be checked at start-up stage.

All Rotork AWT Syncroset 3-phase actuators are tested for correct phase rotation in terminal order 1(W), 2(V), 3(U) (refer to Section 11 and actuator wiring diagram).

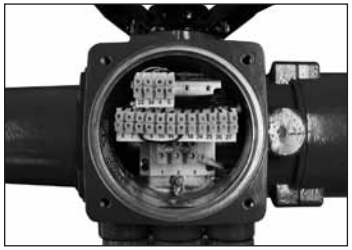


Fig. 7.4 Standard Sealed Terminal Compartment

7.5 Replacing Terminal Cover

Ensure cover 'O' ring seal and spigot joint is in good condition and lightly greased before re-fitting cover.

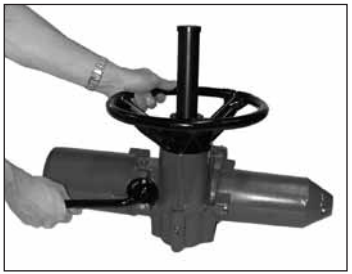
8 Setting Instructions

There are four basic steps that must be carried out to ensure correct operation of the valve.

- Setting the direction of travel.
- Setting the limit switches to operate at the end of travel.
- Selecting the correct Torque or Limit function for the type of valve.
- Adjusting the torque switch value for each direction of travel.

If the actuator was received pre-mounted on the valve, then the valve supplier should have already carried out all three steps. To check if the actuator is correctly set carry out the following:

1. With the actuator securely bolted to the valve, engage handwheel drive.



2. Fully open the valve by hand and check that the position indicator pointer moves over to the Open position just before the valve reaches its open stop.
3. Fully close the valve and check that the position indicator pointer now moves over to the Shut position, just before the valve reaches its closed stop.
4. If the indicator is reading correctly at both ends of the valve stroke, then it can be assumed that the valvemaker has already set the switches to operate at the end of travel. If required, Torque/Limit Function and Valve may be checked (refer to Sections 8.2 and 8.3).

Fig. 8 Valve Position Indicator (Clockwise to Close)

If the actuator was supplied separately from the valve or if the check proved that it is not correctly set up, then the following procedure must be carried out.

5. Note the direction of handwheel operation to close the valve (standard is 'clockwise'). If anti-clockwise direction is required to close the valve, the Valve Position Indicator will be reversed to that shown in Fig 8* and DIP switch 2.1 will be selected to 'ON'.

* A Conversion Kit is available.

8 Setting Instructions cont.

Firstly, check and set all the DIP switches as required using the table below as a guide to each function.

Standard actuator default: All switches off.

	Function	Switch OFF	Switch ON
SW2.1	Direction to Close	Clockwise to close	Anti-Clockwise to close
SW2.2	Local Control	Local operation maintained	Local push to run
SW2.3	Interlock Operation	Interlocks disabled	Interlocks Enabled
SW2.4	Thermostat By-Passed during ESD	Thermostat Active	Thermostat Bypassed
SW2.5	Control Option	No Control Option	Control Option Fitted
SW2.6	ESD Direction	ESD to Close	ESD to Open
SW2.7 SW2.8	Status Indication Relay (SIR)	When both switches are “off” the function of SIR is disabled	
SW2.7 SW2.8	SIR Relay	When switch 2.7 is “on” and 2.8 is “off” the function of SIR is Thermostat	
SW2.7 SW2.8	SIR Relay	When switch 2.7 is “off” and 2.8 is “on” the function of SIR is Local control selected	
SW2.7 SW2.8	SIR Relay	When switch 2.7 is “on” and 2.8 is “on” the function of SIR is Remote control selected	
SW2.9	Unused	-	-
SW2.10	Unused	-	-
SW2.11	Unused	-	-
SW2.12	Unused	-	-

Table 1.

8 Setting Instructions cont.

8.1 Setting the Limit Switches

Caution: Damage to the valve can occur due to incorrect setting of the switch mechanism.

Using a 5mm Allen key remove the three switch mechanism cover screws, pull cover off squarely and retain in a safe place. Engage handwheel by pushing down on the hand auto lever whilst turning the handwheel. Once engaged the lever can be released and the actuator will remain in hand drive. Locate the Switch Mechanism screwed shaft assembly.

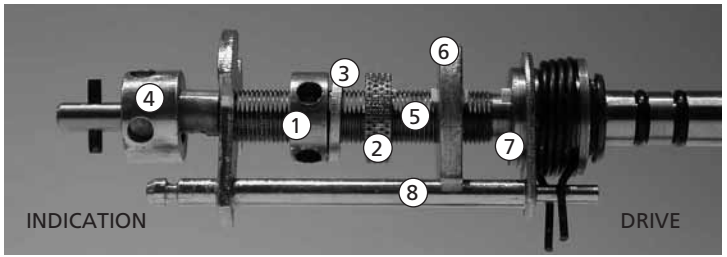


Fig 8.1 switch mechanism – Screwed shaft assembly

1. Lock nut
2. Anti-clockwise switch/stop nut
3. Locking washer
4. Clutch
5. Screwed shaft
6. Travelling nut
7. Clockwise switch/stop nut
8. Over travel guide

Fig. 8.0

Fig. 8.2

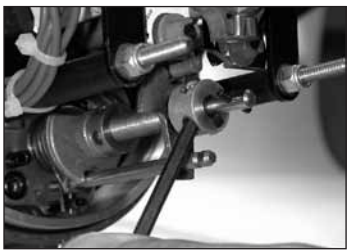


Fig. 8.3

1. Refer to Fig. 8.2. Using a 4mm Allen key as a lever, break open locknut (1) and anti-clock stopnut (2) and run them together with their locking washer along the screwed shaft (5), toward the indicator end of the assembly
2. Leave all three components loose on the shaft.
3. Refer to Fig. 8.3. Using a 4mm Allen key, loosen clutch nut (4) by turning it anticlockwise until it is finger tight. Note that the screwed shaft can now be turned with the fingers.
4. As the screwed shaft is turned, the travelling nut (6) will move up and down the shaft.

8 Setting Instructions cont.

Setting Clockwise Limit
(Valve usually closed)

It is essential that the Clockwise direction is set first.

1. With the valve in a Mid Travel position (at least 3 turns away from the clockwise end of travel), turn screwed shaft (5) anticlockwise until the traveling nut (6) comes to the mechanical back stop (7).
2. Using a 4mm Allen key as a lever tighten the clutch nut (4).
3. Using the handwheel wind the valve fully clockwise. During this operation the over travel guide will rotate to the right and operate the right-hand bank of switches.
4. Continue winding the handwheel clockwise until the valve comes to a mechanical stop.

The fully clockwise end of travel Limit Switches are now set.

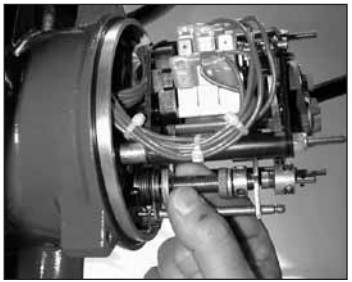


Fig. 8.4

Setting Anticlockwise Limit
(Valve usually open)

1. Wind the handwheel anticlockwise until the valve comes to a mechanical stop. **DO NOT back wind the handwheel**. The actuator will automatically stop before the valve open position is reached.
2. Refer to Fig. 8.5.
   Pull over travel guide (8) in a clockwise direction until it comes hard up against its stop. The left hand bank of switches will operate.
3. With over travel guide still held against the stop, run stop nut (2) clockwise down screwed shaft until it comes hard up against traveling nut (6).
4. Push washer (3) down the screwed shaft until it is against stop nut then run lock nut (1) down until it clamps both nuts and washer together.

Fig. 8.5

5. Lightly tighten locknut (1).
6. Release pressure on over travel guide. The guide should stay put and switches should not be seen or heard to reset. If the switches reset, the setting anticlockwise limit procedure must be repeated.

The Anticlockwise Limit switches are now set.

By following the above procedure exactly, you have ensured:

1. That the switches are set to cut off the motor before the valve reaches its end of travel and that the motor has time to come to rest.
2. That manual operation of the valve can never alter the switch operating point which you have set.

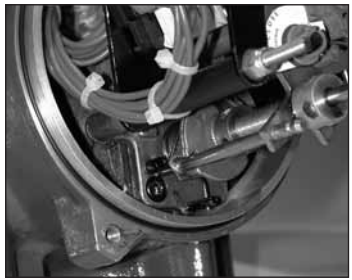


Fig. 8.6

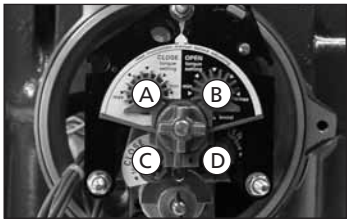


Fig. 8.7

8.2 Selecting Torque or Limit Priority

The actuator can be set to close on Torque for seating valve types or limit for non-seating valve types.

Where the valve requires backseating on torque in the open position 'Open or Torque' should be set.

Selection of Torque or Limit end of travel priority is made by turning controls marked C & D in Fig 8.7. In the absence of specific valve makers' instructions refer to Figure.8.8 as a guide.

If in any doubt about the correct settings for the valve, select Limit in both directions.

Valve Type	Shut	Open
Wedge Gate Globe	Torque	Limit
Thru-Conduit Penstock	Limit	Limit
Sluice Parallel Slide Ball, Plug, Butterfly	Limit	Limit

Fig 8.8

8.3 Selecting Torque Values

Controls A and B, in Figure.8.7, adjust the amount of torque the actuator will produce before the torque switch trips and stops the motor.

Ideally, only the minimum torque necessary to achieve tight shut off should be applied. In practice this value will vary from valve to valve and fluctuate with pressure, temperature, usage and service, etc.

Close Torque – In the absence of specific valve makers' instructions it is recommended that the Close torque knob be selected to the first marked graduation above minimum (approximately 55% of maximum rated torque). Be prepared to increase this torque value if the valve fails to reach the closed position or tight shut off is not achieved.

Open Torque – The Open torque knob should be selected to Max unless the valve makers' specific instructions recommend otherwise.

Open Torque Boost Position – The Open torque selector knob has a position labeled Boost. When selected there will be no torque protection in the opening direction, allowing the actuator to produce torque in excess of rated. Boost is only to be used where a stuck valve will not open using maximum torque.

CAUTION – Double check that the Open Torque/Limit selector (D) is in the Limit position when using Boost.

NEVER SELECT BOOST WITH OPEN TORQUE/LIMIT SELECTOR IN THE TORQUE POSITION.

9 Add-on-Pak

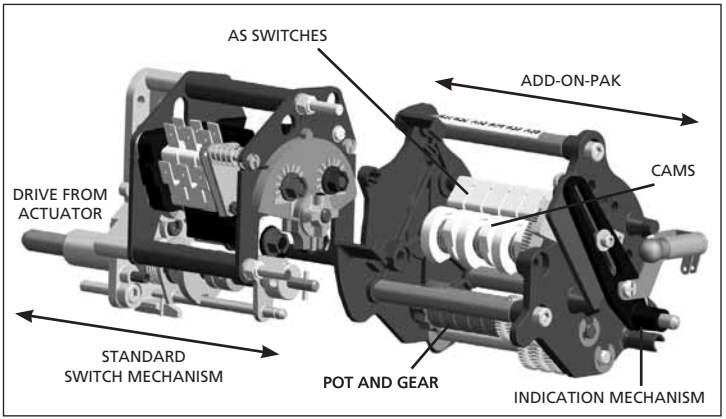


Fig. 9.0 Add-on-Pak

9.0 Add-on-Pak – Setting Instructions

The Add-on-Pak (AOP) is an optional extra providing continuous local cover indication. The Add-on- Pak may also include the following:

- 2 'AS' auxiliary indication switches
- 6 'AS' auxiliary indication switches
- 1k or 5k Ohm Potentiometer position feedback
- 4-20mA Current Position Transmitter (CPT) position feedback

Check the actuator wiring diagram for Add-on-Pak configuration.

The Add-on-Pak is driven from the switch mechanism via an adjustable gear train which must be set for the valve turns range. If the valve turns were quoted with actuator order, Rotork will have set the Add-on Pak gear train and therefore only site setting of cover indicator, auxiliary switches (if fitted) and analogue feedback device (if fitted) is required. Instruction for setting the AOP assume clockwise operation to close the valve. For anti-clockwise to close valves, read ''open'' for ''close'' etc. Refer to Section 10 for AOP turns adjustment.

9.1 Setting the Indication

1. Unscrew the three fixing screws and remove the AOP cover.
2. Close the valve fully and then open it three turns.
3. To set the closed indication of clock to close valves, push the top of the indication mechanism in a clockwise direction until it butts against the plastic stop moulded in the AOP front plate. A slipping clutch allows the indication mechanism to be moved.
4. Wind the valve closed to remove any backlash in the gear train. The closed indication position is now set.
5. To set the open indication, loosen the capscrew on the indication mechanism. The open stop plate is now free to rotate.

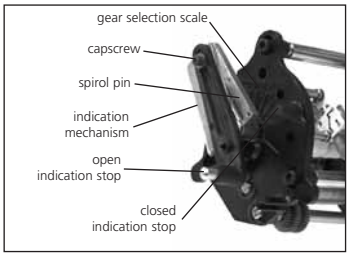


Fig. 9.1 AOP Indication

6. Wind the valve to the fully open position.
7. Rotate the open stop plate anticlockwise until it butts against the open indication stop moulding.
8. Re-tighten the capscrew on the indication mechanism
9. The open position indication is now set.

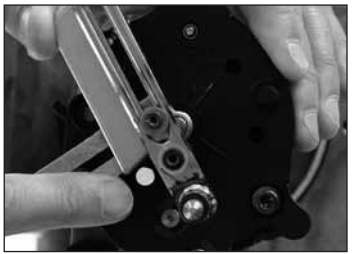


Fig. 9.2 Open Indication stop

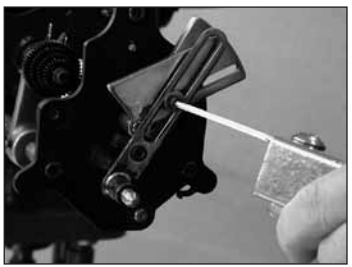


Fig. 9.3 Capscrew

9.2 Setting the Switches – Closing Direction

The switches can be independently adjusted to make or break at any position through the valve stroke including open and shut. This process takes place with the valve being moved from the open to the shut position. Identify the required switch *(refer to the wiring diagram)*.

1. Run the valve to the required switch tripping position.
2. Locate the cam adjacent to the selected switch. The cam must be rotated to a position where the switch operates
3. The cam is adjusted by pushing it against its spring, and rotating it to make or break the switch (for make or break at selected valve position).
4. Continue to close the valve, setting the remaining switches required to operate in the closing direction.

9.3 Setting the Switches – Opening Direction

This process takes place with the valve being moved from the closed to the open position. Identify the required switch *(refer to the wiring diagram)*.

Fig. 9.4 Switch Cam Adjustment

1. Run the valve from the closed position to the required switch tripping position.
2. Locate the cam adjacent to the selected switch. The cam must be rotated to a position where the switch operates
3. The cam is adjusted by pushing t against its spring, and rotating t to make or break the switch (for make or break at selected valve position).

4. Continue to open the valve, setting the remaining switches required to operate in the opening direction.

9.4 Single Turn Pot

(refer to Figure.9.5) Ensure the AOP Indication has been set. (Refer to 9.1)

1. Fully open the valve.
2. Locate the spirol pin in the indication mechanism. This pin will be lined up with a scale moulded in the front plate of the AOP.
3. The scale 1 to 4 relates to the four gears on the potentiometer. 1 = small gear, 4 = large gear.
4. Loosen the pot-mounting bracket screw and disengage gear mesh.
5. Rotate the pot to a Mid position and re-engage the gear, corresponding to the scale (1 to 4), with the large gear on the AOP.
6. Tighten the screw on the pot - mounting bracket to secure the gears in mesh.
7. Run the valve closed. A slipping clutch will automatically set the potentiometer.

Fig. 9.5 Single Turn Pot

9.5 Current Position Transmitter (CPT) Setting

The CPT gives continuous indication with adjustment for Span and Zero settings and can be either internally or externally powered. A multi-turn potentiometer drives the CPT and will be set by Rotork according to the valve turns supplied at time of order. The actuator torque and limit switches should be set *(Refer to Section 8)*.

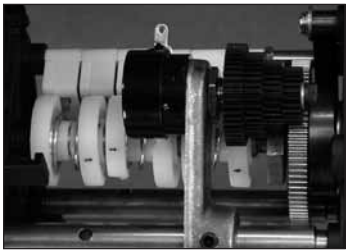


Fig. 9.6 Multi-turn Pot

Check that the remote connections to the CPT are suitable for internally or externally powered systems as applicable *(see actuator wiring diagram)*.

With the valve closed, set the minimum required signal (4mA) by adjusting the Zero potentiometer on the CPT PCB.

Operate the valve to the fully open position and adjust the Span control to give the required maximum signal (20mA).

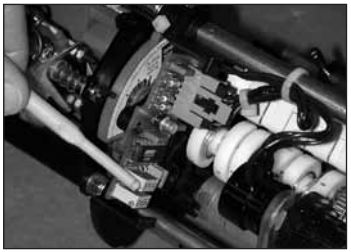


Fig. 9.7 CPT

The AOP cover can now be refitted using the three fixing screws.

Fig. 9.8 AOP Cover

10 Changing the AOP Gear Ratio

If the valve turns range was pecified with actuator order the AOP will be factory set with the correct gear ratio.

To adjust the AOP gear train to suit the valve turns range:

1. Close the valve
2. Remove the three fixing screws securing the AOP cover and remove the cover ensuring the 'O' ring is not damaged.
3. Whilst observing the limit switch shaft, operate the actuator from one end of travel to the other and count the number of turns of the shaft.
4. Use the table in Figure 10.0 to determine the number of gear clusters and spacers you require.

Turns of Limit Switch Shaft	Number of Gear Clusters	Number of Drive Spacers
0.52–1.04	1	8
1.05–2.12	3	7
2.13–4.28	5	6
4.29–8.68	7	5
8.69–17.53	9	4
17.54–32.00	11	3

Fig. 10.0 Gear and Spacer Combinations for Required Valve Torque

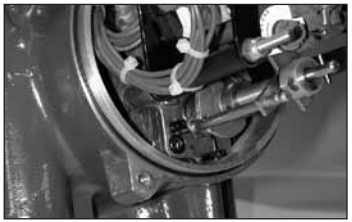


Fig. 10.1 Limit Switch Shaft in Switch Mech

5. Check if the correct number of gear clusters and spacers are fitted to your AOP. If the correct number is used, refer to Section 9 for AOP setting instructions.
6. Refer to Fig. 10.2.
   If the number of gear clusters and spacers is not correct remove the three capscrews located on the AOP frontplate, which secure to the pillars.
7. Refer to Fig. 10.3.
   Pull the frontplate away from the actuator. The frontplate with gear clusters and spacers will detach from the AOP backplate and pillars.
8. Remove the circlip and washer from the end of the lower shaft on the detached AOP frontplate.
9. Add/remove the required number of gear clusters and spacers, according to the table in Figure 10.0.
10. Replace the circlip and washer on the lower shaft on the detached section of the AOP frontplate.
11. Align the detached section with the rest of the AOP.
12. The cam shaft and shaft retaining the gear clusters, will engage first as shown in Figure 10.4.
13. Align the remaining shafts and push the AOP frontplate on to the pillars.
14. When fully located, secure the AOP with the three capscrews.
    Refer to Section 9 for AOP setting instructions.
15. Replace the cover and secure with the three fixing screws.

Fig. 10.2 AOP Front Plate Fixing Screws

Fig. 10.3 AOP Gear Clusters and Spacers

Fig. 10.4 AOP re-alignment and engagement

11 Folomatic Setting Procedure

Syncropak Actuators Fitted with Folomatic Proportional Control and Current Position Transmitter (CPT)

When an Awt Syncropak actuator is specified with the Folomatic Proportional Control option, the CPT will also be present on the same pcb. These instructions cover the set up of both devices since their operation is inter related.

The Folomatic proportional control and CPT pcb enables the valve to be controlled to a position that is proportional to an externally applied, anologue Demand signal. The Folomatic controller is suitable for externally sourced anologue Demand signals in the ranges, 0 to 20mA, 0 to 10mA, 0 to 5 volts or 0 to 10 volts with or without offset (live) zero such as 4 to 20mA.

Before commencing with the set up of the Folomatic controller refer to the actuator wiring diagram, which can be found in the actuator terminal compartment, and any Customer instructions for exact setting requirements. Make sure that the actuator has been commissioned in accordance with the instructions detailed in earlier sections of this booklet and that it is operating correctly with the Local / Remote Selector switched to Local and using the Local pushbuttons. The Folomatic controller output is disabled when the Local / Remote selector is in the Local position and the actuator will only respond to signals from the Local pushbuttons.

In order to set up the Folomatic controller it is necessary to gain access to the Folomatic / CPT pcb. This is fitted inside the actuator control housing immediately behind the pushbutton cover. It is accessible once the pushbutton cover has been removed by unscrewing the four allen screws securing the pushbutton cover to the electrical housing. Make sure that the pushbutton cover is adequately supported and that the electrical connections between the pushbuttons / selector switch assembly and the control system remain connected.

It is suggested that the pushbutton cover, once removed, can be conveniently supported by one allen screw passed through the bottom right screw hole in the pushbutton cover and screwed into the top left tapped hole in the electrical housing. If this method is adopted make sure that the 'o' ring has been removed from the cover spigot and that the wiring loom is not trapped.

When refitting, again make sure that the 'o' ring is fitted correctly and that the wiring loom is not trapped.

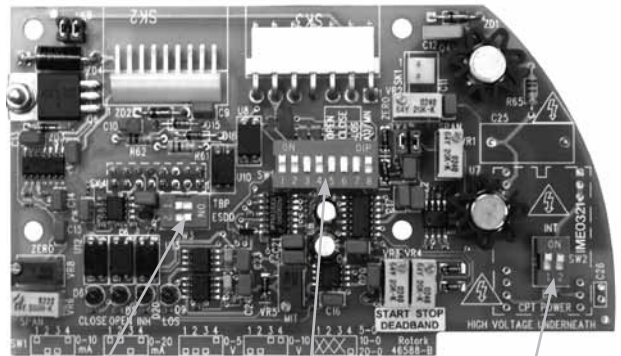


Fig 11.1 Folomatic / CPT PCB

11 Folomatic Setting Procedure cont.

11.1 Configuration of Folomatic and CPT PCB

Step 1 – Configuration of DIP Switches

Main PCB – Please refer to table 1 on page 12 to enable the Folomatic Option.

Switch Bank 1 (SW1) - Demand Signal

SW1 is a bank of 8 switches mounted in the centre of the Folomatic pcb, numbered 1 to 8 from the left as shown on Fig 11.1.

Switch Bank SW1, Switches 1, 2 and 3 are used for setting the Folomatic pcb to suit the incoming Demand signal. Switches 1, 2 and 3 should be configured according to the table below.

0 to 10mA	SW1 Switch 1 - **ON**	SW1 Switch 2 - **OFF**	SW1 Switch 3 - **OFF**
0 to 20mA	SW1 Switch 1 - **ON**	SW1 Switch 2 - **ON**	SW1 Switch 3 - **OFF**
0 to 5 Volts	SW1 Switch 1 - **OFF**	SW1 Switch 2 - **OFF**	SW1 Switch 3 - **OFF**
0 to 10 Volts	SW1 Switch 1 - **OFF**	SW1 Switch 2 - **OFF**	SW1 Switch 3 - **ON**

Switch Bank SW1, Switch 4 is used to select whether increasing or decreasing Demand signal will close the valve. Configure switch 4 as shown below.

Decreasing signal to close valve	SW1 Switch 4 – **ON**
Increasing signal to close valve	SW1 Switch 4 – **OFF**

Switch Bank SW1, Switches 5, 6 and 7 are used to select the action required from the Folomatic controller in the event of loss of Demand signal. Note: this action is only applicable to systems having a Demand signal with a live zero, for example 4 to 20mA.

No Action	SW1 Switch 5 - **OFF**	SW1 Switch 6 - **OFF**	SW1 Switch 7 - **ON**
Stayput	SW1 Switch 5 - **OFF**	SW1 Switch 6 - **OFF**	SW1 Switch 7 - **OFF**
Close valve	SW1 Switch 5 - **OFF**	SW1 Switch 6 - **ON**	SW1 Switch 7 - **OFF**
Open valve	SW1 Switch 5 - **ON**	SW1 Switch 6 - **OFF**	SW1 Switch 7 - **OFF**

Switch Bank SW1, Switch 8 is used when a remotely mounted Auto / Manual selector is employed. This type of control is only available when the Folomatic controller is externally powered by providing an externally sourced 24 Volt DC supply to the Auto / Manual input terminal on the actuator terminal bung.

Folomatic always selected	SW1 Switch 8 - **ON**
Folomatic only when remote Manual / Auto selector is in Auto	SW1 Switch 8 - **OFF**

Switch Bank 2 (SW2) – CPT Power Source

SW2 is a bank of 2 switches mounted at the bottom of the right hand side of the Folomatic pcb, numbered 1 & 2 from the left as shown on Fig 11.1.

Switch Bank 2 switches are used to configure the power supply source for the Current Position Transducer **(CPT)** when it is being used on an actuator that is fitted with a Folomatic controller, check details of your wiring diagram and system.

If the CPT is not in use configure SW2 Switches 1 and 2 to the internally powered position **(ON)**.

When the CPT is powered by the actuator (internally powered) it shares its power supply with the Folomatic input circuit. Actuator terminals 4, 27 and 23 are electrically common.

When SW2 Switches are configured for an externally powered CPT actuator terminal 23 is isolated from actuator terminals 4 and 27. It is essential that the potential between the CPT and the Folomatic input (terminals 26 and 27) should not exceed 500 volts.

CPT internally powered	SW2 Switch 1 - **ON**	SW2 Switch 2 - **ON**
CPT externally powered	SW2 Switch 1 - **OFF**	SW2 Switch 2 - **OFF**

If the CPT is externally powered by a non-SELV (non-Safety Extra Low Voltage) power supply additional precautions are required to ensure that the user is protected from electrical shock risk during the calibration procedure and use of the equipment. These precautions are the responsibility of the installation engineer.

11 Folomatic Setting Procedure cont.

Switch Bank 3 (SW3) – ESD Function

SW3 is a bank of 2 switches mounted to the left of the centre of the Folomatic pcb, numbered 1 & 2 from the top as shown on Fig 11.1.

Switch Bank 3 switches are used to configure the action to be taken by the actuator if an Emergency Shut Down (ESD) signal has been received by the actuator.

The motor thermostat, if active, could interfere with the valve operation if it trips during or prior to an ESD action. Switch Bank 3 Switch 1 allows the Motor Thermostat to be bypassed during an ESD action if desired.

Switch Bank 3 switch 2 configures the direction of valve movement during an ESD.

Thermostat bypassed during ESD	SW3 Switch 1 - **ON**
Thermostat active during ESD	SW3 Switch 1 - **OFF**
Valve to close during ESD	SW3 Switch 2 - **ON**
Valve to open during ESD	SW3 Switch 2 - **OFF**

Step 2 – Configuration of Link A (LKA) and Link B (LKB)

The positions on the Folomatic and CPT pcb of Links A and B are identified in Figure 11.2 below.

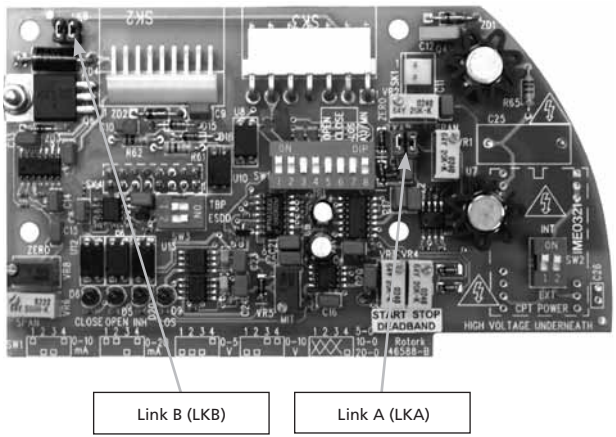


Fig 11.2 Folomatic / CPT PCB

In Fig 11.2, Link A (LKA) is shown in the position for the Folomatic controller to suit a clockwise to close valve.

For anti-clockwise to close valves the link LKA should be removed, rotated through 900 and refitted. In addition switch SWI.1 on the main Syncropak pcb should be moved to the anti-clockwise to close (ACW) position.

In Fig 11.2 Link B (LKB) is shown in the position for the CPT to give an output signal of 20mA at the valve fully open position. To reverse the CPT's operation the link LKA should be removed, rotated through 900 and refitted.

11.2 Commissioning the Folomatic Controller and the CPT

In order to provide details of the commissioning procedure the following instructions assume that:

The valve is clockwise to close with a decreasing Demand signal to close the valve.

AC power has been applied to the actuator.

Limit / torque switches and Add-on-Pak 1 have been set in accordance with the instructions earlier in this booklet.

The Local / Remote selector switch has been set to Local.

Step 1 – Add-on-Pak 1 potentiometer.

This potentiometer provides the "feedback" signal that is compared with the Demand signal by the Folomatic controller.

Maximum accuracy will be achieved with the Folomatic controller when the Add-on-Pak 1 potentiometer is driven over at least 80% of its total travel while the valve is moved over its complete stroke. It is important to ensure that the Add-on-Pak 1 potentiometer does not hit either of its travel end stops at the ends of the valve stroke.

Fully close the valve using the Local controls.

With the actuator fully closed remove the Add-on-Pak 1 cover and loosen the potentiometer mounting bracket grub screw.

Disengage the potentiometer by swinging the potentiometer and its mounting bracket away from its driving gear.

Rotate the potentiometer gear until it is 5% to 10% of its total travel away from its anticlockwise end stop.

Re-engage the potentiometer drive without changing its feedback position and tighten its fixing grub screw to lock it in position.

Step 2 – Folomatic / CPT PCB Adjustments

During this part of the commissioning procedure it will be necessary to adjust 7 trimming potentiometers that are mounted on the Folomatic / CPT pcb while appropriate Demand signals are applied to the actuator terminals and the valve is moved, as required.

Note: Potentiometers VR1, VR2, VR3, VR4 and VR6 all require 24 turns of their adjusting screw to move from end to end of potentiometer travel. VR5 and VR8 require 25 turns of their adjusting screw to move from end to end of potentiometer travel. All PCB mounted potentiometers are protected by a slipping clutches at the ends of travel. They can be moved to the end of travel by rotating the adjusting screw for 25 turns in the appropriate direction. Some potentiometers make an audible 'click' for each turn of the adjusting screw, should you hear this it is not cause for concern.

If the valve is not already in the fully closed position use the actuator's Local controls to move the valve to the fully closed position.

11 Folomatic Setting Procedure cont.

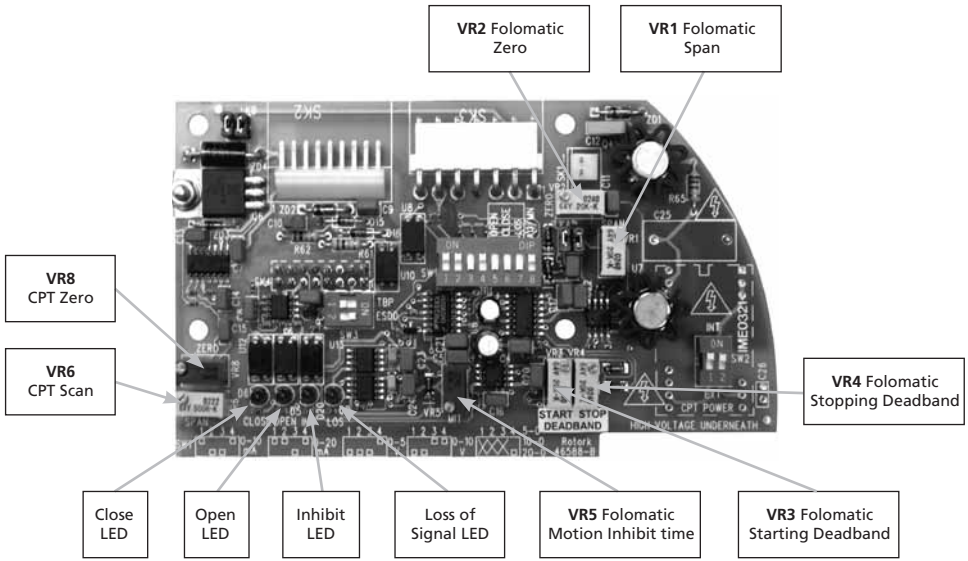


Fig 11.3. Folomatic / CPT PCB

Adjust the CPT Zero potentiometer **VR8** to give an output of 4mA. Note: Rotating the potentiometer adjusting screw clockwise increases the output current.

Set Folomatic Span potentiometer **VR1** to its maximum position, fully clockwise.

Set Folomatic Zero potentiometer **VR2** to its minimum position, fully anti-clockwise.

Set Folomatic Starting Deadband potentiometer **VR3** to its minimum position, fully anti-clockwise.

Set Folomatic Stopping Deadband potentiometer **VR4** to its minimum position, fully anti-clockwise.

Set Folomatic Motion Inhibit Time potentiometer **VR5** to its minimum position, fully anti-clockwise.

11.3 Folomatic PCB Set up for Limit Switch Controlled Valves

During set up of valves whose end(s) of travel is controlled by limit switch use the full range of the Demand signal.

11.4 Folomatic PCB Set up for Torque Seating Valves

In order to ensure that the actuator 'drives' the valve into its seat in the case of torque seating valves it is recommended that during the set up procedure a slightly modified Demand signal for the torque seating direction(s) of operation is used. For example for a system using a Demand signal of 4 to 20mA for full stroke and torque seating at the 4mA end of travel it is suggested that 4.2 mA is used as the set up Demand signal.

During normal operation a Demand signal of 4mA will be present when the valve is required to travel fully to that end of the valve stroke and therefore the valve will be driven by the actuator until the actuator torque switch trips. When the torque switch is tripped, stopping the actuator, the Folomatic Close LED will still be illuminated showing that a the Demand signal is still present thus ensuring that it is the torque switch that is controlling the valve.

If torque seating is required at the high Demand signal end of valve travel it is suggested that on a 4 to 20mA system a Demand signal of say 19.8mA be applied during set up. For proportional control systems using other Demand signals similar adjustments to the signal during set up should be made.

Generally the amount of Demand signal offset should be approximately half of the anticipated dead band setting. For example on a 4 to 20mA system with a deadband of 2% the offset should be 0.16mA

11.5 Folomatic / CPT PCB

Apply the Demand signal corresponding to the valve closed position to the appropriate actuator terminals. The Open LED on the Folomatic PCB should be illuminated.

Rotate the Folomatic Zero potentiometer **VR2** clockwise until the Open LED is just extinguished and the Close LED has not illuminated. The Close LED should not be illuminated but it may be difficult to achieve this balanced condition as the Deadband potentiometers have been set to minimum. If this is the case it is sufficient to be at the threshold of the Open and Close LEDs changing over.

Fully open the valve using the actuator's Local controls.

Adjust the CPT Scan potentiometer **VR6** so that 20mA can be measured at the appropriate actuator terminals. Rotating **VR6** clockwise will increase the current.

Increase the Demand signal applied to the actuator terminals to the value that corresponds with the valve fully open position. The Close LED should be illuminated. Rotate the Folomatic Span potentiometer **VR1** anti-clockwise until the Close LED is just extinguished. Again it may prove difficult to achieve this balanced condition as the Deadband potentiometers have been set to minimum. If this is the case it is sufficient to be at the threshold of the Open and Close LEDs changing over.

Fully close the valve using the actuator's Local controls and apply the Demand signal corresponding with the valve closed position to the appropriate actuator terminals.

Finely adjust the Folomatic Zero potentiometer **VR2** until both the Open and Close LED's are extinguished or at the threshold of changing over. Turn **VR2** clockwise if the Open LED is illuminated and anti-clockwise if the Close LED is illuminated.

Check that the CPT output is 4mA at the appropriate actuator terminals and finely adjust the CPT Zero potentiometer **VR8** if necessary.

Fully open the valve using the actuator's Local controls and apply the Demand signal corresponding with the valve open position to the appropriate actuator terminals.

Finely adjust the Folomatic Span potentiometer **VR1** until both the Open and Close LED's are extinguished or at the threshold of changing over. Turn **VR1** clockwise if the Open LED is illuminated and anti-clockwise if the Close LED is illuminated.

Check that the CPT output is 20mA at the appropriate actuator terminals and finely adjust the CPT Span potentiometer **VR6** if necessary.

11 Folomatic Setting Procedure cont.

The Span should now be sufficiently accurate but if further accuracy is required repeat the last six instructions.

Set the Demand signal to a level corresponding to mid travel of the valve.

Select Remote on the actuator Local / Remote selector switch. The actuator will move the valve to its mid travel position but it will oscillate around that position. Increase the stopping deadband by rotating the Folomatic Stopping Deadband potentiometer **VR4** clockwise until the actuator stops oscillating with both the Open and Close LED's extinguished.

11.6 Deadband adjustment

Although the Folomatic system is now correctly set up with the actuator stopping in the middle of the deadband any electronic noise on the Demand signal could cause unnecessary movement of the actuator. Should this occur it is recommended that the starting deadband be widened by rotating the Folomatic Starting Deadband potentiometer **VR3** in a clockwise direction. The actuator will now run on slightly farther into the widened deadband which will negate the effects of noise on the Demand signal.

When **VR3** and **VR4** are set to minimum the starting and stopping deadbands are less than 1% of valve stroke. With **VR3** and **VR4** set to maximum the starting deadband is approximately 10% of valve stroke and the stopping deadband is approximately 7.5% of valve stroke.

11.7 Motion Inhibit Timer

On some installations the Demand signal is more sensitive than necessary resulting in unnecessary valve movements. This can be resolved by using the Motion Inhibit Timer potentiometer **VR5**. By increasing the setting of **VR5**, (turning it clockwise) a timer is started every time that the actuator motor stops. This timer prevents the actuator from starting until the set time has elapsed. When **VR5** is set to minimum the Motion Inhibit time is less than 100ms. When set to maximum the Motion Inhibit time is 60s +or- 15s.

11.8 Split Range Control

The Folomatic Span and Zero settings are not sufficient to allow split range control, for example 4 to 12mA and 12 to 20mA. If split range control is required it will be necessary to offset the feedback potentiometer mounted in Add-on-Pak 1. For example where 12 to 20mA is required it will be necessary to set the Add-on-Pak 1 potentiometer to approximately its half way position during Step1 of these instructions.

11.9 Folomatic Status – Folomatic PCB LED Display

Close	Open	Inhibit	Loss of Signal	Operating Condition
○	○	○	○	If power is present this indicates that the input signal is within range, the positioner is enabled and that the actuator is at the requested position.
●	○	○	○	The input signal is in range, the positioner is enabled but requires to close the valve to get to the requested position. If remote is selected the actuator should be closing the valve or be at the close limit position.
○	●	○	○	The input signal is in range, the positioner is enabled but requires to open the valve to get to the requested position. If remote is selected the actuator should be opening the valve or be at the open limit position.
✶	○	○	○	The input signal is in range, the positioner is enabled and requires to close the valve to get to the requested position. However the close operation is inhibited pending the expiry of the motion inhibit timer.
○	✶	○	○	The input signal is in range, the positioner is enabled and requires to open the valve to get to the requested position. However the close operation is inhibited pending the expiry of the motion inhibit timer.
○	○	○	●	The loss of signal protection is enabled and the signal is below the minimum level. SW1,5 and SW1,6 are in the OFF requesting that the actuator stays put.
●	○	○	●	The loss of signal protection is enabled and the signal is below the minimum level. SW1,6 is in the ON position and is requesting that the valve close. If remote is selected the actuator should be closing or be at the close limit position.
○	●	○	●	The loss of signal protection is enabled and the signal is below the minimum level. SW1,5 is in the ON position and is requesting that the valve open. If remote is selected the actuator should be opening or be at the open limit position.
●	✶	○	●	The loss of signal protection is enabled and the signal is below the minimum level. SW1,6 is in the ON position and is requesting that the valve close. If remote is selected the actuator should be closing or be at the close limit position. The flashing open LED indicates that the normal output of the positioner would be attempting to open the valve with the current input signal level, however this request is currently being inhibited by the loss of signal detection.
✶	●	○	●	The loss of signal protection is enabled and the signal is below the minimum level. SW1,5 is in the ON position and is requesting that the valve open. If remote is selected the actuator should be opening or be at the open limit position. The flashing close LED indicates that the normal output of the positioner would be attempting to close the valve with the current input signal level, however this request is currently being inhibited by the loss of signal detection.
●	●	○	●	This indication should not arise in normal operation. If it does it is most likely to be attributable to loss of signal and both open and close directions being selected via SW1. This mode of operation is not suppported within AWT.
○	○	●	○	The positioner is currently disabled as SW1,8 is in the OFF position and no Auto signal is present on the terminal bung. However the actuator is at the position corresponding to the input demand signal
✶	○	●	○	The positioner is currently disabled as SW1,8 is in the OFF position and no Auto signal is present on the terminal bung. The flashing close LED indicates that the positioner would, if enabled, attempt to close the valve.
○	✶	●	○	The positioner is currently disabled as SW1,8 is in the OFF position and no Auto signal is present on the terminal bung. The flashing open LED indicates that the positioner would, if enabled, attempt to open the valve.

All other indication combinations represent fault conditions and the Folomatic assembly requires replacement

Key: ○ LED off ✶ LED Flashing ● LED on

12 Electrical Start-up

12.1 Wiring Up

The actuator must be securely bolted to the valve *(refer to Sections 5 and 6)* and cabled/connected in accordance with Section 7 before start-up.

Check that the limit switches have been set *(see Section 8)*.

12.2 Start-up – Syncroset Actuators

Syncroset actuators require a pair of reversing contactors to switch the 3-phase power supply to the actuator for motor directional control.

The Torque/Limit switches supplied in the actuator must be wired correctly into the control circuits of the reversing contactors.

To check the integrity of the Torque/Limit switches in the contactor control circuit:

1. Determine the valve closing direction – clockwise or anticlockwise *(refer to handwheel label)*.
2. Engage Hand drive and wind handwheel until valve is in a Mid Travel position. Lock the hand/auto lever down in hand position *(refer to Fig 12.0)*.

Fig. 12.0

3. If there are no Local control Open/Stop/Close buttons adjacent to the actuator then a communications link must be set up between site and remote control centre.
4. Select close and the motor should be heard to run but will not drive the valve.

Fig. 12.1

5. Operate the Close limit switch by rotating the front plate to stop the motor. Rotate clockwise for clockwise-to-close valves and anticlockwise for anticlockwise-to close valve.
6. If the motor does not stop, rotate the front plate in the opposite direction. If the motor stops, then the Closed limit switch is wired into the Open contractor circuit. Correct the wiring and re-test. If operating both the open and closed switches do not stop the motor, then neither switch is connected into the contractor circuits. Correct the wiring and re-test.
7. Prove the Open limit switch in the same manner then remove the lock from the hand auto lever and check the phase rotation, *(refer to Fig 12.1)*.

12.3 Phase Rotation Check – Syncroset Actuators

1. With the valve still in a mid travel position select Closed and check that output shaft is rotating in the closed direction as indicated by the arrow on the handwheel.

2. If the valve starts moving in the opening direction, stop the actuator immediately.

If there are no local controls, push down and engage then hold down the hand/auto lever until the remote stop button is pperated. To correct the phase rotation, electrically isolate the 3-phase power supply and transpose any two of the three supply cables at actuator power terminals 1-2-3.

3. When correct rotation is achieved run actuator to full limits of travel in the open and closed directions.
4. Apply full working pressure to the in the closing direction an increase of closing torque may be needed *(refer to Section 8.3)*.

12.4 Syncropak Actuators

The units do not require externally fitted motor reversing contactors as they are an integral part of this type of actuator. A permanent 3-phase power supply is required on terminals 1-2-3.

The Syncropak units are not phase sensitive therefore a phase rotation check is not required. The unit will always rotate in the correct direction.

For remote control and indication connections check the supplied wiring diagram.

13 Troubleshooting

13.1 Syncropak Actuators

Check that the clutch lever is not padlocked in hand before troubleshooting unless you wish to run the motor without driving the valve.

13.2 Actuator Fails to Start on Remote Control

The packaged controls of Rotork Syncropak make fault location simple. Set the selector switch to Local and switch on the power supply, at which point the indication lamp should light. If the actuator starts correctly in each direction when the pushbutton is turned, the fault can only be in the remote control circuit.

13.3 Actuator Fails to Start on Local Control

Set the selector switch to Local and switch the power on. If the actuator fails to start, remove the terminal cover and check that all three phase terminals are live with the correct voltage as indicated on the nameplate.

If the motor is very hot, the thermostat will have tripped. Allow the motor to cool and the thermostat to auto-reset.

13.4 Actuator Fails to Start – Syncroset Actuators

Check remote contact circuits and operation. Contactors switch the supply to the actuator motor.

13.5 Valve Jammed – All Actuators

Likely Causes:

1. Reversed phase rotation/incorrect rotation (not applicable to Syncropak - *(Refer to Section 12)*.
2. Limit switches not set. *(Refer to Section 8)*.

To free valve jammed open:

Manual operation of the handwheel utilising the hammer-blow mechanism should be sufficient to unjam the valve.

To free valve jammed shut:

Loosen the mounting bolts evenly to release thrust. Free the valve manually using the handwheel and retighten the mounting bolts.

13.6 Valve Not Seating Correctly

1. The Close Torque/Limit selector incorrectly set for valve type - *(Refer to Section 8)*.
2. The Close Torque setting is too low. Increase as necessary - *(Refer to Section 8)*.

13.7 Actuator Runs Without Driving Valve – Likely Causes

1. Clutch lever is padlocked in Hand *(Refer to Section 4)*.
2. Drive bush not correctly secured in place *(Refer to Section 5)*.

14 Lubrication and Maintenance

14.1 Oil

Unless specially ordered for extreme climatic conditions, Rotork actuators are dispatched with gearcases filled with SAE 80EP oil suitable for ambient temperatures ranging from –22°F/–30°C to 160°F/70°C.

Food grade lubricating oil is available as an alternative: contact Rotork.

14.2 Lubrication

The AWT actuator is factory filled for life with lubricating oil SAE 80EP. Under normal circumstances there is no requirement to replace or top up the actuator gearcase oil. It is essential that valve components such as threaded stems, drive nuts, guides etc are kept clean and lubricated.

Actuator Nett Size	Weight kg / lb		Oil Capacity litres / pt.-US
	Syncroset	Syncropak	
10A	18 / 40	23 / 51	0.3 / 0.63
12A	18 / 40	23 / 51	0.3 / 0.63
18A	18 / 40	23 / 51	0.3 / 0.63
19A	35 / 77	43 / 51	0.8 / 1.7
20A	35 / 77	43 / 95	0.8 / 1.7
25A	35 / 77	43 / 95	0.8 / 1.7
35A	68 / 150	73 / 161	1.1 / 2.3
40A	134 / 296	138 / 304	7.5 / 15.8
70A	176 / 388	217 / 479	7.0 / 14.7
90A	176 / 388	217 / 479	7.0 / 14.7
91A	213 / 470	217 / 479	7.0 / 14.7
95A	176 / 388	217 / 479	7.0 / 14.7

Fig. 14 Actuators Weights and Oil Volumes

14.3 Maintenance

Every Rotork actuator has been fully tested before dispatch and will give years of trouble-free operation providing it is installed, sealed and commissioned in accordance with the instructions given in this publication.

Covers should not be removed for routine inspection as this may be detrimental to the future reliability of the actuator.

The AWT Syncropak pushbutton cover should not be removed as the module contains no site-serviceable components. All electrical power supplies to the actuator must be isolated before any maintenance or inspection is carried out.

Routine maintenance should include the following:

- Check actuator to valve fixing bolts for tightness.
- Ensure valve stems and drive nuts are clean and properly lubricated.
- If the valve is rarely operated, a routine operating schedule should be set up.

Rotork Sales and Service

If your Rotork actuator has been correctly installed and sealed, it will give years of trouble-free service.

Should you require technical assistance or spares, Rotork guarantees the best service in the world. Contact your local Rotork representative or the factory direct at the address on the nameplate, quoting the actuator type and serial number.

A full listing of our worldwide sales and service network is available on our website at **www.rotork.com**

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Notes

Notes

ATTENTION: RED PLASTIC PLUGS IN CONDUIT ENTRIES ARE FOR TRANSIT ONLY. FOR LONG TERM PROTECTION FIT SUITABLE METAL PLUGS.

ATTENZIONE: I TAPPI IN PLASTICA ROSSA PER L'ENTRATA CAVI SONO SOLO TEMPORANEI. PER UNA PROTEZIONE PERMANENTE PREGO SOSTITUIRLI CON APPOSITI TAPPI METALLICI.

ATENCION: LOS TAPONES ROJOS DE PLASTICO EN LAS ENTRADAS DE CABLE SON UNICAMENTE PARA TRANSPORTE. PARA PROTECCION PERMANENTE COLOCAR TAPONES METALICOS APROPIADOS.

ACHTUNG: DIE ROTEN PLASTIKSTOPFEN SIND NUR FÜR DEN TRANSPORT GEEIGNET. FÜR DAVERHAFTEN SCHUTZ SIND DIESE GEGEN GEEIGNETE BLINDSTOPFEN AUSZÜTAUSCHEN.

ATTENTION: LES BOUCHONS PLASTIQUES ASSURENT UNE PROTECTION TEMPORAIRE. POUR UNE PROTECTION DEFINITIVE UTILISER DES BOUCHONS METALLIQUES.

注意：コンジットロの赤色プラグは、輸送用を目的としたプラグです。
長期に渡る保護の場合、適切なメタルプラグをご使用ください。

注意: 接线端红色塑料封口仅为运输途中使用。
长期正常保护时请用金属封口。

주의: 배선인입구의 빨간색 플라스틱 플러그는 오직 임시용입니다.
오래 보관하기 위해서는 규격에 맞는 금속 플러그를 사용하십시오.

As we are continually developing our products, the design of Rotork actuators is subject to change without notice. The latest product and technical information is available at our website: www.rotork.com.

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