



Keeping the World Flowing  
for Future Generations

# A Range

Syncroset

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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## 1. Introduction

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This manual provides instruction on:

- Manual and electrical operation
- Preparation and installation of the actuator onto the valve
- Basic commissioning
- Maintenance



## 2. Health and Safety

This manual is produced to enable a competent user to install, operate, adjust and inspect Rotork A Range valve actuators. Only persons competent by virtue of their training or experience should install, maintain and repair Rotork actuators.

In order to maintain the security of the actuator and any connected systems, it is recommended that operators / end users take appropriate measures to prevent access by unauthorised persons. This may include measures to control or restrict physical access to the actuator.

Under no circumstances should replacement parts be used in Rotork actuators, other than those supplied or specified by Rotork.

Work undertaken must be carried out in accordance with the instructions in this and any other relevant manuals.

If the actuator is used in a manner not specified in this manual and any other Rotork manual, the protection provided by the actuator may be impaired.

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. Due consideration of additional hazards should be taken when using the A Range of actuators with other equipment. Should further information and guidance relating to the safe use of the Rotork A Range of actuators be required, it will be provided on request.

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 USA:** NFPA70, National Electrical Code® is applicable.

**For Canada:** CEC, Canadian Electrical Code is applicable.

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

Where warning symbols or safety notices are marked on the physical actuator, refer to the table below to understand the potential hazards and required actions:

| Symbol / Marking                                                                                                  | Meaning                                               | Required Action                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <br>ISO 7000-0434/<br>Symbol 14 | CAUTION.<br>Refer to<br>accompanying<br>documentation | The user must consult this manual to understand potential hazards and preventative actions.                                 |
| <b>"ISOLATE BEFORE<br/>REMOVING<br/>COVER"</b>                                                                    | Risk of electric<br>shock                             | Hazardous live voltages present inside. Ensure main electrical power is externally isolated before opening.                 |
| <b>"MORE THAN 1<br/>POWER SOURCE"</b>                                                                             | Multiple power<br>circuits present                    | Equipment has multiple hazardous live power sources. Isolate all power sources before opening covers, wiring, or servicing. |

**⚠ 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 develop more force when closing or opening the valve as this may cause damage to the valve and or may cause the valve to become stuck in the seated/backseated position.**

**⚠ WARNING: Service Altitude**

Actuator installation is permitted up to 5,000 m with the following restrictions:

- Actuator power supply is not above 480 V

Installation without restrictions must be less than 2,000 m as defined by IEC61010-1 (Safety requirements for control and laboratory use).

**⚠ WARNING: Motor Temperature**

Under normal operation the temperature of the actuator's motor cover surfaces can exceed 60 °C above ambient.

**⚠ WARNING: Enclosure**

The user must ensure that the operating environment and any materials surrounding the actuator cannot lead to a reduction in the safe use of, or the protection afforded by, the actuator. Where appropriate, the user must ensure the actuator is suitably protected against its operating environment.

**⚠ WARNING: Operating by Hand**

With respect to handwheel operation of Rotork electric actuators, refer to Section 5.1.

**⚠ WARNING: Unit Weight**

The actuator weight is shown on the nameplate. Care must be taken to transport, move or lift the actuator safely. Lifting information is available in Section 7.

**⚠ WARNING: Unexpected Operation**

When powered on, actuators can operate unexpectedly. Users must make provision for electrical isolation to prevent unintended operation and associated hazardous events.

### 3. Storage

If the actuator cannot be installed immediately, store it in a dry place until it is ready for connection to 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.

Covers do need to be removed for setup of A Range actuators.

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 commissioned, installed and sealed.

### 4. Rotork Syncroset Actuators

Each standard Syncroset consists of four basic subassemblies:

- Motor
- Oil-filled worm gearbox with handwheel and declutch mechanism
- Limit and torque switch mechanism
- Terminal box



Fig. 4.0.1 Standard Syncroset

## 5. Operating your Rotork Actuator

Throughout this publication you will be referred to procedures which will require you to operate your actuator either by hand or electrically.

Actuators must not be allowed to run valve to end of travel until correct motor rotation has been established.

Both operations are simple. The various controls which you will need to use are as follows.

### 5.1 Operating by Hand

To engage handwheel, depress clutch lever into 'hand' and turn handwheel to engage clutch. The lever can now be released.

The hand drive will remain engaged until the actuator is operated electrically when it will automatically disengage the handwheel and return to 'auto'. If required the clutch lever can be secured in either position with a  $\frac{5}{16}$ " diameter hasp padlock.



Fig. 5.1.1

### 5.2 Valve Position Indication

Valve position is indicated mechanically by pointer and dial.

Note that the pointer stays central during valve travel. When Add-on-pak 1 is fitted, pointer movement is continuous between 'shut' and 'open'.

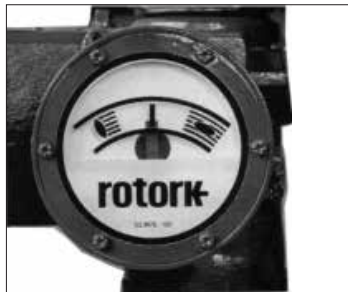


Fig. 5.2.1

## 6. Preparing the Drive Bush

Rotork actuators are supplied fitted with a drive bush which can be detached for machining to suit the valve stem.

### 6.1 Removing Drive Bushes on Actuator Types A and AZ

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



Fig. 6.1.1

Loosen set screw and unscrew retainer using hammer and punch. Remove drive bush and machine to suit valve stem or gearbox input shaft.

Allow apparently excessive clearance on screw thread for old rising stem valves.



Fig. 6.1.2 Type A drive bush

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

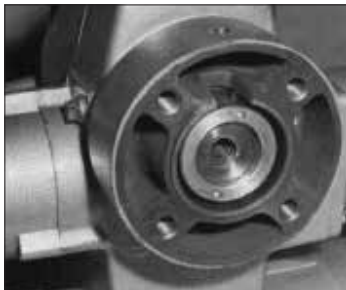


Fig. 6.1.3 Type A drive bush in position 1



Fig. 6.1.4 Type A drive bush in position 2

If it has a type AZ drive bush this can only be fitted below the actuator base to give the maximum stem diameter acceptance.



Fig. 6.1.5 Type AZ drive bush



Fig. 6.1.6 Type AZ drive bush in position 3

## 6.2 Replacing the Drive Bush

Having confirmed the position required, insert the machined drive bush ensuring that the actuator output shaft dogs are in full engagement with the bush.

Fit drive bush retainer securely, turning clockwise until fully tightened using hammer and punch. Rotate by handwheel to align retainer set screw with hole in base and lock tight.



Fig. 6.2.1

## 6.3 Removing Drive Bush on Actuator Types AR and AE

These drive bushes are retained in the actuator without screwed retainers.

## 7. Mounting Actuator on Valve or Gearbox

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

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

It is assumed that the valve has a mounting flange to suit the actuator.

### 7.1 Rising Stem Valves, Top Mounting

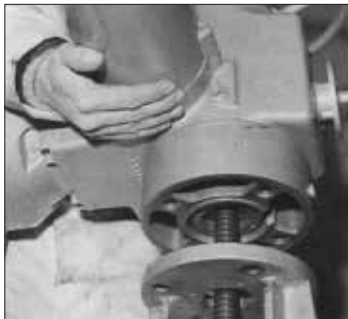


Fig. 7.1.1

Lower the actuator on to the valve stem, engage 'hand' and wind the handwheel in the opening direction to engage the thread on the valve stem. Continue winding until the actuator is firmly down on the valve yoke. Wind two further turns of the output shaft.



Fig. 7.1.2

Fit securing screws or nuts and tighten fully.

### 7.2 Valve Gearboxes, Side Mounting

Check that the valve mounting flange is at right angles to the input shaft, and that the drive bush fits the shaft and keyway with adequate axial tolerance. Engage 'hand', offer up actuator to the input shaft and turn handwheel to align keyway and key. Bolt up tight.

### 7.3 Non-Rising Stem Valves, Top Mounting

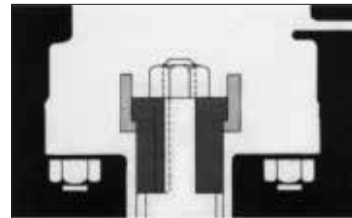


Fig. 7.3.1

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

### 7.4 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.

## 8. Wiring Up

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

**⚠ WARNING: MULTIPLE POWER SOURCES & ELECTRIC SHOCK HAZARD.**

**Isolate Before Opening: Always externally isolate main electrical power before removing any enclosure covers.**

**Multiple power sources: This unit may contain separate motor power and control/indication live wiring.**

**Ensure ALL electrical supplies are isolated and locked out before accessing internal wiring.**

Check that supply voltage agrees with that stamped on actuator nameplate and follow Rotork's wiring diagram for wiring up individual units.

A switch or circuit breaker must be included in the wiring installation or the actuator. The switch or circuit breaker must meet the relevant requirements of IEC60947-1 and IEC60947-3 and be suitable for the application. The switch or circuit breaker must not disconnect the protective earth conductor. The switch

or circuit breaker must be mounted as close to the actuator as possible and shall be marked to indicate that it is the disconnect device for that particular actuator. The actuator must be protected with overcurrent protection devices that are suitably rated in accordance with the applicable electrical data that can be found in the PUB003-003 Electric motor performance data.

**⚠ WARNING: Actuators for use on phase to phase voltages greater than 600 V must not be used on supply systems where phase to earth voltages, pertinent to mains supply system type and nominal voltage, in excess of 600 VAC may exist; reference BS EN IEC 61010 - Annex I.**

Power supply cables must have sufficient mechanical protection properties to meet installation requirements and be screened to comply with EMC requirements of the installed actuator. Suitable methods include armoured and/or screened cables or cables contained within conduit.

### Field Terminal Ratings

Terminals numbered 1-3 and earth must be fitted with 1 off M5 insulated type ring tag suitable for 10-14 AWG conductors, rated for a minimum of 80 °C. Mains power terminals are rated for max. 600 VAC, 3-Phase, 250 A (Overvoltage Category II).

If fitted, switch control terminals are rated for max. 10 A at +70 °C (or 15 A up to +65 °C). Terminals numbered 4-47 must be fitted with 1 off M4 insulated type ring tag suitable for 14 to 16 AWG conductors. Only one conductor per ring tag is permitted. Control terminals support either 250 VAC max (15 A) or 24 VDC / 24 VAC nominal (SELV/PELV) depending on the selected build configuration, with auxiliary switches rated max. 250 VAC 15 A and 30 VDC 10 A and space heater terminals rated for 120/230 VAC.

Installers must provide external branch circuit overcurrent protection upstream per national electrical codes.

### External Insulation Requirements

To maintain shock protection under normal and single fault conditions, external mains wiring requires basic insulation (min. 600 V relative to earth), while any user-accessible circuits require double or reinforced insulation (600 V rated).

External 24 VDC/AC SELV/PELV control lines must feature double or reinforced insulation rated for the highest working mains voltage (600 V min.) relative to power circuits to prevent fault bridging.

The field protective earth conductor must be connected to the terminal marked EARTH before applying power.

### 8.1 Ground Connections

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A lug with ¼" diameter hole is cast adjacent to the conduit entries for attachment of an external earthing strap by nut and bolt. An internal earthing terminal is also provided.

## 8.2 Removing Terminal Cover



Fig. 8.2.1

Use two of the cover retaining screws in the jacking holes.

Do not attempt to lever off with screwdriver as this will spoil O-ring seal and may damage the flame path on a certified unit.

Note the wiring code card fixed inside the cover. This is particular to each actuator and must not be interchanged with any other actuator. If in doubt check serial number on nameplate with that on code card.

Unscrew earthing terminal nut and remove plastic bag containing wiring diagram, terminal nuts and spare O-rings.

## 8.3 Sealing Conduit Entries

Conduit entries should be sealed in accordance with surrounding environment and with any requirements of the regulatory authority.

Seal unused entries with threaded metal plugs. Do not use plastic plugs if supplied with actuator.



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  
AUSZUTAUSSCHEN.

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

注意：コンジット口の赤色プラグは、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.

## 8.4 Connecting Terminals

⚠ To ensure secure electrical connections, it is important that the requisite washers are used as shown in Fig. 8.4.1. Failure to do so may result in connections working loose or screws not clamping down on wire termination tags. Spring washers must be compressed. Screw tightening torques must not exceed 1.5 Nm (1.1 lbf.ft)

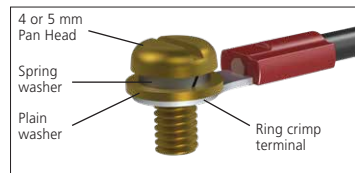


Fig. 8.4.1

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

⚠ **WARNING:** Wiring can reach 80 °C in a 70 °C ambient temperature.

Correct 3-phase rotation is essential for electrical operation and must be checked at start-up stage. All Rotork Syncroset 3-phase actuators are tested for correct operation with phase rotation in terminal order 1,2,3.

All external circuits must be provided with insulation suitable for the rated voltage whilst considering national regulations and statutory provisions.

## 8.5 Replacing Terminal Cover

Check that serial number on code card is the same as on the actuator nameplate before replacing cover with its O-ring in position.

## 9. Setting Instructions

### 9.1 Switch Mechanism

There are two basic operations which have to be carried out:

1. Setting the switches to operate at either end of the valve's stroke
2. Selecting the correct 'torque' or 'limit' function for your particular valve and possibly adjusting the torque value for your particular application.

If you have already received a complete motorised valve these operations should already have been carried out.

### 9.2 How to Check if Your Actuator Has Already Been Properly Set

With the actuator firmly bolted to the valve engage handwheel drive.

Fully open the valve by hand and check that the position indicator pointer moves over to the 'open' position just before the handwheel reaches its stop.

Fully close the valve by hand and check that the pointer moves over to the 'shut' position just as the valve seats.

If the indicator is reading correctly at both ends of stroke, you can assume that your valvemaker has already carried out the detailed setting instructions which follow and you can proceed directly to Section 10 Electrical Start-up.

If you have bought your actuator separately from the valve or if the check was negative you must now go through the following procedure.

### 9.3 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. 9.3.1

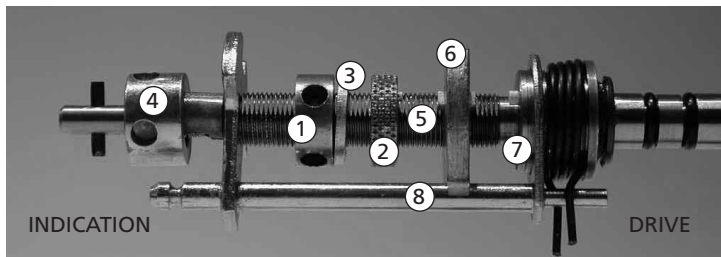


Fig. 9.3.2 switch mechanism  
– Screwed shaft assembly

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. 9.3.3



Fig. 9.3.4

1. Refer to Fig. 9.3.3.  
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. 9.3.4.  
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.

### 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. 9.3.5

### 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. 9.3.6. 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. 9.3.6

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.

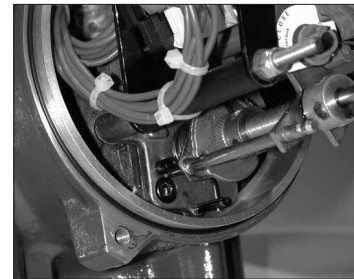


Fig. 9.3.7

## 9.4 Selecting Torque or Limit Control

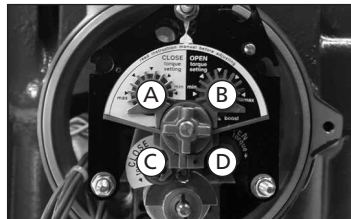


Fig. 9.4.1

Check if the correct torque or limit functions have already been selected as follows:

With the switch mechanism cover still removed check the position of the 'open' and 'close' torque/limit selectors. They should tally with the torque or limit positions on the table below, or with your valvemakers specific instructions.

If necessary, dial selectors C and D to suit your particular valve.

Select the correct torque or limit functions for your valve as follows:

If you have bought a complete motorised valve, your valvemakers will probably have made the correct torque or limit selection to suit his own valve.

In the absence of specific valvemakers instructions, use the following basic table:

| Valve Type                                                        | Close  | Open  |
|-------------------------------------------------------------------|--------|-------|
| Wedge gate or globe                                               | Torque | Limit |
| butterfly, thru conduit ball, plug, sluice gate or parallel slide | Limit  | Limit |

## 9.5 How to Select Torque Values

Selectors A and B adjust the amount of torque which can be applied to the valve before the torque switch cuts out 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 temperature, use, service etc.

We recommend that you dial selector A which controls closing torque to the first marked calibration from the MIN position. But be prepared to remove the switch mechanism cover after start-up to increase the torque value if tight shut-off is not being achieved with your original setting.

Selector B which controls opening torque should be dialled to MAX unless the valvemakers specific instructions recommend against this.

Torque setting adjusters are fitted with locking tabs to discourage unauthorised tampering with original settings. After adjusting 'open' and 'close' torque to required value, lock setting by bending up appropriate tabs each side of pointer. If no open torque limit is required, turn open torque adjuster pointer to boost position, where no locking is required.

## 9.6 How to Replace Switch Mechanism Cover

Ensure that indicator lamp support, if fitted, is central. Ensure that O-ring is in good condition (spare may be found in terminal box).

Offer cover up squarely to spigot, register and push on. Tighten the three securing screws.

## 9.7 Optional Extras

### Setting Intermediate Auxiliary Switches (AOP1 only)

**Note:** Add-on-Pak 1 setting is entirely independent of the switch mechanism.

For Add-on-Pak 1 to be supplied fitted to the actuator, the number of turns must have been specified at the time of ordering and its gear ratio should therefore be correct.

Add-on-Pak 1 incorporates a scale adjusting mechanism to align the pointer movement with scale length. This may have been preset to suit the valve. Both of the above may be checked by hand operating the valve full stroke; the pointer should move continuously from 'shut' to 'open'. If it does not, the scale adjuster setting or the gear ratio may be incorrect, see publication AE5/4.8 in Maintenance and Spare Parts manual.

If it operates correctly, you have only set the switches to trip at the required valve positions.

**Note:** Instructions are for 'clockwise closing'. For 'anticlockwise' read 'opening' as 'closing' etc.

From a suitable mid-travel position operate valve to the point at which switches are required to trip in closing direction.

Loosen nut 10 at rear of cam shaft. Set inner cam 12 so that it just trips switches IAS4, 5 and 6. Partially tighten nut.

Operate the valve to the point at which switches are required to trip in opening direction.

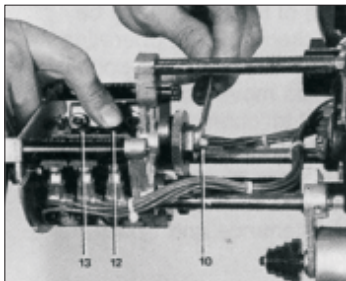


Fig. 9.7.1

Loosen nut 10 again, set outer cam 13 to trip switches IAS1, 2 and 3. Tighten nut to approximately 10 lbs in (0.6 Nm). **Do not over-tighten.**

### Setting the Potentiometer

For potentiometer drives fitted to the switch mechanism only:

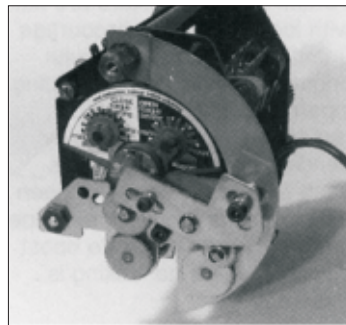


Fig. 9.7.2

Close valve and loosen outer Allen screw which clamps the variable gear mounting plate and disengage gear drive to potentiometer. Turn gear coupled to potentiometer clockwise looking on front of switch mechanism until firm stop is felt. Turn potentiometer gear back approximately 15°. Re-engage the gear train and clamp the variable gear mounting plate.

For potentiometer drives fitted to AOP1 (valve should be fully open): Normally the correct potentiometer gear will be meshed with the main potentiometer drive gear to suit the number of actuator output turns specified for full valve travel.\* Having noted which gear has been selected, unclamp the potentiometer assembly from its mounting pillar using a  $\frac{3}{32}$ " AF Allen key. Un-mesh the potentiometer gear and rotate the potentiometer spindle anti-clockwise so that it is about 2 away from the end of its travel.

\* See publication AE5/4.8 for correct selection if necessary.

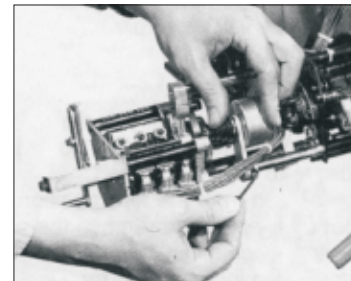


Fig. 9.7.3

Mesh with the correct gear and clamp.

### Setting Current Position Transmitter (CPT)

The CPT gives continuous indication with adjustment for span and zero settings and can be either internally or externally powered. The following instructions are for a CPT with a PCB mounted in the switch mechanism compartment – see Fig 9.7.4. The CPT will be factory set and normally, once the main potentiometer is set, no further adjustment is required. Should adjustment be required:

1. First set actuator torque and limit switches – see Sections 9.1 to 9.5. Then operate valve to the fully closed position.
2. Set the mechanical zero of the main potentiometer transmitter, checking that the correct gears are selected to suit full travel.
3. Check that the remote connections to the CPT are suitable for internally or externally powered systems as applicable. (Refer to the actuator wiring diagram.)
4. With the valve still closed, set minimum required signal by adjusting the zero potentiometer on CPT PCB.

5. Operate valve to fully open position and adjust CPT span control to give required maximum signal.
6. For maximum signal indication corresponding to valve closed position (i.e. reverse of the above): isolate DC supply; swap outer connections on main potentiometer; re-engage potentiometer drive gear so that it is fully clockwise with the valve fully open; and then with DC supply reconnected repeat adjustments of zero (at valve open) and span (at valve closed).

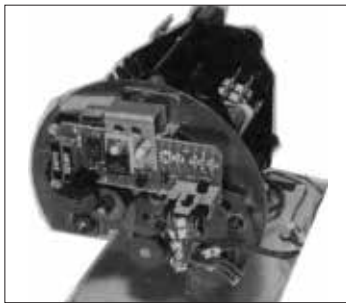


Fig. 9.7.4

### Blinker

The blinker is factory set to suit the actuator output turns range and no further setting is normally required.

## 10. Electrical Start-up

---

Check that limit switches have been set; see Section 9.

Maximum external load to switch contacts shall be 250 VA, 15 A and 50 VDC, 1 A for ambient temperatures of +65 °C rated ambients.

Maximum external load to switch contacts shall not exceed 10 A for 250 VAC and 1 A for 50 VDC at +70 °C rated ambients.

### 10.1 Checking Rotation

---

If valve stem is not visible, remove stem cover to observe direction of output rotation.

Engage 'hand' and wind handwheel until valve is well away from end position.

**⚠ WARNING: All actuator covers must be installed before turning on the power supply.**

Switch on power supply. If there are no pushbuttons within sight of the actuator arrange communication link between control station and the observer at the actuator.

Press 'open' button.

If connections are correct valve should open.

If the valve starts closing stop immediately. If there is no local stop, engage hand immediately and hold in hand drive until remote stop button is operated.

Correct phase rotation as follows:

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

3-phase actuators. Exchange any two of three phase supply leads at power terminals.

**⚠ WARNING: All actuator covers must be installed before turning on the power supply.**

If valve opens, run valve to full travel in 'open' and 'close' directions.

If the actuator stops prematurely it may be due to too low a torque setting. Increase as necessary; see Section 9.

For valves requiring precisely controlled position limit, check that valvemakers mark on valve is reached. If it is not, this is due to incorrectly set limit switches; see Section 9.

Replace stem cover using suitable sealing tape or compound.

## 11. Troubleshooting

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### 11.1 Valve Jammed

---

Likely causes:

1. Reversed phase rotation/incorrect rotation. See Section 10.
2. Limit switches not set correctly. See Section 9.

#### To free valve jammed open:

Manual operation of the handwheel utilising the hammerblow mechanism should be sufficient to unjam the valve.

#### To free valve jammed shut:

Loosen actuator mounting bolts evenly to release thrust. Free the valve by hand and re-tighten mounting bolts.

### 11.2 Valve Not Seating Correctly

---

Likely causes:

1. The 'close' torque/limit selector has been set at 'limit'. Reset to 'torque'.
2. The 'close' torque setting is too low. Increase as necessary. See Section 9.

### 11.3 Actuator Runs Without Driving Valve

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Likely causes:

1. Clutch lever padlocked in 'hand'.
2. Drive bush not correctly locked in place. See Section 6.

# 12. Lubrication and Maintenance

## 12.1 Oil

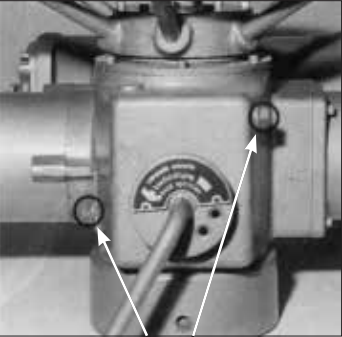
Unless specially ordered for extreme climatic conditions, Rotork actuators are dispatched with gearcases filled with SAE 80EP oil which is suitable for ambient temperatures ranging from -30 to +70 °C (-22 to +160 °F).

## Oil capacities

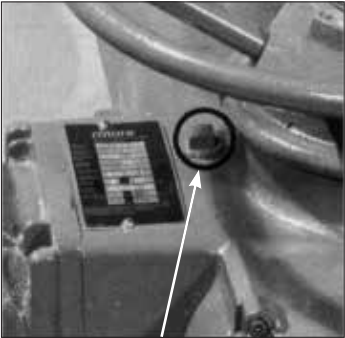
| Actuator Size | Oil Capacity (litres) |
|---------------|-----------------------|
| 7A            | 0.6                   |
| 11A           | 0.6                   |
| 13A           | 0.6                   |
| 14A           | 1.4                   |
| 16A           | 1.4                   |
| 30A           | 2.0                   |
| 40A           | 3.0                   |
| 70A           | 4.5                   |
| 90A           | 4.5                   |
| 91AR          | 4.5                   |
| 95A           | 4.5                   |

## 12.2 Oil Fill/Drain Plugs

The use of the plugs provided is determined by the mounting position on the valve.



Oil fill/drain plugs



Oil fill/drain plugs

## 12.3 Maintenance

After six month's 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 beyond the lubrication of valve stems and nuts. If the motorised valve is rarely operated, a routine operating schedule should be set up.

### 13. Decommissioning and Environmental Considerations

End user advice on disposal at end of life of the product.

In all cases check local authority regulation before disposal.

The actuator can be removed by reversing the operations detailed in the mounting and cabling sections.

All warnings as detailed in the mounting and cable connection sections must be followed. Disposal of the actuator or any of its components should be done in accordance with the table below.

**⚠ WARNING: It is essential that the actuator is not subject to any valve / system loads at the time of removal as this could cause operator injury due to the actuator moving unexpectedly.**

| Subject                           | Definition               | Remarks / examples                       | Hazardous | Recyclable | EU Waste Code | Disposal                                                                                             |
|-----------------------------------|--------------------------|------------------------------------------|-----------|------------|---------------|------------------------------------------------------------------------------------------------------|
| Electrical & Electronic Equipment | Printed circuit boards   | All products                             | Yes       | Yes        | 20 01 35      | Use specialist recyclers                                                                             |
|                                   | Wire                     | All products                             | Yes       | Yes        | 17 04 10      |                                                                                                      |
| Metals                            | Aluminium                | Covers                                   | No        | Yes        | 17 04 02      | Use licensed recyclers                                                                               |
|                                   | Copper/Brass             | Wire, small components, motor windings   | No        | Yes        | 17 04 01      |                                                                                                      |
|                                   | Iron/Steel               | Gearcases, gears, bases, small component | No        | Yes        | 17 04 05      |                                                                                                      |
|                                   | Mixed Metals             | A Range motor rotors                     | No        | Yes        | 17 04 07      |                                                                                                      |
| Plastics                          | Glass filled nylon       | Switch mechanism components              | No        | No         | 17 02 04      | Disposal as general commercial waste                                                                 |
|                                   | Unfilled                 | Window, switch mechanism components      | No        | Yes        | 17 02 03      | Use specialist recyclers                                                                             |
| Oil /Grease                       | Mineral & Kerosene Mixed | Gearbox lubrication                      | Yes       | Yes        | 13 07 03      | Will require special treatment before disposal, use specialist recyclers or waste disposal companies |
|                                   | Mineral                  | Gearbox lubrication                      | Yes       | Yes        | 13 02 04      |                                                                                                      |
|                                   | Food Grade               | Gearbox lubrication                      | Yes       | Yes        | 13 02 08      |                                                                                                      |
|                                   | Grease                   | Side handwheel / linear drive            | Yes       | No         | 13 02 08      |                                                                                                      |
| Rubber                            | Seals & O-rings          | Cover and shaft sealing                  | Yes       | No         | 16 01 99      | May require special treatment before disposal, use specialist waste disposal companies               |

## 14. Approvals

Refer to actuator nameplate for unit specific approval details.

### International – Non-Hazardous

#### Ingress Protection BS EN60529

**IP66 & IP68**, (3 metres for 48 hours).

Temperature -30°C to +70°C (-22°F to +158°F)

\*Option -40°C to +70°C (-40°F to +158°F)

\*Option -60°C to +70°C (-76°F to +158°F)

### USA – Non-Hazardous

#### Enclosure Type 4 & 6

Temperature -30°C to +70°C (-22°F to +158°F)

\*Option -40°C to +70°C (-40°F to +158°F)

\*Option -60°C to +70°C (-76°F to +158°F)

### Canada – Non-Hazardous

#### Enclosure Type 4 & 6

Temperature -30°C to +70°C (-22°F to +158°F)

\*Option -40°C to +70°C (-40°F to +158°F)

\*Option -60°C to +70°C (-76°F to +158°F)

Rotork can supply actuators to national standards not listed above. For details please contact Rotork.

## Relative Humidity

Externally rated Pollution Degree 4, suitable for up to 100% RH.

Internally rated Pollution Degree 2, maximum 80% RH.

## Overvoltage Category II

**Note:** A Range actuators are constructed for process control applications only and are not intended to perform a safety function.

**Note:** This equipment is suitable for outdoor use.

## 15. Vibration, Shock and Noise

Standard A Range actuators are suitable for applications where vibration and shock severity does not exceed the following:

| Type                    | Level                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------|
| Plant induced vibration | 0.5g rms total for all vibration within the frequency range of 10 to 200 Hz                           |
| Shock                   | 5g peak acceleration                                                                                  |
| Seismic                 | 1g acceleration over a frequency range of 0.2 to 33 Hz if it is to operate during and after the event |

## 16. Conditions of Safe Use

### EMC

The equipment is intended for use in an industrial electromagnetic environment.









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A full listing of our worldwide sales and service network is available on our website.

**[www.rotork.com](http://www.rotork.com)**

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