



rotork[®] electric

IQ Range
Installation and
Maintenance Instructions

Please ensure that this publication is thoroughly read and understood

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The Rotork Setting Tool allows actuator control, indication and protection functions to be configured to suit site requirements. It is essential that all the actuator settings are checked for compatibility with the process and control system requirements before the actuator is put into service. Please read this publication.

When Rotork personnel or nominated agents are contracted to carry out site commissioning and/or acceptance, documentation of commissioned actuator configuration can be made available for customer records.

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 Primary Settings for correct valve operation.
- * Commissioning and adjustment of the Secondary Settings to suit site-specific control and indication requirements.
- * Maintenance – Troubleshooting.
- * Sales and Service.

Refer to Publication E180E2 for repair, overhaul and spare part instructions.

THE ROTORK IQ RANGE – THE FIRST VALVE ACTUATOR THAT YOU CAN COMMISSION AND INTERROGATE WITHOUT REMOVING ELECTRICAL COVERS.

Using the supplied infra-red Setting Tool to access the actuator set up procedures, “point and shoot” setting of torque levels, position limits and all other control and indication functions can be made safely, quickly and conveniently, even in hazardous locations. The IQ allows commissioning and adjustment to be carried out with the main power supply to the actuator switched on or off.

Standard diagnostics access information about the control system, valve and actuator status in the form of display icons and help screens.

Instantaneous valve torque and position can be monitored on the actuator with a single key press of the Setting Tool.

The on board Datalogger captures operational and valve torque data enabling informed maintenance choices to be made. IQ Insight software for PC and PDA allows the Datalogger to be interrogated, as well as the complete actuator set up to be configured and recorded.

The actuator containing the Setting Tool will be identified with a yellow label on the terminal cover.

Visit our web site at www.rotork.com for more information on the IQ and other Rotork actuator ranges.

	Page		Page		Page
1 Health and Safety	2	5.4 Handwheel Sealing	11	8 Commissioning – Primary Functions	20
2 Storage	3	5.5 IQM Modulating Actuators	12	Primary Functions Contents	21
3 Operating your IQ Actuator	3	5.6 IQML Linear Drive Unit	12	9 Commissioning – Secondary Functions	29
3.1 Operating by Hand	3	5.7 IQML Adjusting Linear Stroke	12	Secondary Functions Contents	31
3.2 Operating Electrically	3	6 Cable Connections	14	Default Options	63
3.3 Display – Local Indication	4	6.1 Earth/Ground Connections	14	10 Maintenance, Monitoring and Troubleshooting	65
3.4 Display – Alarm Indication	5	6.2 Removing Terminal Cover	14	10.1 Help Screens	67
4 Preparing Drive Bush	7	6.3 Cable Entry	14	10.2 IrDA Diagnostics & Configuration	72
4.1 IQ10 to IQ35 Thrust Base Types A and Z	7	6.4 Connecting to Terminals	15	11 Weights and Measures	74
4.2 IQ10 to IQ35 Non-Thrust Base Type B	8	6.5 Replacing Terminal Cover	15	Binary, Hexadecimal and Decimal Conversion Table	75
4.3 IQ40 to IQ95 Thrust Base Types A and Z	8	7 Commissioning	16	12 IQ Approvals	76
4.4 IQ40 to IQ95 Non-Thrust Base Type B	9	7.1 The Setting Procedure	16		
5 Mounting the Actuator	10	7.2 The Setting Tool	17		
5.1 Rising Stem Valves – Top Mounting	11	7.3 Entering the Actuator Setting Procedure	18		
5.2 Valve with Gearbox – Side Mounting	11	7.4 Setting Mode – Password	18		
5.3 Non-Rising Stem Valves – Top Mounting	11	7.5 New Password	18		
		7.6 Checking Mode	18		
		7.7 Procedure Branch – Crossroad	19		
		7.8 The Actuator Display – Setting/Checking Mode	19		
		7.9 Returning to Valve Position Display	19		

This manual is produced to enable a competent user to install, operate, adjust and inspect Rotork IQ 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. If the actuator has nameplates indicating that it is suitable for installation in Hazardous Gas Areas then the actuator is suitable for use in Zone 1 and Zone 2 (or Div 1 and Div 2) explosive atmospheres only. It should

not be installed in atmospheres where gases are present with an ignition temperature less than 135°C, unless suitability for lower ignition temperatures has been indicated on the actuator nameplate.

Any test instruments applied to the actuator should be of equivalent certification. The electrical installation, maintenance and the use of the actuator should be carried out in accordance with the code of practice relevant for that particular Hazardous Gas Area certification.

No inspection or repair should be undertaken unless it conforms to the specific Hazardous Gas Area certification requirements. Under no circumstances should any modification or alteration be carried out on the actuator as this could invalidate the conditions under which its certification was granted.

Access to live electrical conductors is forbidden in the hazardous area unless this is done under a special permit to work, otherwise all power should be isolated and the actuator moved to a non-hazardous area for repair or attention.

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: **Motor Temperature**

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

Thermostat Bypass

If the actuator is configured to bypass the motor thermostat, when using the ESD function, the hazardous area certification will be invalidated.

Control and Indication

Where the actuator build allows remote control and indication supplies higher than 150V a.c. but below 300V a.c. (refer to actuator wiring diagram) the remote control and indication supplies must be derived from a supply which is designated as installation category (overvoltage category) II as defined in

BSEN 61010 (Safety Requirements For Electrical Equipment for measurement, control and laboratory use).

Enclosure Materials

IQ10 to IQ35 are manufactured from aluminium alloy with stainless steel fasteners and the thrust bases are manufactured in cast iron. IQ40 to IQ95 enclosures are manufactured in aluminium alloy and cast iron with stainless steel fasteners and the thrust bases are manufactured in cast iron.

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.

Should further information and guidance relating to the safe use of the Rotork IQ range of actuators be required, it will be provided on request.

WARNING: Operating by Hand

With respect to handwheel operation of Rotork electric actuators, see warning on p3.

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.

It is not necessary to remove any electrical compartment covers in order to commission the IQ actuator.

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.

3.1 Operating by Hand

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.



Fig. 3

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 when 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 6.5mm hasp.

3.2 Operating Electrically

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.

Do not operate the actuator electrically without first checking, using the infra-red Setting Tool, that at least the Primary Settings have been made (refer to Section 8 page 20).

Selecting Local/Stop/Remote Operation

The red selector enables either Local or Remote control, lockable in each position using a padlock with a 6.5mm 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.

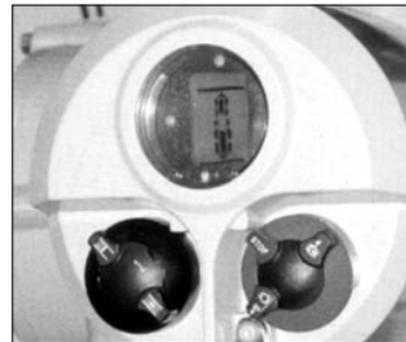


Fig. 3.1

Local Control

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.

Remote Control

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.

3.3 Display–Local Indication

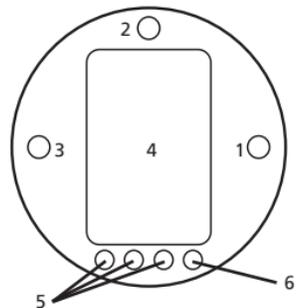


Fig. 3.2 The Actuator Display

The display consists of:

1. Red – position indication lamp
2. Yellow – position indication lamp
3. Green – position indication lamp
4. Liquid crystal display screen (LCD)
5. Infra-red sensors
6. Infra-red signal confirmation indicator (Red)

The liquid crystal display screen has 2 modes of position indication:

1. Valve position – power on
2. Valve position – power off

On power up the actuator's liquid crystal display screen is back-lit with a "soft amber" light and one of the indicator lamps will be on, dependent on position. The display screen will show percentage open or an end of travel symbol. (See Figs 3.3, 3.4 and 3.5)

As standard, red lamp signifies valve open, yellow intermediate, and green lamp signifies valve closed. Open and closed colour functions can be reversed on request.

Open

Red indicator and open symbol displayed

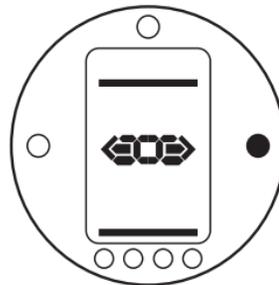


Fig. 3.3

Mid Travel

Yellow indicator and percentage open value displayed



Fig. 3.4

Closed

Green indicator and closed symbol displayed

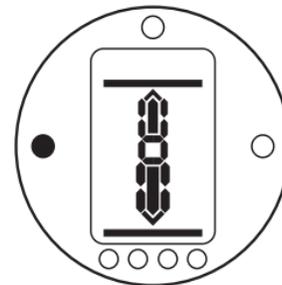


Fig. 3.5

With the main power supply switched off, the liquid crystal display screen is powered by a battery and continues to display actuator position. However, the battery does not support screen back-lighting, or position indicator lamps.

3.4 Display–Alarm Indication

The IQ display incorporates valve, control system, actuator and battery alarm indication in the form of four display icons. Located in the top portion of the display, each icon represents certain alarm conditions. Standard help screens are also available to assist in determining the actuator operational and alarm status (refer to *Help Screens page 67*).

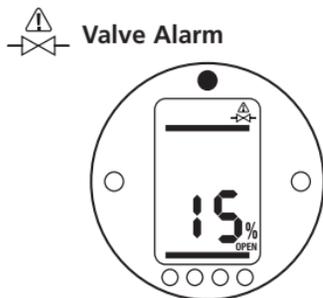


Fig. 3.6

The valve alarm icon, Fig 3.6, is displayed when a valve problem causes the actuator to “trip-off” due to the configured torque value being developed (refer to **[tC]/[tO]** pages 25/26). The possible causes are:

- Valve tight or obstructed in mid travel.
- Valve stuck or jammed
- Valve process conditions changed (increase in pressure, flow etc.)

Once the actuator has tripped off on torque, electrical operation in the same direction is inhibited. The icon will remain displayed until movement in the opposite direction takes place.

The valve alarm icon will not be displayed when stopping at end of travel for valves configured to torque seat or torque back seat at end of travel (refer to **[C2]/[C3]** pages 23/24).

Try handwheel operation of the valve to “feel” for stiffness (refer to page 3).

Control Alarm

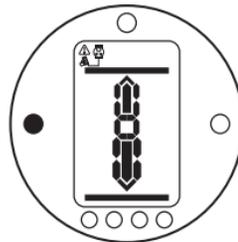


Fig. 3.7

The control system alarm icon, Fig 4.5, is displayed when the remote control system maintains an active ESD or interlock signal (the ESD, interlock function or conditional control having been enabled.)

Local and Remote operation will be inhibited while an active ESD or interlock signal is present (refer to **[A1] ESD Action page 34**, **[A8] External Interlocks page 36** and **Conditional Control [A9] page 36**.)

Investigate the operational conditions of the actuator remote control system.

Actuator Alarm

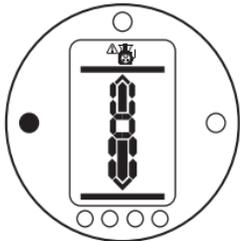


Fig. 3.8

The actuator alarm icon, Fig. 3.8, is displayed when an active actuator alarm is present.

Electrical operation will be inhibited while an alarm is present. The possible causes are:

- Transformer thermostat tripped
- Battery low on power up*
- Power supply fault

*see *Battery Alarm*

(To identify the specific cause of the alarm refer to Help Screens pages 67-71).

Battery Alarm



Fig. 3.9

The battery alarm icon, Fig. 3.9, is displayed when the actuator detects its battery as being low, discharged or missing.

If, on power up, the actuator detects a discharged battery and actuator power loss inhibit feature **[OS]** is enabled (refer to page 62), both battery and actuator alarm icons (Fig.3.8 and 3.9) will be displayed. Electrical operation will be inhibited.

When the battery alarm icon is displayed, the battery should be replaced immediately (refer to page 65).

The actuator checks the battery status at approximately 10 minute intervals. After replacing a battery the alarm icon will continue to be displayed until the next check indicates the battery is healthy. This may take up to 10 minutes.

4.1 IQ10 to IQ35 Thrust Base Types A and Z

Removal of Drive Bush for Machining

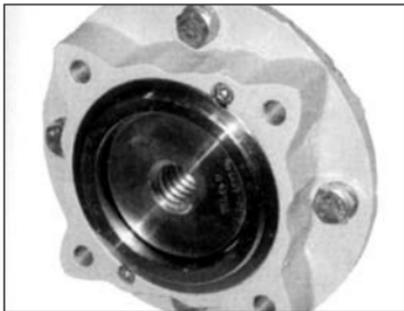


Fig. 4 Bronze Drive Bush Fitted into Thrust Taking Base

Turn actuator onto its side, remove the two cap-headed screws holding base plate onto thrust base, pull out the drive bush complete with its bearing assembly.

Before machining the drive bush the thrust bearing must be removed. IQ10, IQ12 and IQ18 actuators have a sealed thrust bearing located on the drive bush and retained by the steel



Fig. 4.1 Components of Type A Thrust Base

bearing stop ring. The bearing stop ring is locked with one socket set screw.

IQ20, IQ25 and IQ35 have a thrust race ball bearing within the steel bearing housing, located on the drive bush and retained by the steel bearing stop ring. The bearing is sealed within its housing by O-rings located on the drive bush and on the bearing stop ring. The bearing stop ring is locked with two socket set screws.

1. Locate and loosen the locking socket set screw(s) in the bearing stop ring.

2. Unscrew the bearing stop from the drive bush. Slide the bearing off the drive bush. Keep the drive bush and stop ring in a safe clean place.
3. For all sizes ensure the drive bush male thread (stop ring) is not damaged during machining. For sizes IQ20, IQ25 & IQ35, ensure the O-ring located in the drive bush is not damaged during machining. Machine drive bush to suit the valve stem, allowing generous clearance on the screw thread for rising stem valves.

Re-assembly

1. Remove all swarf from the drive bush, ensuring the O rings on the drive bush and bearing stop ring (where fitted) are undamaged, clean and greased.
2. Slide the bearing assembly onto the drive bush and ensure it is fitted down to the drive bush shoulder.
3. Screw the stop ring with the locking socket set screw(s) uppermost on to the drive bush until it comes to a stop – hand tight and lock with the locking socket set screws. The locking socket set screws must be done up tight to prevent the

assembly working loose, as shown in Fig 4.2. Refer to the table below for required tightening torques.

Socket set screw size	Allen key bit size	Torque Nm	Torque lbs/ft
M4	M2	2.2	1.62
M6	M3	7.8	5.75



Fig. 4.2

4. 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.
5. Refit the base plate and secure with cap-headed screws.

4.2 IQ10 to IQ35 Non-Thrust Base Type B

Undo the four set screws 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: (refer to Fig. 4.3)

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.

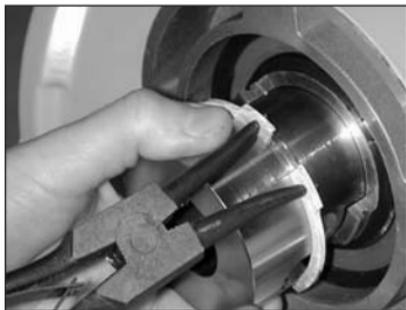


Fig. 4.3



Fig. 4.4

Type B1

(Refer to Fig. 4.4)

The procedure for removal and refitting of the B1 drive bush is the and same as for B3 and B4, However the circlip is replaced with a custom spring clip. The spring clip operates in the same manner as the B3/B4 circlip but is expanded using long-nose pliers.

4.3 IQ40 to IQ95 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. 4.5 Locating Set Screw

Loosen set screw 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. 4.6 Removal of Retainer



Fig. 4.7 Type A Drive Bush

If the actuator has a type A drive bush (Fig. 4.7) this can be fitted in position 1 or 2 to suit the position of the valve mounting flange.

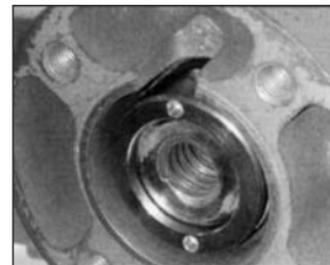


Fig. 4.8 Type A Drive Bush in
Position 1

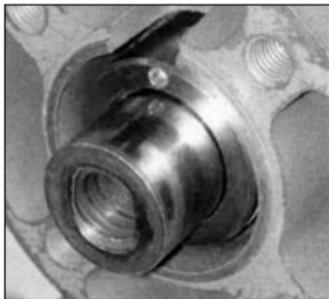


Fig. 4.9 Type A Drive Bush in Position 2

If the actuator has a type Z3 drive bush (Fig. 4.10) this can only be fitted below the actuator base (Fig. 4.11).



Fig. 4.10 Type Z3 Drive Bush

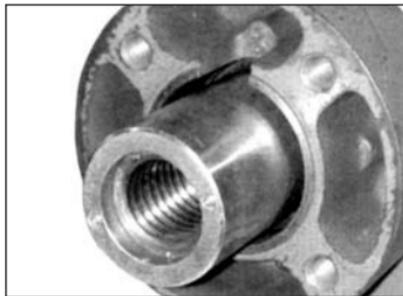


Fig. 4.11 Type Z3 Drive Bush in Position 3

Re-Assembly

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 hand wheel to align retainer set screw with hole in the side of base and tighten.

4.4 IQ40 to IQ95 Non-Thrust Base Type B

Type B1

Output shaft bored and keyed to ISO 5210 standard. There is no drive bush to machine.



Fig. 4.12 Tightening Retainer Set Screw

Types B3 and B4

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.

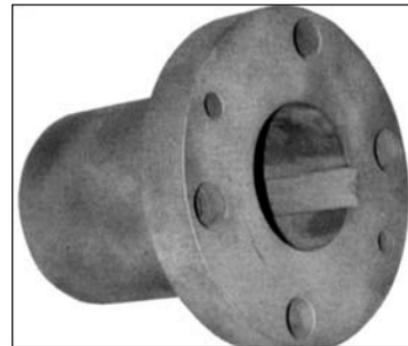


Fig. 4.13 B3/B4 Drive Bush



Fig. 4.14 B3/B4 Drive Bush in Situ

(Refer to Weights and Measures page 74 for actuator weight.)

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 Fig.5 for vertical valve shafts and Fig.5.1 for horizontal shafts.

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.



Fig. 5



Fig. 5.1

5.1 Rising Stem Valves – Top Mounting

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

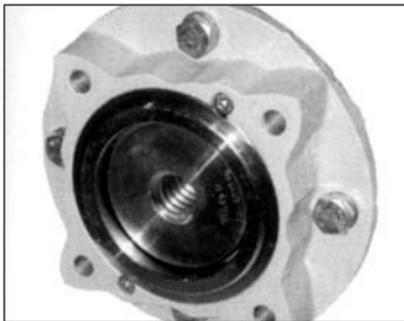


Fig. 5.2

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.



Fig. 5.3

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.

5.2 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 key with adequate axial engagement. Engage “hand”, offer up actuator to the input shaft and turn handwheel to align keyway and key. Tighten mounting bolts.

5.3 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.

5.4 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.

5.5 IQM Modulating Actuators

The IQM range of actuators are suitable for modulating control duty of up to 1200 starts per hour in accordance with IEC 34-1 to S4 50%.

IQM actuators have a dynamic braking facility as standard. If mechanical overrun of the actuator and valve prove to be excessive for accurate control, the brake can be enabled by fitting a link to the actuator terminal block as indicated by the wiring diagram. With dynamic braking enabled, motor heating effects increase and therefore the number of actuator starts should be reduced to prevent motor thermostat tripping (refer to publication E 410E for more information).

Commissioning of IQM range actuators is identical to the standard IQ (refer to Sections 7, 8 and 9 commencing on page 16).

5.6 IQML Linear Drive Unit

Consists of a lead screw assembly arranged attached to the base of the actuator in order to provide a linear output stroke between 8mm ($\frac{3}{8}$ in) minimum and 120mm ($4\frac{3}{4}$ in) maximum.

The IQML can be supplied with or without a yoke mounting adaptor. This adaptor consists of four pillars and a base flange to suit the valve.

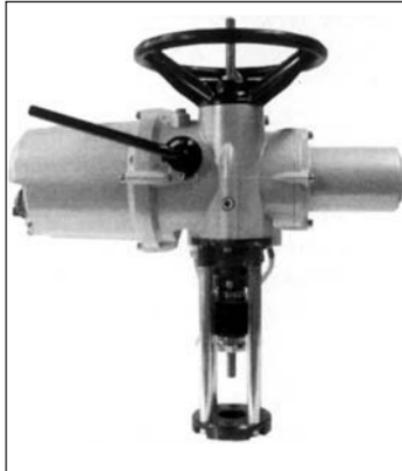


Fig. 5.4 IQML with Yoke



Fig. 5.5 IQML without Yoke

5.7 IQML Adjusting Linear Stroke

With actuator securely fitted to valve, but with the linear drive disconnected, ensure valve is at its fully closed (down) position.

Remove cover tube from actuator handwheel, locate the down stop adjustment on the linear drive unit and with two spanners loosen the lock nut, run the lock nut and tubular down stop to the end of the thread.



Fig. 5.6 Down Stop two Spanners

5.7 IQML Adjusting Linear Stroke continued

Turn the actuator handwheel clockwise, linear drive will move down towards the valve spindle, couple linear drive to valve spindle.

Turn the tubular down stop clockwise into the actuator until it comes to a mechanical stop. If the valve must close onto its seat by "TORQUE ACTION" then back off (anti-clockwise) the down stop by one third of one turn (equivalent to 1mm). Run the lock nut down onto the tubular down stop and tighten with two spanners. There is no "up stop" (open) on the linear drive unit, the mechanical stop in the valve will give this position. Refit the top cover tube to the handwheel using PTFE tape to seal the thread.

The linear drive unit is pre-packed with grease type Rocol MTS 1000, use this or an equivalent high temperature-bearing grease.

A grease nipple is situated in the base of the actuator to enable lubrication of the lead screw. Periodically, depending on usage and temperature, apply two pumps of a grease gun.

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 No. E130E Electric motor performance data for IQ range actuators.

WARNING:

Actuators for use on phase to phase voltages greater than 600V a.c. must not be used on supply systems such as floating, or earth-phase systems, where phase to earth voltages in excess of 600V a.c. could exist.

6.1 Earth/Ground Connections

A lug with a 6mm diameter hole is cast adjacent to the conduit entries for attachment of an external protective earthing strap by a nut and bolt. An internal earth terminal is also provided, however it must not be used alone as the protective Earth Connection.

6.2 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 and may damage the flamepath on a certified unit.

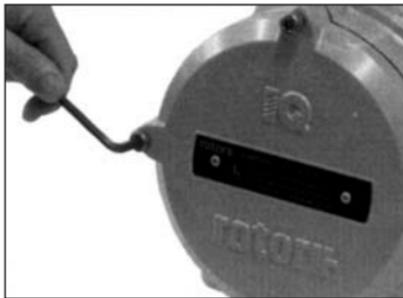


Fig. 6

Actuators containing a Setting Tool fitted to the inside of the terminal compartment cover are identified with a self-adhesive yellow label on the outside of the terminal compartment cover.

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



Fig. 6.1

A plastic bag in the terminal compartment contains:
Terminal screws and washers.
Spare cover "O" ring seal.
Wiring diagram.
Instruction book.

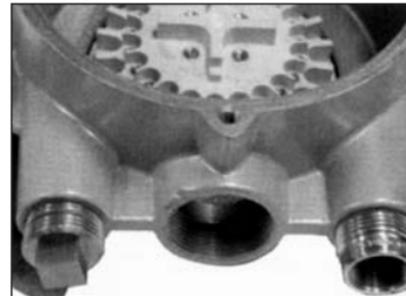


Fig. 6.2

6.3 Cable Entry

Only appropriate certified Explosion-Proof entry reducers, glands or conduit may be used in hazardous locations.

Remove red plastic transit plugs. Make cable entries appropriate to the cable type and size. Ensure that threaded adaptors, cable glands or conduit are tight and fully waterproof. Seal unused cable entries with a steel or brass threaded plug. In hazardous areas an appropriately certified threaded blanking plug must be used.

6.4 Connecting to Terminals

On EExde enclosure units connections to the power and control terminals must be made using AMP type 160292 ring tabs for power and earth terminals and AMP type 34148 ring tabs for the control 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.

6.5 Replacing Terminal Cover

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

7.1 The Setting Procedure

The Rotork IQ range of actuators is the first that enables commissioning to be carried out without removing covers.

Setting torque, limit and other functions is achieved by using the Infra-Red Setting Tool. The Setting Tool is certified Intrinsically Safe to allow commissioning in hazardous areas.

All the commissioning functions are stored in non-volatile memory in the actuator. The Setting Tool enables the user to view all the functions in turn via the actuator display window. As each function is viewed its setting can be checked and, if required, changed within the bounds of that function.

Commissioning may be carried out with main power switched on or off. Refer to page 20 for Power Off Setting.

The setting procedure is divided into two stages:

1. Primary Functions

Settings for end of travel limit actions, torque values, limit positions etc.

2. Secondary Functions

Settings covering the control, indication and optional equipment functions.

All IQ actuator functions are configured before dispatch to Rotork standard default settings unless alternatives have been specified with the order. Should difficulty be encountered during commissioning the default settings can be reinstated, returning the actuator configuration to its original manufactured state. Site commissioning can then begin again (refer to Section 9.16 page 63).

The default function should be used with caution as settings selected after manufacture may be essential for the safe operation of the valve and/or plant.

Actuator Display

Position Display

50

This may be an open or closed symbol or a percentage open value.

Torque and Position

Refer to Section 10.

Password

P?

→ PC → Ir → Ic

Setting Branch
(crossroad)

cr

Primary Functions
Direction
Limit Actions
Torque Values
Limit Positions

Secondary Functions
Indication Contacts
Control Mode
Options
Help Screens
Defaults

Note: The Primary Functions must be commissioned first.

7.2 The Setting Tool

Specification

Enclosure	IP67
Certification	EEx ia IIC T4 (intrinsically safe) FM, INT SAFE, Class I & II Div 1 Groups A B C D E F G, T4A CSA, Exia, Class I, II Div 1 Groups A B C D
Power supply	9V Battery (supplied and fitted)
Operating range	0.75m (from actuator display window)

Name

Name	Instruction
1. ↓ Key*	Display next function down
2. → Key*	Display next function across
3. - Key	Decrease/change displayed function's value or option setting
4. + Key	Increase/change displayed function's value or option setting
5. ← Key	Enter displayed value or option setting

* Pressing the two arrow keys together returns the actuator display to the position indication mode

Infra-red local operation (when enabled)

5. ← Key	Stop actuator
6. ☰ Key	Open actuator
7. ⊞ Key	Close actuator
8. Infra-red Transmitter Window	

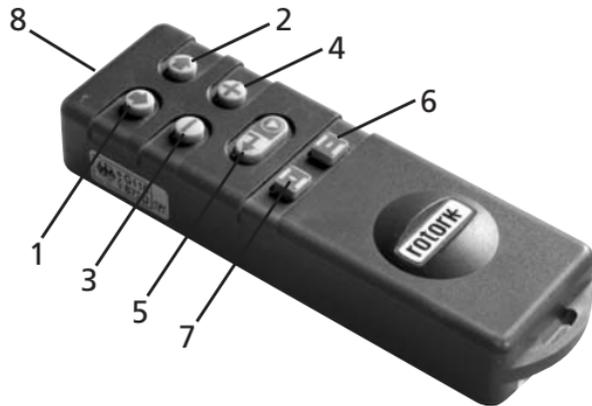


Fig. 7 The Setting Tool

Setting Tool Battery Replacement

Battery status can be checked by looking at the Infra-red transmitter window while depressing any Setting Tool button. A flashing red indicator should be seen.

Battery replacement must be carried out in a safe area. To replace the battery remove the six caphead screws in the back of the Setting Tool. Remove the back cover to expose the battery.

In order to maintain hazardous area certification fit only Duracell MN1604 or Rayovac Alkaline Maximum NoAL-9V battery types. Refit cover ensuring red indicator LED faces the transmitter window in the back cover.

When a button is depressed the Setting Tool transmits the relevant instruction to the actuator by infra-red pulses and must therefore be directly in front of the actuator indicator window and at a distance no greater than 0.75m.

7.3 Entering the Actuator Setting Procedure

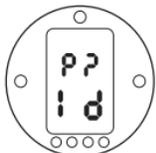
With the actuator securely mounted on the valve, the mains supply on and Local control or Stop selected.

PRESS THE ↓ KEY.

The actuator display will change and the Torque & Position display will be seen. (For instantaneous torque & position monitoring, refer to Section 10, page 66.)

PRESS THE ↓ KEY.

The actuator display will change and the password protection display will be seen.



The Actuator Function Settings can be protected by the Use of a Password

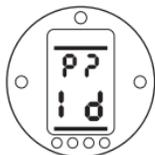
7.4 Setting Mode – Password

To enable setting and adjustment of the actuator functions the correct password must be entered. The factory set (default) password is [Id]. If the actuator has previously been set with a site password this must be displayed.

Use the + or – keys to scroll through the available passwords 00–FF (hexadecimal). With the correct password displayed press the enter key.

PRESS THE ← KEY.

Two “setting” bars will appear and will remain visible on every function display screen.



Default Password, Setting Mode Enabled

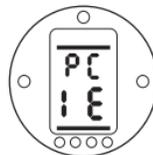
7.5 New Password [PC]

To configure a new password, the actuator must be in setting mode with the password display – setting mode enabled – showing,

PRESS THE → KEY.

The display will change to [PC]. Using the + or – key scroll through the available passwords until the desired password is displayed.

PRESS THE ← KEY.

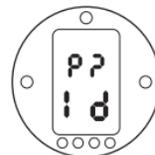


Password Changed to [IE]

NOTE: The new password becomes effective the next time setting mode is entered.

7.6 Checking Mode

The actuator function settings can be checked without entering the correct password. The settings can only be viewed and not altered. The setting bars will not be seen.



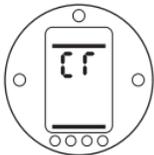
Password Display, Checking Mode

Once the procedure has been entered in the required mode

PRESS THE ↓ KEY.

The procedure branch [Cr] (crossroad) display can now be seen (refer to Section 7.7 page 19).

7.7 Procedure Branch – Crossroad [Cr]



To access the Primary Function settings **press the arrow ↓ key** (refer to *Section 8 Commissioning Primary Functions page 20*).

To access the Secondary Function settings **press the arrow → key** (refer to *Section 9 Commissioning Secondary Functions page 31*).

7.8 The Actuator Display – Setting/Checking Mode

Actuator functions as laid out in the Primary and Secondary commissioning stages, can be individually displayed by using the Setting Tool arrow keys.

The ↓ arrow key will always display the FIRST function on the next level DOWN within the procedure.

The → arrow key will always display the NEXT function on the SAME level and will wrap around the functions on the same level.

The actuator display indicator lamps will continue to indicate valve position.

Actuator functions are displayed in code form in the top portion of the liquid crystal display screen.

The setting for the displayed function is shown in the lower portion of the screen. Depending on the actuator function displayed, its setting may be an option or a value. In setting mode the Setting

Tool + or – keys will cause the setting to be changed. In checking mode the settings cannot be altered.

In setting mode, once displayed, a new setting can be entered into the actuator memory by **pressing the ← key**. The setting will flash off and back on, confirming its selection.



TOP PORTION

Function e.g.
tC = Torque Close

LOWER PORTION

Function Setting
e.g. Value = 40%

*Typical Actuator Function Display
Setting Mode Enabled*

7.9 Returning to Valve Position Display

There are four ways of returning to valve position display:

1. Approximately 5 minutes after the last Setting Tool operation the display will automatically return to position display.
2. Press the ↓ and → arrow keys together.
3. Press the ↓ arrow key until the display returns to position.
4. With any actuator function screen displayed, select Remote control using the red Local/Stop/Remote selector.



Fig. 8

The actuator's Primary Function settings affect the correct operation of the valve by the actuator. If the actuator has been supplied with the valve, the valve maker or supplier may have already made these settings.

ELECTRICAL OPERATION MUST NOT TAKE PLACE UNTIL THE PRIMARY SETTINGS HAVE BEEN MADE AND CHECKED.

This instruction assumes setting mode has been entered (refer to section 7.4 page 18).

Viewing the Primary Function Settings

With the actuator mounted on the valve, the power supply on and Local or Stop control selected, point the Setting Tool at the actuator indicator window from a distance of no more than 0.75m. By pressing the ↓ key and, when appropriate, the → key, it is possible to move through the procedure, displaying the various functions and their settings as shown in Fig. 8.1 (refer to page 21). The right-hand side of Fig.8.1 explains the function of each LCD display.

Power Off Setting

IQ allows settings to be viewed and set without main power. To enable this function, engage handwheel drive and rotate until the output drive moves (refer to page 3). The Setting Tool can now be used. As long as a Setting Tool key press takes place within the 30 seconds timeout period, Power Off Setting will remain enabled. If no infra-red Setting Tool communication takes place the display will return to indicating position. The actuator must then be operated by handwheel to re-enable Power Off Setting.

Settings and operation must be verified by electric operation and function test of the actuator to ensure correct operation.

Viewing the Primary Function Settings

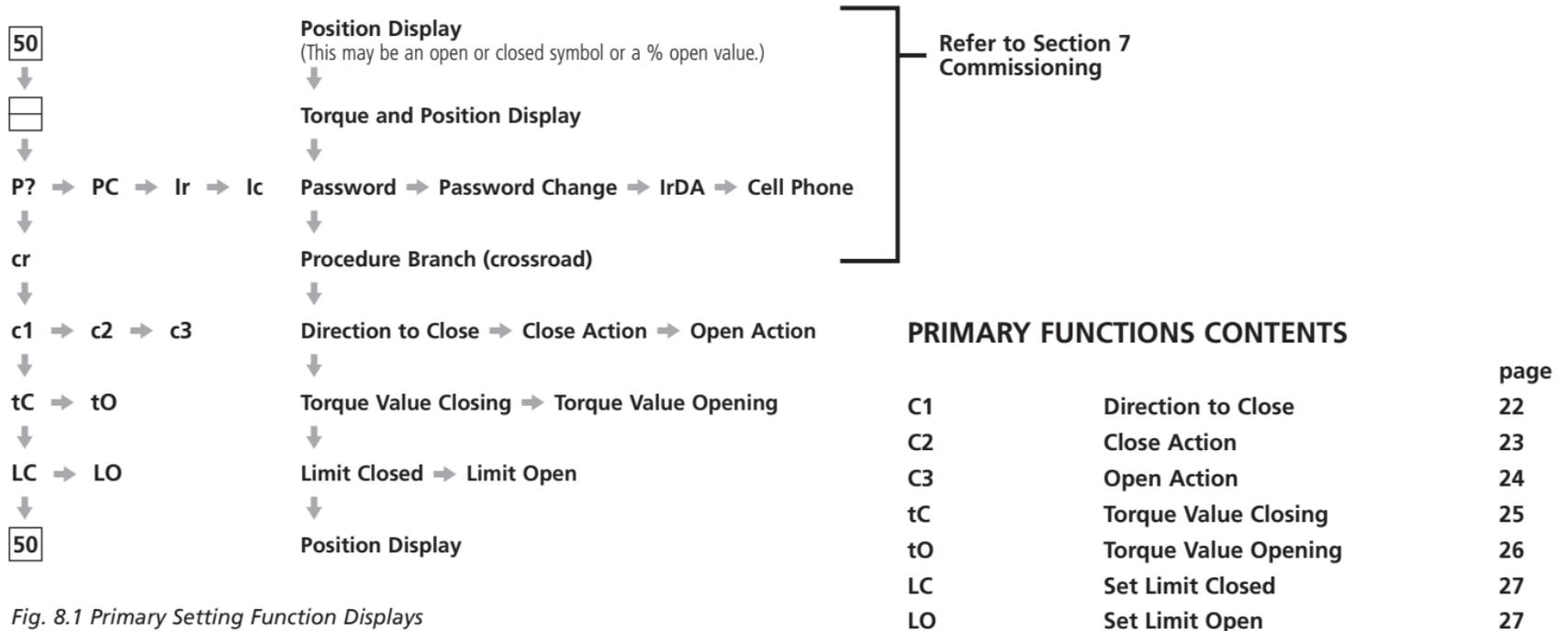


Fig. 8.1 Primary Setting Function Displays

The actuator can be configured to be clockwise or anti-clockwise to close.

C1

Direction to Close

Manually operate actuator and valve to establish correct closing direction. If the handwheel labelling is found to be incorrect please apply to Rotork for conversion labels.

Using the + or - key, display character conforming to correct closing direction.

Having ensured that the display corresponds to the established closing direction

PRESS THE ← KEY.

The displayed option will flash, indicating that it has been set.

PRESS THE → KEY.

50



P? → PC → Ir → Ic



cr



c1 → c2 → c3



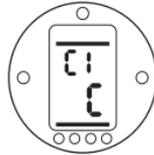
tC → tO



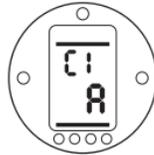
LC → LO



50



[C] in the Setting Field Indicating
Clockwise to Close



[A] in the Setting Field Indicating
Anti-clockwise to Close

C2

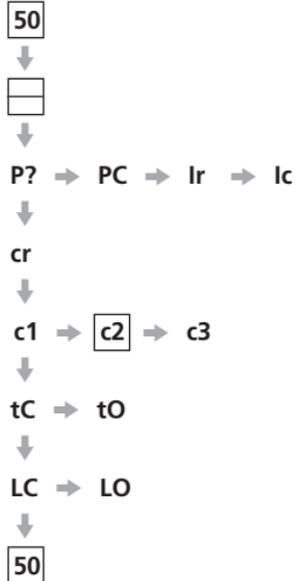
Close Action

The actuator can be configured to close on torque for seating valves and limit for non-seating valves.

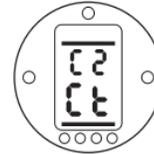
(Refer to valve manufacturer for recommended selection).

In the absence of valvemaker instructions refer to the following table

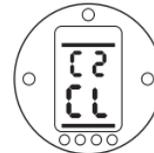
Valve type	Close	Open
Wedge gate	"torque"	"limit"
Globe	"torque"	"limit"
Butterfly	"limit"	"limit"
Thru conduit	"limit"	"limit"
Ball	"limit"	"limit"
Plug	"limit"	"limit"
Sluice gate	"limit"	"limit"
Penstock	"limit"	"limit"
Parallel slide	"limit"	"limit"



Using the + or – key, display the desired option.



[Ct] in the Setting Field Indicating Close on Torque - default setting.



[CL] in the Setting Field Indicating Close on Limit

Having selected the required option

PRESS THE ← KEY.

The displayed option will flash, indicating that it has been set.

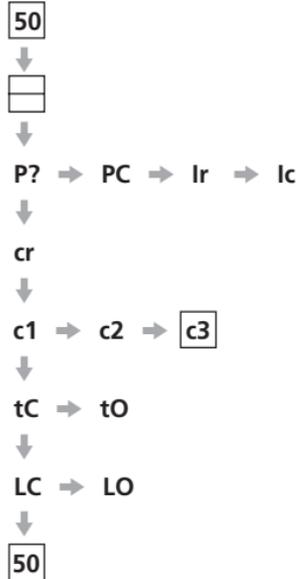
PRESS THE → KEY.

NOTE: When set to close on torque, the actuator will apply the value of torque as set for **[tC]** in seating the valve (refer to **[tC]** page 25).

C3

Open Action

The actuator can be configured to open on torque for back seating valves or limit for non back seating valves. Refer to valve manufacturer for recommended setting. In the absence of valvemaker instructions set "Open Limit".



Using the + or – key display the desired option.



[Ot] in the Setting Field Indicates Open on Torque - default setting.



[OL] in the Setting Field Indicates Open on Limit

PRESS THE ← KEY.

The displayed option will flash, indicating that it has been set.

PRESS THE → KEY.

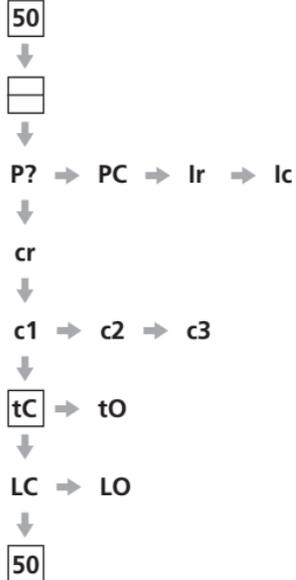
NOTE: When set to open on torque, the actuator will apply the value of torque as set for **[tO]** in back seating the valve (refer to **[tO]** page 26).

tC

Torque Value Closing

The value of torque available in the close direction can be configured. Refer to valve manufacturer for recommended value.

The closing torque value can be varied between 40% and Rated, in 1% increments.



Using the + and – keys display recommended value. In the absence of a recommended torque value, try a low setting and increase until satisfactory valve operation is achieved.

PRESS THE ← KEY.

The displayed value will flash, indicating that it has been set.

Should the set value of torque be developed in closing, the actuator will torque trip and stop.

PRESS THE → KEY.

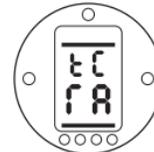
NOTE: Rated torque is quoted on the actuator nameplate.



40% of Rated Torque



99% of Rated Torque



Rated Torque

tO

Torque Valve Opening

The value of torque available in the open direction can be configured. Refer to valve manufacturer for recommended value.

50



P? → PC → Ir → Ic



cr



c1 → c2 → c3



tC → tO



LC → LO



50

The opening torque value can be varied between 40% and Rated, in 1% increments. In addition "Boost" can be configured when no open torque protection is required.

BOOST SHOULD NOT BE SELECTED WHEN THE ACTUATOR HAS BEEN CONFIGURED TO OPEN ON TORQUE (refer to [C3] page 24) unless back seating at Rated torque is acceptable.

Using the + and - keys display the recommended torque value.

In the absence of a recommended torque value, try a low setting and increase until satisfactory valve operation is achieved.

NOTE: Rated torque is quoted on the actuator nameplate. Boost torque is at least 140% of Rated torque.

PRESS THE ← KEY.

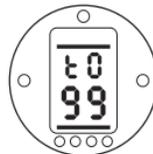
The displayed value will flash, indicating that it has been set.

Should the set value of torque be developed in opening, the actuator will torque trip and stop.

PRESS THE ↓ KEY.



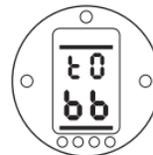
40%



99%



Rated

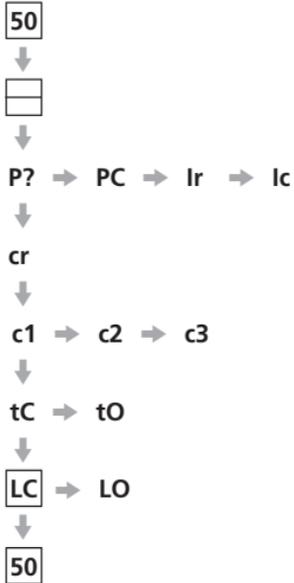


Boost

In checking mode, on pressing the ↓ key after reviewing open torque setting, the display will revert to valve position.

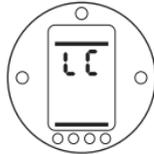
LC Set Limit Closed

NOTE: It is possible to set the Open Limit Position [LO] first.



NOTE: When in checking mode Set Limit Closed [LC] does not appear.

With [LC] displayed



Limit Closed

Move valve manually to the closed position. Allow for overrun by winding actuator output open by two handwheel turns.

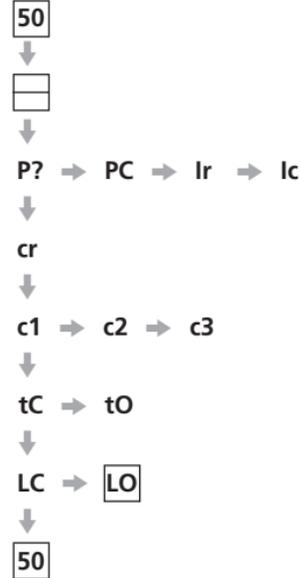
PRESS THE ← KEY.

The two bars will flash and the closed indicator lamp will illuminate, indicating closed limit position has been set.

PRESS THE → KEY.

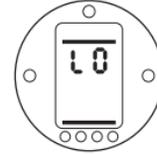
To check closed limit position hand wind valve open until the amber lamp illuminates. Wind valve back closed until the closed lamp illuminates.

LO Set Limit Open



NOTE: When in checking mode Set Limit Open [LO] does not appear.

With [LO] displayed



Limit Open

Move valve manually to the open position. Allow for overrun by winding actuator output closed by two handwheel turns.

PRESS THE ← KEY.

The two bars will flash and the open indicator lamp will illuminate, indicating open limit position has been set.

PRESS THE ↓ KEY.

The open symbol (refer to Fig. 3.3. page 4) should now appear.

Return to Positional Display

50



P? → PC → Ir → Ic



cr



c1 → c2 → c3



tC → tO



LC → LO



50

If the procedure has been followed as described, the positional display will indicate that the actuator is in the open position.

Select Remote control momentarily, using the red selector to exit setting procedure and then select required control: Local, Stop or Remote.

With the correct settings made electric operation can now be carried out safely.



Fig. 9

The Secondary Functions can be configured to suit site control and indication requirements. It is important that Primary Functions such as limits and torque switch settings are set before work commences on commissioning the Secondary Functions (refer to page 20). The layout of the Secondary Functions accessed with the Setting Tool are detailed in Fig. 9.1. To successfully commission the Secondary Functions, information about the site or process control system will be required.

The supplied actuator Wiring Diagram details control and indication devices fitted to the actuator along with terminal connection detail and standard remote control wiring systems.

Power Off Setting

IQ allows settings to be viewed and set without main power. To enable this function, engage handwheel drive and rotate until the output drive moves by one turn (refer to page 3). The Setting Tool can now be used. As long as a Setting Tool key press takes place within the 30 seconds timeout period, Power Off Setting will remain enabled. If no infra-red Setting Tool communication takes place the display will return to indicating position. The actuator must then be operated by handwheel to re-enable Power Off Setting.

Settings and operation must be verified by electric operation and function test of the actuator to ensure correct operation.

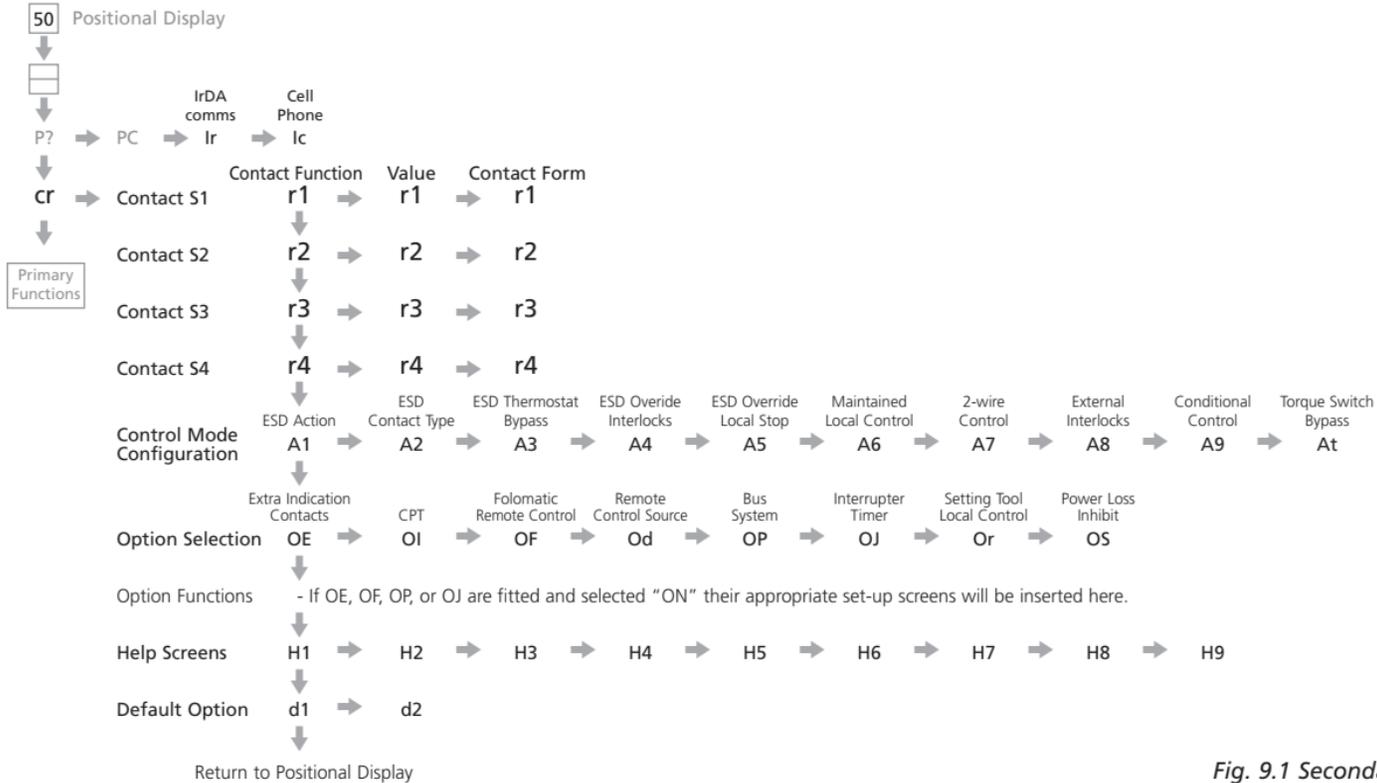


Fig. 9.1 Secondary Functions

SECONDARY FUNCTIONS CONTENTS

9.1	Accessing the Secondary Settings	31
9.2	Indication Contacts S1, S2, S3 and S4	32
9.3	Control Mode Configuration	34
9.4	Option Extra Indication Contacts S5–S8	37
9.5	Option CPT (Current Position Transmitter)	38
9.6	Option Folomatic Remote Control	39
9.7	Remote Control Source	42
9.8	Bus System Option Pakscan	43
9.9	Bus System Option Modbus	47
9.10	Bus System Option Profibus DP	51
9.11	Bus System Option DeviceNet	55
9.12	Bus System Positioning Control Settings	58
9.13	Option Interrupter Timer	60
9.14	Setting Tool Local Control	62
9.15	Inhibit Operation After Power Loss	62
9.16	Default Options	63
9.17	Default Options	64
10.1	Help Screens	67
10.2	IrDA Diagnostics and Configuration	72

Having established that the Primary Functions have been correctly set, the Secondary Functions can now be configured to suit site control and indication requirements.

It is possible to move through the various Secondary Functions as shown in Fig. 9.1 using the → and ↓ keys.

The actuator wiring diagram will indicate any options fitted.

Options Setting Tool Local Control [Or] and Power Loss Inhibit [OS] are standard features, their use being optional.

In order to display the Secondary Functions it is necessary to press the ↓ key until [Cr] appears.

If you have chosen to enter Secondary Functions in the checking mode the display will be as Fig. 9.2.

If you have chosen to enter Secondary Functions in the setting mode the display will be as Fig. 9.3 (refer to Section 7).

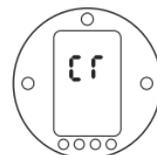


Fig. 9.2

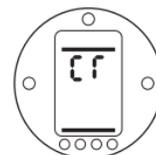


Fig. 9.3

PRESS THE → KEY.

9.2 Indication Contacts S1, S2, S3 and S4

Indication contacts S1 [r1], S2 [r2], S3 [r3] and S4 [r4] may each be set to trip for any one of the following functions:

Code Function

[CL]	closed end position
[OP]	open end position
[Po]	intermediate position
[tC]	torque trip close
[tO]	torque trip open
[tt]	torque trip any position
[tl]	torque trip mid travel
[dC]	actuator closing
[dO]	actuator opening
[d?]	actuator rotating
[St]	motor stalled
[bA]	battery low
[HA]	hand operation
[bL]	blinker
[LS]	local stop
[OI]	open interlock
[CI]	close interlock
[IL]	interlock active
[ES]	ESD signal
[LP]	lost phase **
[Lo]	local selected
[RE]	remote selected
[AA]	actuator alarm *

[24]	24V power failure ***
[rr]	motor running
[UA]	Valve alarm*
[Ht]	thermostat tripped
[CA]	Control alarm*
[rP]	relay parity

The S contact form can be set normally open [no] or normally closed [nc].

The procedures for setting up contacts S2, S3 and S4 are the same as those shown for S1.

Unless specified with order, the default settings for indication contacts are as follows:

S1 – [CL] closed end position [no]

S2 – [OP] open end position [no]

S3 – [CL] closed end position [nc]

S4 – [OP] open end position [nc]

* Contact alarm indication will operate under the same conditions as the display alarm indication icons (*refer to page 5 for information*).

** [LP] Function not available for phases 1 & 2, only for phase 3. For phase loss detection on phase 1 & 2 please use monitor relay

*** [24] Function not available if the 3 phase supply is lost.

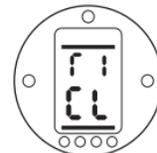
r1 Contact S1 - Function

32

Using the + or – key display the desired function.

PRESS THE ← KEY.

The displayed function will flash indicating that it has been set.



Contact S1 Configured to Trip at Valve Closed Limit

PRESS THE → KEY.

r1

Contact S1 - Value

When the S contact function is set to **[PO]**, the required intermediate position value must be set.

No other contact function requires a value to be set.

The value can be set from 1% open to 99% open in 1% increments.

Using the + or – key, display the required value.

PRESS THE ← KEY.

The displayed value will flash indicating that it has been set.



*Value Set to Indicate
25% Open*

PRESS THE → KEY.

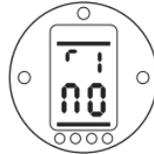
r1

**Contact S1
Contact Form**

Use the + or – keys to select between **[NO]** (normally open) and **[NC]** (normally closed).

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



*Contact S1 Configured as a
Normally Open Contact*

NOTE: If function **[PO]** is selected and it is configured as a normally open contact it will make at the set value with the actuator moving in the open direction.

To access S2–S4

PRESS THE ↓ KEY.

9.3 Control Mode Configuration

The Control Mode Configuration affects how the actuator will respond under conditions of emergency shut down, local control, remote control interlocks, and 2-wire remote control. Also included is an unseating torque switch bypass function. Unless specified with order, the control mode configuration will be set as shown for default configuration on page 63.

If it is necessary to change the configuration follow the instructions in this section.

There are 10 configurable control functions:

A1 ESD action

A2 ESD contact type

A3 ESD thermostat bypass

A4 ESD override interlock

A5 ESD override local stop

A6 Maintained local control

A7 2-wire remote control

A8 External interlocks

A9 Conditional Control

At Torque switch bypass.

A1 ESD Action

An active ESD signal applied to the actuator will override any existing or applied local or remote control signal. ESD can be configured to override the transformer thermostat, active interlocks or local stop selection. Refer to A3, A4 and A5.

The default action under an active ESD signal is to stay put **[SP]**.

Press the **+** or **-** key to select the required ESD action:

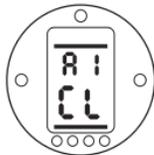
[CL] Close on ESD

[SP] Stay put on ESD

[OP] Open on ESD

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



ESD Set to Close

A2 ESD Contact Type

The default setting for ESD Contact Type is **[NO]**.

The actuator responds to a remote control ESD signal derived from a normally open contact making. For ESD, where a remote control ESD signal is derived from a normally closed contact breaking, the signal being removed, press the **+** or **-** key.

The display will change to **[NC]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



Actuator Responds to a Remote, Normally Open ESD Contact Making (Signal Applied)

*Note: If Folomatic analogue control is required A2 must be set to **[NO]**.*

A3 ESD Thermostat Bypass

The default setting for Motor Thermostat Bypass is **[OF]** during ESD. The thermostats remain in circuit and enabled during ESD.

The motor thermostats can be bypassed during ESD as a factory set, hard-wired option only. Contact Rotork for information.

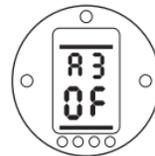
Danger: Actuator hazardous area certification is invalidated while the thermostats are bypassed.

A3 should be set to reflect the factory set configuration of thermostat bypass.

During an ESD event:

[A3]=**[OF]** thermostats enabled

[A3]=**[ON]** thermostats bypassed



Thermostats Enabled During ESD

A4 ESD Override Interlocks

The default setting for ESD Override Interlocks is **[OF]**. ESD action will not override an active interlock applied to the actuator.

If an applied ESD signal is required to override active interlocks causing the ESD action as set for A1, press the **+** or **-** key. The display will change to **[ON]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



ESD Override Interlock – Off

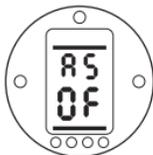
A5 ESD Override Local Stop

The default setting for ESD Override Local Stop is **[OF]**. ESD will not override local stop when selected.

If an applied ESD signal is required to override local stop causing the ESD action as set for A1, press the **+** or **-** key. The display will change to **[ON]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



ESD Override Local Stop – Off

A6 Maintained Local Control

The default setting for Local Actuator Pushbutton control is self-maintained **[ON]**.

If non-maintained actuator pushbutton control is required (jogging, inching, push to run), press the **+** or **-** key. The display will change to **[OF]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



Self-Maintained Local Control

A7 2-wire Remote Control

The default setting for 2-wire Remote Control is Stayput **[SP]**. If an open and closed remote control signal are applied simultaneously the actuator will stayput (stop if running). Refer to actuator wiring diagram or publication E120E.

Use the **+** or **-** key to select the required priority:

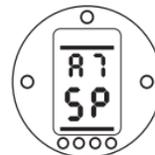
[OP] Open

[SP] Stay put

[CL] Close

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



2-wire Control – Stayput Priority

A8 External Interlocks

Actuators are delivered with the interlock facility disabled **[OF]**. Refer to the actuator wiring diagram or publication E120E for interlock control circuits.

To enable remote external interlocks press the **+** or **-** key.

The display will change to **[ON]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



Interlocks Disabled

Note: If interlocking is required in only one direction, it will be necessary to connect a link between the actuator terminals associated with the other direction.

A9 Conditional Control

Where a high level of safety integrity is required, Conditional Control can be configured. In this mode two discreet signals are required for remote operation. Remote control will be conditional on both a control signal (open or close) and the appropriate interlock signal being applied simultaneously. Failure of either or a spurious signal will not cause operation.

Interlocks [A8] must be set **[ON]**. Interlock signals are not required for local operation.

The default setting for conditional control is **[OF]**. To enable conditional control press the **+** or **-** key. The display will change to **[ON]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



Conditional Control Off

At Torque Switch Bypass

The default setting for Torque Switch Bypass is **[OF]**, the torque switches are not bypassed during the unseating movement.

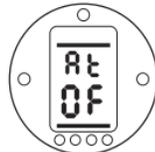
To bypass the torque switches during the unseating movement press the **+** or **-** key.

The display will change to **[ON]**.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

The torque switches will be bypassed from closed limit to 5% open when opening and from open limit to 95% when closing. Bypassing the torque switches makes torque in excess of rated and up to actuator stall available for unseating a "sticky" valve. Outside these positions the torque setting will revert to the values set for **[tC]**, see page 25 and **[tO]** page 26.



Torque Switch Bypass Off

9.4 Option Extra Indication Contacts

Extra indication contacts S5 [r5], S6 [r6], S7 [r7] and S8 [r8] are available as an option.

Check actuator circuit diagram for inclusion.

When the Extra Contact Option is included the set-up procedure and available contact functions for S5 – S8 are identical to S1–S4 (refer to Section 9.2 page 32).

Unless specified with order the default setting for the extra indication contacts will be as follows:

S5 [r5] Close limit indication

S6 [r6] Open limit indication

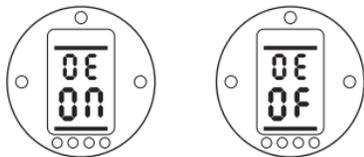
S7 [r7] Torque trip mid travel

S8 [r8] Remote control selected

NOTE: If the Extra Contact Option is not included in the actuator build, any settings made for S5–S8 will have no effect on the indication output of the actuator.

OE Display Extra Contact Set-up Screens

The action of turning on the Extra Contact Option makes an additional series of set-up screens available



Enabled *Disabled*
Extra Contact Set-up Displays

Press the + or – key to select the Extra Contact Option set-up screens [On].

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

PRESS THE ↓ KEY TO ACCESS S5 TO S8 SET-UP DISPLAYS.

The procedure for setting S5 to S8 is the same as that for S1 to S4 (refer to Section 9.2 page 32).

9.5 Option CPT [OI] (Current Position Transmitter)

Setting instructions for actuators including a CPT providing 4-20 mA analogue position feedback.

The CPT is an optional extra. It may be internally or externally powered.

Check wiring diagram for inclusion and connection details.



*With [HI] Displayed, the (CPT)
20mA Output will Correspond to
Actuator Fully Open*

If 20mA is required to correspond to actuator closed use the + or – key to change to [LO].

PRESS THE ← KEY.

The displayed option will flash indicating that the option has been set.

NOTE: If the actuator has options Folomatic and CPT, redefining the CPT, will require the Folomatic to be recommissioned (*refer to Section 9.6 Folomatic [OI] page 39*).

9.6 Option Folomatic Remote Control

Setting instructions for actuators including a Folomatic (proportional) Controller for use in (analogue) valve position control.

The Folomatic is an optional control device. Check actuator wiring diagram for inclusion.

Before setting the parameters for Option Folomatic ensure Remote Control Source [Od] has been selected to [bo] in Section 9.7.

Folomatic set-up screens can be turned OFF to provide extra security.

Once selected ON the option function displays allow commissioning of the Folomatic to be undertaken.

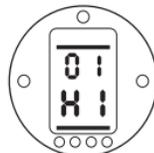
NOTE: Turning ON/OFF the Folomatic set-up screens (when fitted) does **not** affect its operation.

This instruction lists the Folomatic function displays in their sequence and assumes that all Folomatic functions are to be checked/set.

The actuator should be selected in Local or Stop with the set point signal connected to terminals 26(+ve) and 27(-ve) (refer to wiring diagram).

OI Folomatic Feedback

Before commissioning of the Folomatic functions can begin, the Folomatic Feedback must be set to suit the applied set point signal.



With [HI] displayed, an increasing set point signal will correspond to valve opening.

If a high set point signal is required to correspond to valve closing use the + or - key to change to [LO].

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

If setting [OI] is modified after commissioning the Folomatic, it will be necessary to recommission the Folomatic.

Press the → key to access the Folomatic set-up display [OF].

OF Display Folomatic Set-up Screens

The action of turning on the Folomatic option makes an additional series of settings available.



Folomatic Set-up Screens OFF



Folomatic Set-up Screens ON

Use the + or - key to select Folomatic Display [ON].

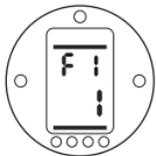
PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the ↓ key to access the Folomatic set-up displays.

Fl Set Point Signal Type

Using the **+** or **-** key select **[I]** for current set point signal or **[U]** for voltage set point signal.



Current Mode Selected

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[Fr]**.

Fr Set Point Signal Range

Using the **+** or **-** key select **[05]**, **[10]** or **[20]** to correspond with the set point signals within the range of 0–5mA or volts, 0–10mA or volts or 0–20mA or volts (i.e. 4–20mA).



0–20mA or Voltage Range Selected

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[FL]**.

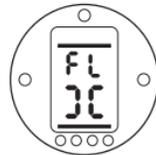
FL Valve Position LOW Set Point

APPLY MINIMUM SET POINT SIGNAL

Using the **+** or **-** key select:

- [I]** = valve closed
- [00] to [99]** = percent open
- [≡≡]** = valve open

to correspond with the **LOW** set point signal.



Valve Closed on LOW Signal

PRESS THE ← KEY.

The displayed value will flash indicating that it has been set.

Press the → key to display **[FH]**.

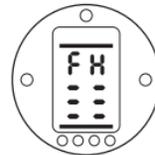
FH Valve Position HIGH Set Point

APPLY MAXIMUM SET POINT SIGNAL

Using the **+** or **-** key select:

- [I]** = valve closed
- [00] to [99]** = percent open
- [≡≡]** = valve open

to correspond with the **HIGH** set point signal.



Valve Open on HIGH Signal

PRESS THE ← KEY.

The displayed value will flash indicating that it has been set.

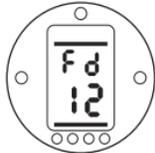
Press the → key to display **[Fd]**.

Fd Deadband Adjustment

If the actuator hunts or responds unnecessarily to a fluctuating set point signal the deadband must be increased. If more accurate control is required the deadband may be decreased.

Use the **+** or **-** key to select the deadband width. Range 00–99 corresponds to 0–9.9% of setpoint signal.

NOTE: Maximum deadband is 9.9% of valve stroke. Normally minimum deadband should not be less than 1%.



Deadband Set to 1.2%
of Valve Stroke

PRESS THE ← KEY.

The displayed value will flash indicating that it has been set.

Press the → key to display **[Ft]**.

Ft Motion Inhibit Timer Adjustment

The motion inhibit timer introduces a delay in the actuator response to a rapidly fluctuating set point signal, preventing unnecessary movement.

Once the system stabilises the actuator will respond to steady changes in the set point signal as necessary.

Use **+** or **-** key to adjust motion inhibit time in seconds: range 0–99. Normally it is recommended that motion inhibit time should not be set to less than 5 seconds (*refer to note on page 62*).



Motion Inhibit
Time Set to 5 Seconds

PRESS THE ← KEY.

The displayed value will flash indicating that it has been set.

Press the → key to display **[FA]**.

FA Action On Loss of Set Point Signal

Use **+** or **-** key to enable **[On]** or disable **[Of]** action on loss of set point signal.

[On] – Failsafe as determined by **[FF]**.

[Of] – Failsafe to position corresponding to low set point.



Enabled

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

NOTE: Failsafe action “ON” will be effective only for systems using an offset or live zero signal range, for example 4–20 mA.

Press the → key to display **[FF]**.

FF Failsafe Action

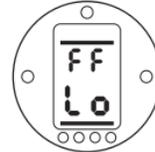
Failsafe action when **[FA]** enabled.

Use **+** or **-** key to select, on loss of set point signal:

[Lo] – move valve to position corresponding to minimum set point.

[SP] – stayput on loss of set point.

[Hi] – move valve to position corresponding to maximum set point.



PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Commissioning of the Folomatic is now complete. Remote control may be selected.

9.7 Remote Control Source

The available forms of remote control are listed below:

Standard hardwired control
 Analogue control-Option Folomatic
 Network control including:
 Option Pakscan
 Option Modbus
 Option Profibus

The setting for Remote Control Source will depend on the type of remote control required and the option specified and fitted. Check actuator circuit diagram for remote control form.

Od Remote Control Source

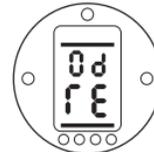
The setting of Remote Control Source will be determined by the option that has been fitted, if any.

- [rE]** Standard hardwired remote control.
- [bo]** Option Folomatic.
- [oP]** Options Pakscan, Profibus, Modbus, Foundation Fieldbus or DeviceNet.
- [OF]** All remote control disabled (Actuator available for local control only).

To change the remote source press the **+** or **-** key until the required setting is displayed.

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



*Standard Hardwired
Remote Control*

9.8 Bus System Option Pakscan [OP]

Setting instructions for actuators including an optional Pakscan Field Control Unit – check wiring diagram for inclusion.

Before setting the parameters for Option Pakscan ensure Remote Control Source [Od] has been selected to [oP] in Section 9.7. (refer to page 42)

Pakscan set-up screens can be turned off to provide extra security. The action of turning screens on or off does not affect its operation.

Use the + or – key to turn on Pakscan set-up screens.



Pakscan Set-up Screens ON

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the ↓ key to display the Pakscan set-up screens.

PA Pakscan Address

The actuator Pakscan Field Control Unit must be allocated a unique loop address.

The actuator must be in “Loopback” for its address to be set or changed. Loopback can be achieved in two ways:

1. Turn OFF the master station.
2. Isolate the actuator from the 2-wire control loop.

Using the + or – keys display the required loop address.

Address to be set within the range 01–F0 Hexadecimal. (refer to table on page 75).



PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [Pb].

Pb Pakscan Baud Rate

The actuator Pakscan Field Control Unit baud rate must be set to the loop baud rate. For a Pakscan 2-wire control loop the selected baud rate must be common to the master station and all the field control units included in the loop.

The actuator must be in “Loopback” for its baud rate to be set or changed.

Loopback can be achieved in two ways:

1. Turn OFF the master station.
2. Isolate the actuator from the 2-wire control loop.

Pb**Pakscan Baud Rate**

Using the **+** or **-** keys display the required baud rate.

01 = 110 baud

03 = 300 baud

06 = 600 baud

12 = 1200 baud

24 = 2400 baud



2400 baud rate set

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[PF]**.

PF**Pakscan Remote Auxiliary Input**

The IQ actuator has the facility to accept 4 auxiliary inputs (AUX1–AUX4). These are used when supplementary remote control or digital auxiliary inputs are required in addition to the standard control and feedback features incorporated into the Pakscan card. It is also possible to have a combination of both remote control and volt-free inputs to provide, for example, open and close control as well as a high and low tank level alarm indication, supplied via an external transducer.

The hexadecimal number displayed under PF can be considered as a “software mask”. It is this mask that tells the Pakscan card what type of input to expect, control or input signal, and what form the input will be, normally open or normally closed (refer to page 75 for Binary, Hexadecimal and Decimal Conversion Table).

To decipher the mask the number needs to be split into two separate hexadecimal characters, each of which can be sub-divided into 4 binary bits. The first 4 bits represent the function and the second 4 represent the input source (known as invert). Pictorially this can be represented as:

	Left side hex character	Right side hex character
	Aux 4 to 1 (function)	AUX 4 to 1 (Invert)
Bits	4 3 2 1	4 3 2 1

When used for remote control of the actuator bits 4 to 1 of the function character have been designated as follows:

Bit 4 (AUX4)	–	ESD
Bit 3 (AUX3)	–	Stop/Maintain
Bit 2 (AUX2)	–	Close
Bit 1 (AUX1)	–	Open

(When used for digital signal inputs they are simply designated as AUX 4 to AUX 1)

Rules

1. Function bit set to "0"

Any function bit set to "0" indicates that the particular aux input is to be treated as a digital signal for field status reporting, e.g. a level switch or motor running status.

If the corresponding invert bit is set to a "0", an open contact is reported as a logic "1" and a closed contact is reported as a logic "0" (i.e. this will invert the input).

If the corresponding invert bit is set to a "1", an open contact is reported as a logic "0" and a closed contact is reported as a logic "1" (i.e. this gives a noninverting input).

2. Function bit set to "1"

Any function bit set to "1" indicates that the particular aux input is to be treated as a digital command to operate the actuator.

When the corresponding invert bit is set to a "0" this represents an N.C. contact as being the command source, i.e. a closing contact de-energises the input and an opening contact energises the input.

When the corresponding invert bit is set to a "1", this represents an N.O. contact as being the command source, i.e. a closing contact energises the input and an opening contact de-energises the input.

3. ESD Control

When using ESD (aux input 4), the ESD contact mode setting **[A2]** should be set to the default value of **[NO]**. The **[A1]**–ESD direction setting should be set to either Open or Close the valve (*refer to page 34*).

4. Stop/Maintain Control

When energised this will make the Aux input Open/Close/ESD control push-to-run, (non-maintained).

When de-energised, the Aux input Open/Close/ESD control will be maintained.

5. Remote I/P Setting

Ensure that the correct **[Od]** setting is selected (refer to page 42).

For Pakscan this is **[oP]**.

The factory default for **[PF]** is **[OF]**.

Examples

1. The full range of remote controls is needed. Open and Close are NO and ESD and Stop/maintain is NC.

Aux I/P 4 3 2 1

Function 1 1 1 1 = F

Invert 0 0 1 1 = 3 i.e. set **[PF]** to **[F3]**

2. Open and close control is required along with 2 inverted digital signal inputs (Note that with this setting the open and close commands will be maintained.)

Aux I/P 4 3 2 1

Function 0 0 1 1 = 3

Invert 0 0 1 1 = 3 i.e. set **[PF]** to **[33]**

3. Only an ESD input is needed. The requirement is for push to run control with a NO contact input.

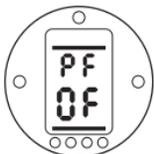
Aux I/P 4 3 2 1

Function 1 1 0 0 = C

Invert 1 0 0 0 = 8 i.e. set **[PF]** to **[C8]**

PF Pakscan Remote Auxiliary Input

Using the + or - keys display the required mask setting.



Auxiliary Input Mask [OF]

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

If Pakscan positioning control is required, return to the position display by pressing ↓ and → keys together.

Display [OF] (refer to page 58).

PP

Setting [PP] is not used by Pakscan. Entered settings will be ignored.

Setting instructions for actuators including an optional Modbus RTU module – check wiring diagram for inclusion.

Before setting the parameters for Option Modbus ensure Remote Control Source [Od] has been selected to [oP] in Section 9.7. (refer to page 42).

Modbus module set-up screens can be turned off to provide extra security. The action of turning screens on or off does not affect its operation.

Use the + or – keys to turn on Modbus set-up screens.



Modbus Set-up Screens [On]

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

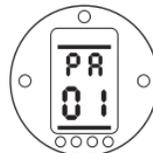
Press the ↓ key to display the Modbus set-up screens.

The Modbus module must be allocated a unique address.

To set the address the Modbus module must be isolated from the host by disconnecting the RS485 highway or turning off the host device.

Using the + or – keys display the required address.

Address to be set within the range 01 to F7 Hexadecimal (refer to page 75 for conversion). If an address value outside this range is entered, the address set will revert to 01 (for 00) or F7 (for value above F7).



PRESS THE ← KEY.

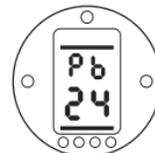
The displayed option will flash indicating that it has been set.

Press the → key to display [Pb].

The Modbus module must be set to the RS485 highway baudrate. To set the baudrate the Modbus module must be isolated from the host by disconnecting the RS485 highway or turning off the host device.

Using the or keys display the required baudrate:

[01] 110	[06] 600
[03] 300	[24] 2400
[12] 1200	[96] 9600
[48] 4800	[38] 38400
[19] 19200	



2400 Baud

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [PF].

The IQ actuator has the facility to accept 4 auxiliary inputs (AUX1 – AUX4). These are used when supplementary remote control or digital auxiliary inputs are required in addition to the standard control and feedback features incorporated into the Modbus module. It is also possible to have a combination of both remote control and volt-free inputs to provide, for example, open and close control as well as a high and low tank level alarm indication, supplied via an external transducer.

The hexadecimal number displayed under PF can be considered as a “software mask”. It is this mask that tells the Modbus module what type of input to expect, control or input signal, and what form the input will be, normally open or normally closed (*refer to page 75 for Binary, Hexadecimal and Decimal Conversion Table*).

To decipher the mask the number needs to be split into two separate hexadecimal characters, each of which can be sub-divided into 4 binary bits. The first 4 bits represent the function and the second 4 represent the input source (known as invert). Pictorially this can be represented as:

	Left side hex character Aux 4 to 1 (function)	Right side hex character AUX 4 to 1 (Invert)
Bits	4 3 2 1	4 3 2 1

When used for remote control of the actuator bits 4 to 1 of the function character have been designated as follows:

Bit 4 (AUX4)	–	ESD
Bit 3 (AUX3)	–	Stop/Maintain
Bit 2 (AUX2)	–	Close
Bit 1 (AUX1)	–	Open

(When used for digital signal inputs they are simply designated as AUX 4 to AUX 1.)

Rules

1. Function bit set to “0”

Any function bit set to “0” indicates that the particular aux input is to be treated as a digital signal for field status reporting, e.g. a level switch or motor running status.

If the corresponding invert bit is set to a “0”, an open contact is reported as a logic “1” and a closed contact is reported as a logic “0” (i.e. this will invert the input).

If the corresponding invert bit is set to a “1”, an open contact is reported as a logic “0” and a closed contact is reported as a logic “1” (i.e. this gives a noninverting input).

2. Function bit set to “1”

Any function bit set to “1” indicates that the particular aux input is to be treated as a digital command to operate the actuator.

When the corresponding invert bit is set to a “0” this represents an N.C. contact as being the command source, i.e. a closing contact de-energises the input and an opening contact energises the input.

When the corresponding invert bit is set to a “1”, this represents an N.O. contact as being the command source, i.e. a closing contact energises the input and an opening contact de-energises the input.

3. ESD Control

When using ESD (aux input 4), the ESD contact mode setting **[A2]** should be set to the default value of **[NO]**. The **[A1]**–ESD direction setting should be set to either Open or Close the valve (*refer to page 34*).

4. Stop/Maintain Control

When energised this will make the Aux input Open/Close control push-to-run. When de-energised, the Aux input Open/Close control will be maintained. ESD is always push to run (non maintained).

5. Remote I/P Setting

Ensure that the correct **[Od]** setting is selected (*refer to page 42*).

For Modbus this is **[rE]**.

The factory default for **[PF]** is **[OF]**.

Examples

1. The full range of remote controls is needed. Open and Close are NO and ESD and Stop/maintain is NC.

Aux I/P 4 3 2 1

Function 1 1 1 1 = F

Invert 0 0 1 1 = 3 i.e. set [PF] to [F3]

2. Open and close control is required along with 2 inverted digital signal inputs. (Note that with this setting the open and close commands will be maintained.)

Aux I/P 4 3 2 1

Function 0 0 1 1 = 3

Invert 0 0 1 1 = 3 i.e. set [PF] to [33]

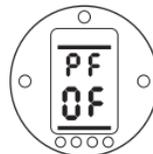
3. Only an ESD input is needed. The requirement is for push to run control with a NO contact input.

Aux I/P 4 3 2 1

Function 1 1 0 0 = C

Invert 1 0 0 0 = 8 i.e. set [PF] to [C8]

Using the or keys display the required mask setting.



Auxiliary Input Mask **[OF]**

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[PP]**.

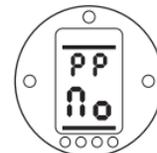
Where Modbus parity bit detection is used the module must be set with the parity bit setting of the host.

Using the + or – keys display the required parity bit:

[No] No parity bit

[En] Even parity bit

[Od] Odd parity bit



No Parity Bit

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

For Modbus module positioning settings and action on loss of signal setting **[OF]** (*refer to page 58*).

If Modbus positioning control and action on loss of communication are required, return to the position display by pressing **↓** and **→** keys together.

Display **[OF]** (*refer to page 58*).

9.10 Bus System Option Profibus DP [OP]

Setting instructions for actuators including an optional Profibus DP module – check wiring diagram for inclusion.

Before setting the parameters for Option Profibus ensure Remote Control Source [Od] has been selected to [oP] in Section 9.7. (refer to page 42).

Profibus module set-up screens can be turned off to provide extra security. The action of turning screens on or off does not affect its operation.

Use the + or – keys to turn on Profibus set-up screens.



Profibus set-up screens [ON]

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the ↓ key to display the Profibus set-up screens.

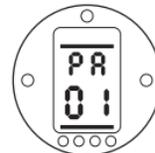
PA Profibus Address

The Profibus DP module must be allocated a unique address.

To set the address the Profibus module must be isolated from the host by disconnecting the RS485 highway or turning off the host device.

Using the + or – keys display the required address.

Address to be set within the range 01 to 7E Hexadecimal (refer to page 75 for conversion). If an address value outside this range is entered, the address set will revert to 01 (for 00) or 7E (for value above 7E).



PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → to display [Pb].

PF Profibus Remote Auxiliary Input

The IQ actuator has the facility to accept 4 auxiliary inputs (AUX1–AUX4). These are used when supplementary remote control or digital auxiliary inputs are required in addition to the standard control and feedback features incorporated into the Profibus module. It is also possible to have a combination of both remote control and volt-free inputs to provide, for example, open and close control as well as a high and low tank level alarm indication, supplied via an external transducer.

The hexadecimal number displayed under PF can be considered as a “software mask”. It is this mask that tells the Profibus module what type of input to expect, control or input signal, and what form the input will be, normally open or normally closed (*refer to page 75 for Binary, Hexadecimal and Decimal Conversion Table*).

To decipher the mask the number needs to be split into two separate hexadecimal characters, each of which can be sub-divided into 4 binary bits. The first 4 bits represent the function and the second 4 represent the input source (known as invert). Pictorially this can be represented as:

	Left side hex character	Right side hex character
	Aux 4 to 1 (function)	AUX 4 to 1 (Invert)
Bits	4 3 2 1	4 3 2 1

When used for remote control of the actuator bits 4 to 1 of the function character have been designated as follows:

Bit 4 (AUX4)	–	ESD
Bit 3 (AUX3)	–	Stop/Maintain
Bit 2 (AUX2)	–	Close
Bit 1 (AUX1)	–	Open

(When used for digital signal inputs they are simply designated as AUX 4 to AUX 1.)

Rules

1. Function bit set to "0"

Any function bit set to "0" indicates that the particular aux input is to be treated as a digital signal for field status reporting, e.g. a level switch or motor running status.

If the corresponding invert bit is set to a "0", an open contact is reported as a logic "1" and a closed contact is reported as a logic "0" (i.e. this will invert the input).

If the corresponding invert bit is set to a "1", an open contact is reported as a logic "0" and a closed contact is reported as a logic "1" (i.e. this gives a noninverting input).

2. Function bit set to "1"

Any function bit set to "1" indicates that the particular aux input is to be treated as a digital command to operate the actuator.

When the corresponding invert bit is set to a "0" this represents an N.C. contact as being the command source, i.e. a closing contact de-energises the input and an opening contact energises the input.

When the corresponding invert bit is set to a "1", this represents an N.O. contact as being the command source, i.e. a closing contact energises the input and an opening contact de-energises the input.

3. ESD Control

When using ESD (aux input 4), the ESD contact mode setting **[A2]** should be set to the default value of **[NO]**. The **[A1]**–ESD direction setting should be set to either open or close the valve (*refer to page 34*).

4. Stop/Maintain Control

When energised this will make the Aux input Open/Close control push to run. When de-energised, the Aux input Open/Close control will be maintained. ESD is always push to run (non maintained).

5. Remote Source Setting [Od]

Ensure that the correct **[Od]** setting is selected (*refer to page 42*).

For Profibus this is **[OP]**.

The factory default for **[PF]** is **[OF]**

Examples

1. The full range of remote controls is needed. Open and Close are NO and ESD and Stop/maintain is NC.

Aux I/P	4 3 2 1	
Function	1 1 1 1	= F
Invert	0 0 1 1	= 3 i.e. set [PF] to [F3]

2. Open and close control is required along with 2 inverted digital signal inputs. (Note that with this setting the open and close commands will be maintained.)

Aux I/P	4 3 2 1	
Function	0 0 1 1	= 3
Invert	0 0 1 1	= 3 i.e. set [PF] to [33]

3. Only an ESD input is needed. The requirement is for push to run control with a NO contact input.

Aux I/P	4 3 2 1	
Function	1 1 0 0	= C
Invert	1 0 0 0	= 8 i.e. set [PF] to [C8]

PF Profibus Remote Auxiliary Input

Using the + or – keys display the required mask setting.



Auxiliary Input Mask OF

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

If Profibus positioning control and action on loss of communication are required, return to the position display by pressing ↓ and → keys together. Display **[OF]** (refer to page 58).

PP

Setting [PP] is not used by Profibus. Entered settings will be ignored.

9.11 Option DeviceNet

Setting instructions for actuators including an optional DeviceNet DFU module – check wiring diagram for inclusion.

DeviceNet module set up screens can be turned off to provide extra security. The action of turning screens on or off does not effect its operation.

Use the **+** or **-** key to turn on DeviceNet set up screens.



DeviceNet Set-up Screens ON

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

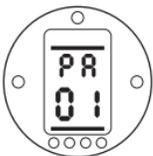
Press the ↓ key to display the DeviceNet set up displays.

PA DeviceNet Address

The DeviceNet module must be allocated a unique address.

Using the **+** or **-** keys display the required address.

Address to be set within the range 01 to 3F Hexadecimal. See page 72 for conversion. If an address value outside this range is entered, the address set will revert to 01 (for 00) or 3F (for value above 3F).



PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[Pb]**.

Pb DeviceNet Baudrate

The DeviceNet module must be set to the DeviceNet highway baudrate.

Using the **+** or **-** keys display the required baudrate:

[01] 125 k baud

[03] 250 k baud

[06] 500 k baud



PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display **[PF]**.

Press the ➔ key to display [PF].

The IQ actuator has the facility to accept 4 auxiliary inputs (AUX1–AUX4). These are used when supplementary remote control or volt free digital auxiliary inputs are required in addition to the standard control and feedback features incorporated into the DeviceNet module. It is also possible to have a combination of both remote control and volt free inputs to provide, for example, open and close control as well as a high and low tank level alarm indication, supplied via an external transducer.

The hexadecimal number displayed under PF can be considered as a “software mask”. It is this mask that tells the DeviceNet module what type of input to expect, control or input signal, and what form the input will be, normally open or normally closed.

To decipher the mask the number needs to be split into two separate hexadecimal characters, each of which can be sub-divided into 4 binary bits. The first 4 bits represent the function and the second 4 represent the input source (known as invert). Pictorially this can be represented as:

	Left side hex character Aux 4 to 1 (function)	Right side hex character AUX 4 to 1 (Invert)
Bits	4 3 2 1	4 3 2 1

When used for remote control of the actuator bits 4 to 1 of the function character have been designated as follows:

Bit 4 (AUX4)	–	ESD
Bit 3 (AUX3)	–	Stop/Maintain
Bit 2 (AUX2)	–	Close
Bit 1 (AUX1)	–	Open

(When used for digital signal inputs they are simply designated as AUX 4 to AUX 1.)

Rules

1. Function bit set to “0”

Any function bit set to “0” indicates that the particular aux input is to be treated as a digital signal for field status reporting, e.g. a level switch or motor running status. If the corresponding invert bit is set to a “0”, an open contact is reported as a logic “1” and a close contact is reported as a logic “0” (i.e. this will invert the input).

If the corresponding invert bit is set to a “1”, an open contact is reported as a logic “0” and a close contact is reported as a logic “1” (i.e. this gives a non-inverting input).

2. Function bit set to “1”

Any function bit set to “1” indicates that the particular aux input is to be treated as a digital command to operate the actuator.

When the corresponding invert bit is set to a “0” this represents an N.C. contact as being the command source, i.e. a closing contact de-energises the input and an opening contact energises the input.

When the corresponding invert bit is set to a “1”, this represents an N.O. contact as being the command source, i.e. a closing contact energises the input and an opening contact de-energises the input.

3. ESD Control

When using ESD (aux input 4), the ESD contact mode setting **[A2]** should be set to the default value of **[NO]**. The **[A1]**–ESD direction setting should be set to either open or close the valve (*refer to page 34*).

4. Stop/Maintain Control

When energised this will make the Aux input Open/Close control push-to-run. When de-energised, the Aux input Open/Close control will be maintained. ESD is always push to run (non maintained).

5. Remote I/P Setting

Ensure that the correct "Od" setting is selected (*refer to page 42*).

For DeviceNet this is [OP].

The factory default for [PF] is [OF].

Examples

1. The full range of remote controls is needed. Open and Close are NO and ESD and Stop/maintain is NC.

Aux I/P 4 3 2 1

Function 1 1 1 1 = F

Invert 0 0 1 1 = 3 i.e. set [PF] to [F3]

2. Open and close control is required along with 2 inverted digital signal inputs. (Note that with this setting the open and close commands will be maintained.)

Aux I/P 4 3 2 1

Function 0 0 1 1 = 3

Invert 0 0 1 1 = 3 i.e. set [PF] to [33]

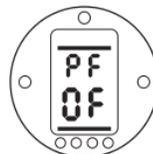
3. Only an ESD input is needed. The requirement is for push to run control with a NO contact input.

Aux I/P 4 3 2 1

Function 1 1 0 0 = C

Invert 1 0 0 0 = 8 i.e. set [PF] to [C8]

Using the + or – keys display the required mask setting.



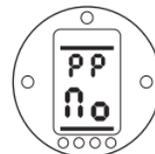
Auxiliary Input Mask OF

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [PP].

This option is not used by the DeviceNet DFU Module.



No Parity Bit

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

9.12 Bus System Positioning Control Settings

If the system control strategy for Pakscan, Modbus or Profibus requires intermediate valve travel positioning, certain control parameters need to be checked: the Limited Range Position Settings, the Motion Inhibit Time and its Deadband. There are an additional two "Action on Loss of Signal" parameters relating only to Modbus and Profibus systems that also need to be checked.

Limited Range Positioning is a selectable option whereby positioning limits, 0% and 100%, can be at different positions to those used for digital Closed and Open limit commands. Limited range positioning can be set using the **[FL]** and **[FH]** screens.

It should be noted that the actuator will respond to a digital Open or Close host command by moving the valve to the set limits irrespective of settings made for positioning control.

Settings for Deadband and Motion Inhibit Time affect accuracy and response time.

OF Display Bus System Positioning Set-up Screens

Bus system positioning control set-up screens can be suppressed to provide extra security.

Use the **+** or **-** key to turn on the positioning set-up screens.



Bus System Positioning Control Screens [ON]

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the **↓** key to display Bus System Positioning Control Settings.

Once **[FI]** is displayed, press the **→** key to display **[FL]**.

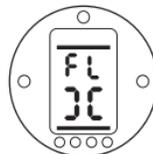
FL Bus System Valve Position at 0% DV

[FL] is the position to which the actuator will move if a 0% command is sent and is the position at which the actuator will report 0% to the host.

The default setting is for 0% to be the Close limit.

If altered, it is possible that the position indicated by the actuator display will differ to that indicated by the host.

Use the **+** or **-** key to select the desired valve position for a 0% command.



0% DV = Valve Closed

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the **→** key to display **[FH]**.

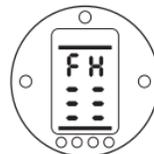
FH Bus System Valve Position at 100% DV

[FH] is the position to which the actuator will move if a 100% command is sent and is the position at which the actuator will report 100% to the host.

The default setting is for 100% to be the Open limit.

If altered, it is possible that the position indicated by the actuator display will differ to that indicated by the host.

Use the **+** or **-** key to select the desired valve position for a 100% command.



100% DV = Valve Open

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the **→** key to display **[Fd]**.

Fd Bus System Deadband Adjustment

All positioning commands are subject to a deadband tolerance.

The deadband sets the expected positioning accuracy of the actuator and is dependent on various factors including, actuator output speed, number of turns and valve torque. If the deadband is set too low the valve may "hunt" around the set point.

Use the **+** or **-** key to display the required setting:

[00] to [99] – 0% to 9.9% of valve stroke.



2.5% Deadband

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [Ft].

Ft Bus System Motion Inhibit Time (MIT)

MIT sets the minimum time between successive position commands being actioned. It is used in situations to reduce the number of starts per hour and to smooth out fluctuations if continuous positioning is implemented.

Setting the longest possible time while maintaining acceptable control will maximise the life of the motorised valve.

Use the **+** or **-** key to display the required setting:

[02] to [99] – 2 to 99 seconds.



5 Second MIT

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [FA].

FA Modbus, Profibus & DeviceNet Action on Loss of Signal

Modbus, Profibus & DeviceNet modules can be set to respond on loss of host communication by positioning the valve. Modbus checks for a loss of general highway communications whereas Profibus checks for a loss of communications addressed specifically to itself.

The default setting is off [OF] and the default timeout is 255 sec.

Use the **+** or **-** key to display the required setting:

[ON] Failsafe determined by setting [FF]

[OF] No failsafe action



Failsafe Action Enabled

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [FF].

FF Modbus, Profibus & DeviceNet Failsafe Action

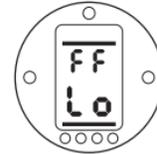
Modbus, Profibus & DeviceNet failsafe action when [FA] is enabled.

Use the **+** or **-** key to display the required setting:

[Lo] Close valve

[SP] Stay put

[Hi] Open valve



Failsafe Close

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

9.13 Option Interrupter Timer

Setting instructions for actuator including an interrupter timer.

The interrupter timer enables pulsed "stop/start" operation by the actuator as a response to local and remote control commands.

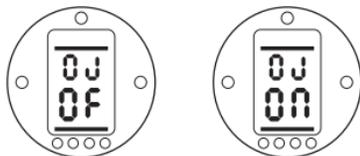
This effectively increases the valve stroke time and can be adjusted to prevent hydraulic shock (water hammer) and flow surges in pipelines.

The interrupter timer is an optional extra – check wiring diagram for inclusion.

OJ Interrupter Timer Enabled/Disabled

When fitted, the timer will be made available for operation.

The Interrupter cannot be enabled or disabled using the Setting Tool.



Interrupter Timer Disabled Interrupter Timer Enabled

When the timer option is available an additional series of settings can be accessed by pressing the ↓ key.

NOTE: If the timer option is not available pressing the ↓ key will not access setting.

Press the ↓ key to display interrupter timer set-up screens.

Jd Interrupter Timer Direction

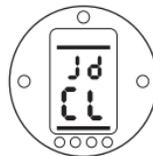
The default for timer direction is [CL], timer operation will **start in closing** and **stop in opening** – pulsing operation around the close position.

If pulsing operation is required to stop in closing and start in opening – around the open position, use the + or – key.

The display will change to [OP].

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.



Pulsed Operation Around the Closed Position

NOTE: Instructions [JC] and [JO] are for timer operation around the Closed position. For timing around the Open position, read stop for start [JC] and start for stop [JO].

Press the → key to display [JC].

JC Position in Valve Closing Stroke for Timer to Start

Using the + or – key select the position for the **TIMER TO START WHEN THE VALVE IS CLOSING.**

[1:] = valve closed
[00] to [99] = percentage open
[≡] = valve open



Timer Set to Start Pulsing when Closing Valve Reaches 25% Open

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

If the timing is not required in the closing stroke select [JC] to [1:] valve closed position.

Press the → key to display [JO].

JO Position in Valve Opening Stroke for Timer to Stop

Using the + or – key select the position for the **TIMER TO STOP WHEN THE VALVE IS OPENING**.

[] [] = valve closed
 [00] to [99] = percentage open
 [≡≡] = valve open



Timer Set to Stop Pulsing when Opening Valve Reaches 25% Open

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

If timing is not required in the opening stroke select [JO] to [] [].

Press the → key to display [Jn].

Jn Contactor On Time

Using the + or – key select the actuator run period in the range 1–99 seconds.



Actuator Run Period Set for 5 Seconds

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [JF].

JF Contactor Off Time

Using the + or – key select the actuator stop period in the range 1–99 seconds.



Actuator OFF Period Set for 25 Seconds

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Press the → key to display [JE] (refer to note on Page 62).

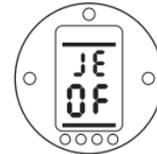
JE ESD Override Interrupter Timer

The interrupter timer may be overridden when the actuator is under ESD signal command. This will mean the actuator will run to limit without “stop/start” action under ESD command.

Refer to A1–A3 (refer to page 34 for ESD settings).

The default for ESD override interrupter timer is [OF]. The interrupter timer will continue “stop/start” action during ESD action.

If ESD must override the timer use the + or – to display [on].



ESD Override Timer OFF

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

Example

An actuator fitted with the interrupter timer and set as the example shown in these instructions would operate at:

Rated speed from full Open to 25% Open.

1/6 rated speed from 25% Open to Fully Closed and from Fully Closed to 25% Open.

Rated speed from 25% Open to Fully Open.

Note

With a Folomatic option fitted *and* the Interrupter Timer enabled, the Folomatic Motion Inhibit Timer must be adjusted to the same time as that set for the Interrupter Timer "contactor off".

Failure to do so will cause the actuator response to defer to the lower time which may cause control or process problems.

For "ON" and "OFF" times in excess of 99 seconds apply to Rotork.

9.14 Setting Tool Local Control [Or]

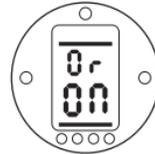
The default setting for Setting Tool Local Control is [OF].

To enable Setting Tool Control press the + or – key to select [ON].

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

With the red control selector in Local, the Setting Tool control keys are active (*refer to page 17*).



Local Setting Tool Control Enabled

Vandal resistant actuators ONLY (red/black selectors not supplied). For control, the selection of [Or] is as follows:

[ON] Local Setting Tool control only.

[OF] Local/Remote Control disabled.

[RE] Remote Control only.

9.15 Inhibit Operation After Power Loss [OS]

The default setting for this protection option is disabled [OF]. When disabled it is important that the actuator is not manually operated during a power failure if the battery is low as changes in position cannot be tracked - refer to page 6 for battery level status display. Should this occur the limits must be reset before electric operation takes place- refer to LC/LO page 27. Locking the hand auto lever can prevent manual operation - refer to 3.1 page 2.



The protection may be enabled by using the + or – key to select [ON].

PRESS THE ← KEY.

The displayed option will flash indicating that it has been set.

When protection is enabled, on power up if a low battery is detected, the actuator will inhibit electrical operation and display Power Loss Inhibit via actuator alarm display (refer to page 6) and the monitor relay will de-energise. Limits must reset and the battery replaced – refer to page 65.

9.16 Default Options [d1] and [d2]

All IQ functions are configured to a set of Rotork default (standard) settings before despatch, see the table opposite. When requested, alternative settings specified with the order will be used. When site commissioning takes place, entered settings overwrite Rotork defaults and these "current" settings are used for operation along with the remaining unadjusted defaults.

Should difficulty be encountered during commissioning the default settings can be reinstated, returning the actuator configuration to its original manufactured state. Site commissioning must then begin again.

There are two levels of default:

d1 Rotork standard or customer specified primary and secondary settings.

d2 Limit positions only – factory set limits.

NOTE: Settings associated with control options Folomatic, Pakscan, Modbus Profibus and Foundation Fieldbus are not affected by d1 or d2. Functions will remain as set.

If d1 is entered, all Primary and Secondary Functions except limit positions will return to their default setting. See the table opposite for Rotork standard settings. Primary setting (except limits) and secondary settings must then be checked and reset as required (refer to Primary Functions page 15 and Secondary Functions page 29).

If d2 is entered the limits will be reset, with the actuator positioned at 50%. Limits must then be reset to the suit the valve (refer to Primary Functions page 20).

Rotork standard [d1] Default settings for IQ:

Function	[d1] Default Setting
[P?] Password	Unaffected – will remain as set
[Ir] IrDA – Insight	[ON] IrDA Enabled
[Ic] Cell Phone	[OF] Disabled

Primary Functions

[C1] Close Direction	[C] Clockwise
[C2] Close Action	[Ct] Close Torque
[C3] Open Action	[Ot] Open Torque
[tC] Close Torque	[40] 40% of rated
[tO] Open Torque	[40] 40% of rated

Secondary Functions

[r1] Indication Contact S1	[CI]/[NO] Close, Normally Open
[r2] Indication Contact S2	[OP]/[NO] Open, Normally Open
[r3] Indication Contact S3	[CI]/[NC] Close, Normally Closed
[r4] Indication Contact S4	[OP]/[NO] Open, Normally Closed
[A1] ESD Action	[SP] Stay put on ESD
[A2] ESD Contact Type	[NO] Normally Open (make for ESD)
[A3] ESD Thermostat Override	[OF] Thermostats Active during ESD
[A4] ESD Override Interlocks	[OF] Interlocks Active during ESD
[A5] ESD Override Local Stop	[OF] Local Stop Active during ESD
[A6] Maintained Local Control	[ON] Maintains in Local Control

9.17 Default Options [d1] and [d2]

Rotork standard [d1] Default settings continued:

Function	[d1]	Default Setting
[A7] 2-wire Remote Control	[SP]	Stayput on 2-wire signal
[A8] Interlocks	[OF]	I/L function disabled
[A9] Conditional Control	[OF]	Function disabled
[AE] Torque Switch Bypass	[OF]	Function disabled
[OE] Option Extra Indication Contacts	[OF]	Unless fitted. See wiring diagram
[OI] Option CPT	[HI]	4mA at Closed
[OF] Option Folomatic	[OF]	Unless fitted. See wiring diagram
[Od] Remote Source	[rE]	Unless option fitted (refer to 9.7 page 42.)
[OP] Option Bus System Control	[OF]	Unless fitted. See wiring diagram
[OJ] Option Interrupter Timer	[OF]	Unless fitted. See wiring diagram
[Or] Setting Tool Local Control	[OF]	Setting Tool Control disabled
[OS] Power Loss Inhibit	[OF]	Protection off

Option Extra Indication Contacts (when fitted) - refer to wiring diagram

[r5] Indication Contact S5	[CI]/[NO]	Close, normally open
[r6] Indication Contact S6	[OP]/[NO]	Open, normally open
[r7] Indication Contact S7	[tl]/[NO]	Torque Trip Mid Travel, normally open
[r8] Indication Contact S8	[rE]/[NO]	Remote Selected, normally open

The Rotork standard default settings are subject to change without notice.

If specified with order, [d1] settings will be configured as requested.

To reinstate [d1] settings, with [d1] displayed.

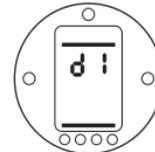
PRESS THE ← KEY.

The setting bars will flash, indicating the [d1] default settings have been reinstated.

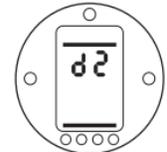
To reinstate factory set limits (actuator positioned at 50%) with [d2] displayed,

PRESS THE ← KEY.

The setting bars will flash, indicating the [d2] default limits have been reinstated.



[d1] Displayed



[d2] Displayed

Maintenance

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

The IQ actuator's unique double sealed, non-intrusive enclosure provides complete protection for the actuator components.

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

The electrical control module cover is bonded by the Rotork quality control seal. It 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, except replacement of the battery.

Electrical supplies must be isolated before actuator covers are removed refer to Battery replacement instructions.

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 motorised valve is rarely operated, a routine operating schedule should be set up.
- * Replace actuator battery every 5 years.
- * Check the actuator enclosure for damage, loose or missing fasteners.
- * Ensure there is not an excessive build up of dust or contaminant on the actuator.
- * Check for any loss of lubricant.

The Actuator Battery

The battery supports the actuator position updating circuits and the position (LCD) display when the main power supply is turned off. It ensures the current position is updated and displayed when manual operation takes place with the main power turned off.

The battery is not required to retain any actuator settings.

WARNING:

The battery holder in the actuator gearcase also protects the user from the hazardous live connections inside the actuator and therefore it must not be damaged. The actuator must be isolated or disconnected if the battery holder has to be removed from the actuator gearcase.

A unique circuit has been incorporated into the battery function of the IQ, effectively reducing the overall drain and significantly increasing the battery life.

In normal circumstances battery replacement interval should not exceed 5 years. Ambient temperature and plant operating conditions may affect battery life.

Battery level status is indicated by an icon on the actuator display, refer to Section 3.4 Alarm Indication (*refer to page 5*).

If the battery icon is displayed the battery must be replaced.

Battery Replacement

If the actuator is located within a hazardous area permission must be obtained in the form of a "hot work permit" or other local regulation before removal and/or replacement of the battery.

Removal of the battery with the main electrical power switched off will result in stored Datalogger records being lost. It is therefore recommended that the battery is replaced with the main electrical supply to the actuator switched on.

If main electrical power is not available or if main power has been switched off while the battery was discharged, it is recommended that the actuator limits be checked after battery replacement (*refer to Section 8 Commissioning Primary Functions, page 20*).

Battery Removal

The actuator must be selected to Stop using the red selector (*refer to page 3*). Access to the battery is via a labelled sealing plug situated on the main gearcase near the handwheel hub.

Use an 8mm Allen key to remove the sealing plug, ensuring the "O" ring seal remains on the plug. Disconnect the battery wiring loom from the battery terminals. Using the black pull strap, lift the battery out of the rubber sealing pocket.



Fig. 10

Battery Types

For European hazardous area certified actuators (ATEX) use an Ultralife U9VL lithium manganese dioxide battery only.

For FM and CSA certified enclosures use an Ultralife U9VL lithium manganese dioxide battery. Equivalent, UL recognised, batteries may be used.

For watertight (WT) actuator enclosures use an Ultralife U9VL lithium manganese dioxide battery or any equivalent 9V battery.

If in doubt regarding the correct battery type, contact Rotork.

Fitting Replacement Battery

Fit the pull strap around the replacement battery and insert into the rubber sealing pocket. Reconnect the battery wiring loom to the battery terminals. Refit the battery sealing plug ensuring "O" ring is in good condition and correctly fitted. Hand tighten sealing plug using an 8mm Allen key.

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 -22°F / -30°C to 160°F / 70°C .

IQ actuators do not require regular oil changes (refer to *Weights and Measures Section 11, page 74*).

Torque and Position Monitoring

The IQ range of actuators incorporate real time, instantaneous Torque & Position monitoring as standard.

Torque & Position can be used to monitor valve performance during operation. The effect of process changes (differential pressure etc.) can be evaluated. Tight spots in valve travel can be pinpointed as well as gauging torque developed through stroke for torque value setting (refer to pages 25, 26).

Using the Setting Tool, the display can be set to indicate Torque and Position as follows:

With the actuator displaying Current Position and selected to Local or Stop, using the Setting Tool,

PRESS THE ← KEY.

The display will split, the top indicating the instantaneous torque (as a % of rated), the bottom indicating the measured position (% open).



Example shows 19% (of rated) torque at 50% open position. Display torque range: [00] to [99]% of rated torque in 1% increments. For values of torque above 99% the display will indicate [HI].

Display position range:

[1]	= valve closed
[00] to [99]	= percentage open
[≡≡]	= valve open

For a stationary actuator the display will indicate the actual torque value as applied by the actuator.

To keep the torque + position display active press the + or - keys. The display will remain active for approximately 5 minutes from the last key operation.

10 Maintenance, Monitoring and Troubleshooting cont.

Troubleshooting

The IQ range of actuators is the world's first that can be commissioned and interrogated without removing electrical covers. Help Screen diagnostics enable fast and complete fault finding to be carried out.

With power off, the actuator display is not backlit. Position indicator lamp not illuminated.

With mains power on, the actuator's display should be backlit (*refer to Section 3.3 page 4 – The Actuator Display*).

Check that 3 phase supply is available and is of the correct voltage as stated on the actuator nameplate. Measure voltage phase to phase across terminals 1, 2 and 3 of the actuator terminal bung.

With power Off, the actuator does not display position.

With mains power off the actuator battery supports position indication liquid crystal display only.

(*Refer to Section 3.3 page 4 – The Actuator Display*).

If the display is blank the actuator battery must be replaced and the limits of travel reset (*refer to Section 10 page 65 – The Actuator Battery*).

10.1 Help Screens

With the actuator powered up and Local or Stop selected, eight Help Screens can be accessed using the Setting Tool (*refer to Fig. 9.1 page 30 for their location*).

With Remote selected press the  key on the Setting Tool twice. The Help Screens will be displayed.

Each screen uses bars to indicate the status of a particular control or indication function. Each bar reacts to changes in the status of its actuator function by turning "on" or "off".

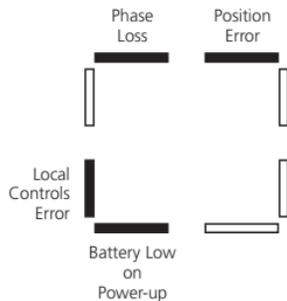
For troubleshooting, access the following Help Screens and refer to text:

- H1** – Factors inhibiting electrical operation.
- H2** – Monitor battery level and ESD control input.
- H3** – Monitor the position limit and actuator power supply status.
- H4** – Monitor remote control inputs to the actuator.
- H5** – Monitor remote interlocks local control inputs and motor thermostats.
- H6** – Monitor torque switch status and IR Setting Tool communication for vandal proof applications.
- H7** – Monitor travel limits, centre column and position limit status.
- H8** – Monitor the actuator's position-sensing devices.
- H9** – Rotork use only.

Help screen bars shown  are undefined and may be ON, OFF or flashing.

H1 Factors Inhibiting Electrical Operation

H1



Help Screen 1

POSITION ERROR

Bar ON = Current Position Error Present.

During power up the actuator position processor compares the current position to that stored in the Eeprom. If there is a discrepancy this is shown as a current position error.

Re-setting of both actuator limits should now be carried out (refer to page 27).

BATTERY LOW ON POWER UP

Bar ON = Low battery detected On Power Up.

If **[OS]** is selected **[ON]** (set as default) the actuator operation will be inhibited when powered up with a discharged battery (refer to **[OS]** page 58).

The battery should be replaced at the earliest opportunity (refer to page 65).

LOCAL CONTROLS ERROR

Bar ON = Invalid Local Control Signals Detected.

For example if a Local Open and Close signal is detected at the same time this would be classed as an invalid or fault condition.

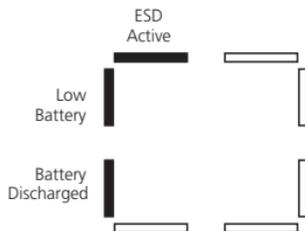
PHASE LOSS

Bar ON = Phase Lost (3 Phase Actuators Only).

Loss of third monitored power supply phase connected to actuator terminal 3.

H2 Battery Level and ESD Control Input

H2



Help Screen 2

BATTERY DISCHARGED

Bar ON = Battery Discharged.

Bar ON when the battery is no longer able to support actuator functions under loss of power conditions.

The battery must be replaced (refer to Section 10 page 65) and limit positions reset (refer to **[LC]** and **[LO]** page 27).

LOW BATTERY

**Bar ON = Battery level low.
Bar OFF = Battery OK.**

Bar ON when the battery is low but still able to support the necessary actuator functions.

The battery should be replaced at the earliest possible opportunity.

ESD SIGNAL ACTIVE

Bar ON = ESD Signal is present.

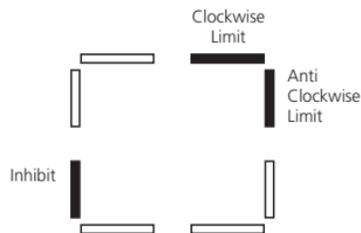
When applied, an Emergency Shutdown Signal will override any existing local or remote control signal, causing the actuator to respond in the direction selected for ESD.

The ESD function will be determined by the settings on Control Mode Configuration screens **[A1]** to **[A5]** (refer to Section 9.3 page 34).

The actuator will not respond to any local or remote control while an ESD signal is maintained.

H3 Factors Inhibiting Electrical Operation

H3



Help Screen 3

CLOCKWISE LIMIT

Bar ON = Actuator has reached clockwise limit of travel.

ANTI-CLOCKWISE LIMIT

Bar ON = Actuator has reached Anti-clockwise limit.

INHIBIT

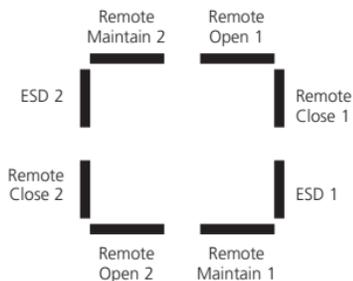
Bar ON = Actuator inhibited.

Possible Causes:

Phase Loss (3 phase only).
Power Loss Inhibit (page 62).
Internal Failure.

H4 Remote Control Inputs

H4



Help Screen 4

All remote signals designated with '1' are standard hard wired remote inputs.

When a Pakscan, Profibus or Foundation Fieldbus card is fitted, remote control inputs are designated with a '2'.

REMOTE OPEN 1

Bar OFF = Remote Open Signal Present.

REMOTE CLOSE 1

Bar OFF = Remote Close Signal Present.

ESD 1

Bar OFF = ESD signal present.

REMOTE MAINTAIN 1

**Bar OFF = Remote Maintain signal present.
Bar ON = Remote Maintain not present and/or Remote Stop active.**

REMOTE OPEN 2

Bar OFF = Remote Open signal present from BUS option pcb.

REMOTE CLOSE 2

Bar OFF = Remote Close signal present from BUS option pcb.

ESD 2

Bar OFF = ESD signal present from BUS option pcb.

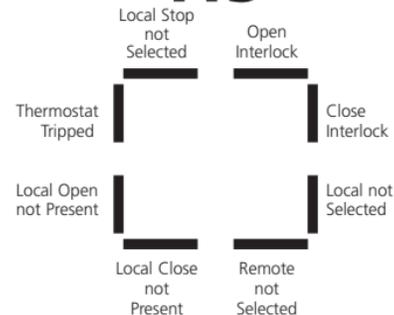
REMOTE MAINTAIN 2

Bar OFF = Remote Maintain signal present from BUS option pcb.

H5 Remote Interlocks, Local Control Inputs, & T/stat

69

H5



Help Screen 5

OPEN INTERLOCK

Bar ON = Open Interlock Active. (Actuator disabled)

Unauthorised Open electrical operation can be prevented by interlocking the actuator (Open) control with an external interlock contact.

If external interlocks are not required the interlock function must be selected OFF.

H5**Remote Interlocks,
Local Control Inputs,
& T/stat continued****CLOSE INTERLOCK**

**Bar ON = Close Interlock Active.
(Actuator disabled)**

Unauthorised Close electrical operation can be prevented by interlocking the actuator (Close) control with an external interlock contact.

If external interlocks are not required the interlock function must be selected OFF.

REMOTE NOT SELECTED

**Bar ON = Remote control not selected.
Bar OFF = Remote control selected.**

LOCAL CLOSE NOT PRESENT

**Bar ON = Local Close signal not present.
Bar OFF = Local Close signal present.**

LOCAL OPEN NOT PRESENT

**Bar ON = Local Open signal not present.
Bar OFF = Local Open signal present.**

THERMOSTAT TRIPPED

Bar ON = Thermostat tripped.

The actuator motor is protected by thermostats.

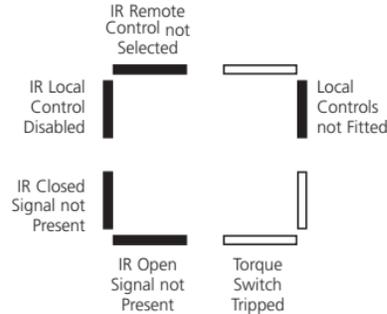
Should the motor become overheated the thermostats will trip and the actuator will stop. On cooling the thermostat will automatically reset, enabling operation. See the actuator nameplate for the motor rating.

LOCAL STOP NOT SELECTED

**Bar ON = Local Stop not selected.
Bar OFF = Local stop selected.**

LOCAL NOT SELECTED

**Bar ON = Local control not selected.
Bar OFF = Local control selected.**

H6**Torque Switch Status & IR
Setting Tool Comms for
Vandal Proof Applications****H6****Help Screen 6**

When actuators are supplied for Vandal Proof applications the local control knobs are removed to prevent unauthorised operation.

The local control functions are then carried out by using the Infra-red Setting Tool.

LOCAL CONTROLS NOT FITTED

**Bar OFF = Local controls fitted
(standard).
Bar ON = Local controls not fitted
(vandal proof).**

TORQUE SWITCH TRIPPED

Bar OFF = Torque switch tripped.

When the actuator generates a value of torque equal to that set for Open (when opening) or Close (when closing) it will stop, protecting itself and the valve from damage. This feature is known as Over Torque Protection.

Once a torque trip has occurred further operation **IN THE SAME DIRECTION** is prevented.

This “latching” of the event protects the actuator and valve from repeated “hammering” against the obstruction as a response to a maintained control signal.

To “de-latch” the actuator it must be reversed.

(For actuator torque adjustment, refer to [tC] and [tO] pages 25 and 26)

H6**Torque Switch Status & IR Setting Tool Comms for Vandal Proof Applications cont.**

IR OPEN SIGNAL NOT PRESENT
Bar OFF = IR Open signal present.

IR CLOSE SIGNAL NOT PRESENT
Bar OFF = IR Close signal present.

IR LOCAL CONTROL DISABLED
Bar OFF = IR Local control enabled.

To operate the actuator locally with the IR Setting Tool refer to the option selection screen **[Or]** Section 9.14 page 62.

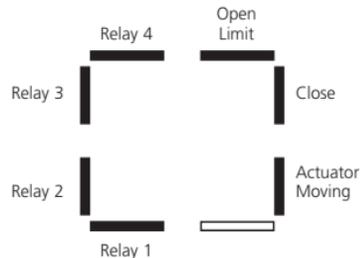
[Or] must be selected to **[ON]**.

IR REMOTE CONTROL NOT SELECTED

Bar OFF = IR Remote control selected (vandal-proof units only).

When actuator is supplied without local controls for vandal proof applications the option selection screen **[Or]** must be set to **[RE]** for

Remote operation (refer to Section 9.14 page 62).

H7**Travel Limits, Centre Column & Remote Indication Outputs****H7**

Help Screen 7

OPEN LIMIT

Bar ON = Actuator has reached open limit.

CLOSE LIMIT

Bar ON = Actuator has reached Close limit.

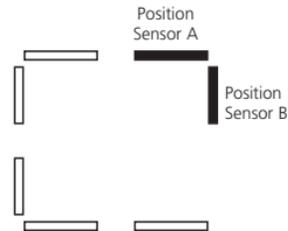
ACTUATOR MOVING

Bar ON = Actuator moving.

SWITCH CONTACTS S1, S2, S3, S4

Bar ON = S contact is close circuit.

Bar indication is real time and reactive (refer to Section 9.2 **[r1]** page 32 for configuration of "S" contacts).

H3**Actuator Position Sensing Devices****H8**

Help Screen 8

POSITION SENSOR A

Senses output rotation. Used for the position sensing circuit. Correct operation of the sensor is indicated by the bar being ON (and OFF) 12 times per output revolution. When the motor is running, ON and OFF bit duration should be equal.

POSITION SENSOR B

Senses output rotation. Used for the position sensing circuit. Correct operation of the sensor is indicated by the bar being ON (and OFF) 12 times per output revolution.

When the motor is running, ON and OFF bit duration should be equal.

For the two sensors, A and B, correct operation is indicated by the following truth table.

To observe this function, select manual operation and turn the actuator handwheel clockwise, starting with all sensors OFF:

	CLOCKWISE 30 Deg.				
	→				
Sensor B	0	1	1	0	0
Sensor A	0	0	1	1	0

10.2 IrDA Diagnostics & Config. IQ Insight – IrDA Comms [Ir]

IQ Insight software tool for PC has been developed to enable the actuator configuration and onboard datalogger to be reconfigured and analysed.

To enable communication with IQ Insight the actuator IrDA interface must be enabled.

A PC running IQ Insight software may be located at the actuator or, using a cell phone link, at a remote site (for information on IQ Insight see www.rotork.com).

The default setting for IQ IrDA is **[on]**, enabling IrDA.

To disable IrDA use the **+** or **-** key. The display will change to **[OF]**.

PRESS THE ← KEY.

The displayed option will flash indicating it has been set.



IQ Insight – IrDA Communication Enabled.

10.2 IrDA Diagnostics & Config. IQ Insight – Cell Phone [Ic]

Using IQ Insight software tool, remote diagnostics can be enabled using a cell phone located at the actuator to transmit and receive data to and from a remote PC running IQ Insight software.

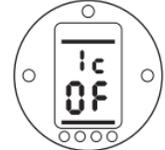
The cell phone must be IrDA compatible and have access to a transmit/receive data line (contact your cell phone manufacturer and service provider).

(For information on IQ Insight software refer to publication E111E).

The actuator IrDA feature must be enabled (refer to **[Ir]** IQ Insight – IrDA Comms).

Before starting, the cell phone must be configured for "data" as opposed to "voice" and be positioned in direct line of sight to the actuator display, no more than 0.5m (2ft) from the display.

The default setting for IQ Insight – Cell Phone is **[OF]**.



To enable remote diagnostics use the **+** or **-** key. The display will change to **[On]**.

PRESS THE ← KEY.

The actuator display will automatically return to indicating the current position.

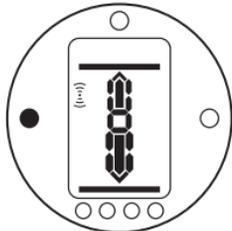
The actuator will search for a compatible IrDA device within range for approximately 30 seconds.

On establishing communication, the actuator display will indicate the symbol shown below.



10.2

IrDA Diagnostics & Config. IQ Insight – Cell Phone [lc] cont.



The cell phone must be kept within range for the duration of the remote diagnostic session.

If communication is not established or is lost, after 30 seconds the actuator will stop searching.

To resume remote cell phone diagnostics the process outlined above must be started again.

IQ Insight software is available free of charge from the Rotork web site, www.rotork.com, or for sale as a “pak” which includes an IrDA serial link for convenient connection when using a notebook PC in the field.

NOTE: The use of a notebook PC or cell phone with actuators located in hazardous areas will be subject to local regulations.

It is the responsibility of the user to seek guidance and permission.

The IQ Setting Tool is certified Intrinsically Safe (IS) and therefore can be used in defined hazardous areas (*refer to page 17*).

Diagnostic devices are available for local configuration, analysis and transportation of actuator data to other areas.

Contact Rotork for further information.

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.

NOTE: Excludes second stage gearbox if fitted.

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

Actuator Size	Nett Weight kg/lbs	Oil Capacity litres/pt.-US
IQ10	32/70	0.3/0.63
IQ12	32/70	0.3/0.63
IQ18	32/70	0.3/0.63
IQ20	52/115	0.8/1.7
IQ25	52/115	0.8/1.7
IQ35	75/165	1.1/2.3
IQ40	200/441	7.5/15.8
IQ70	215/474	7.0/14.7
IQ90	230/507	7.0/14.7
IQ91	220/485	7.0/14.7
IQ95	230/507	7.0/14.7

BINARY	HEX	DEC
0000 0000	00	0
0000 0001	01	1
0000 0010	02	2
0000 0011	03	3
0000 0100	04	4
0000 0101	05	5
0000 0110	06	6
0000 0111	07	7
0000 1000	08	8
0000 1001	09	9
0000 1010	0A	10
0000 1011	0B	11
0000 1100	0C	12
0000 1101	0D	13
0000 1110	0E	14
0000 1111	0F	15
0001 0000	10	16
0001 0001	11	17
0001 0010	12	18
0001 0011	13	19
0001 0100	14	20
0001 0101	15	21
0001 0110	16	22
0001 0111	17	23
0001 1000	18	24
0001 1001	19	25
0001 1010	1A	26
0001 1011	1B	27
0001 1100	1C	28
0001 1101	1D	29
0001 1110	1E	30
0001 1111	1F	31

BINARY	HEX	DEC
0010 0000	20	32
0010 0001	21	33
0010 0010	22	34
0010 0011	23	35
0010 0100	24	36
0010 0101	25	37
0010 0110	26	38
0010 0111	27	39
0010 1000	28	40
0010 1001	29	41
0010 1010	2A	42
0010 1011	2B	43
0010 1100	2C	44
0010 1101	2D	45
0010 1110	2E	46
0010 1111	2F	47
0011 0000	30	48
0011 0001	31	49
0011 0010	32	50
0011 0011	33	51
0011 0100	34	52
0011 0101	35	53
0011 0110	36	54
0011 0111	37	55
0011 1000	38	56
0011 1001	39	57
0011 1010	3A	58
0011 1011	3B	59
0011 1100	3C	60
0011 1101	3D	61
0011 1110	3E	62
0011 1111	3F	63

BINARY	HEX	DEC
0100 0000	40	64
0100 0001	41	65
0100 0010	42	66
0100 0011	43	67
0100 0100	44	68
0100 0101	45	69
0100 0110	46	70
0100 0111	47	71
0100 1000	48	72
0100 1001	49	73
0100 1010	4A	74
0100 1011	4B	75
0100 1100	4C	76
0100 1101	4D	77
0100 1110	4E	78
0100 1111	4F	79
0101 0000	50	80
0101 0001	51	81
0101 0010	52	82
0101 0011	53	83
0101 0100	54	84
0101 0101	55	85
0101 0110	56	86
0101 0111	57	87
0101 1000	58	88
0101 1001	59	89
0101 1010	5A	90
0101 1011	5B	91
0101 1100	5C	92
0101 1101	5D	93
0101 1110	5E	94
0101 1111	5F	95

BINARY	HEX	DEC
0110 0000	60	96
0110 0001	61	97
0110 0010	62	98
0110 0011	63	99
0110 0100	64	100
0110 0101	65	101
0110 0110	66	102
0110 0111	67	103
0110 1000	68	104
0110 1001	69	105
0110 1010	6A	106
0110 1011	6B	107
0110 1100	6C	108
0110 1101	6D	109
0110 1110	6E	110
0110 1111	6F	111
0111 0000	70	112
0111 0001	71	113
0111 0010	72	114
0111 0011	73	115
0111 0100	74	116
0111 0101	75	117
0111 0110	76	118
0111 0111	77	119
0111 1000	78	120
0111 1001	79	121
0111 1010	7A	122
0111 1011	7B	123
0111 1100	7C	124
0111 1101	7D	125
0111 1110	7E	126
0111 1111	7F	127

BINARY	HEX	DEC
1000 0000	80	128
1000 0001	81	129
1000 0010	82	130
1000 0011	83	131
1000 0100	84	132
1000 0101	85	133
1000 0110	86	134
1000 0111	87	135
1000 1000	88	136
1000 1001	89	137
1000 1010	8A	138
1000 1011	8B	139
1000 1100	8C	140
1000 1101	8D	141
1000 1110	8E	142
1000 1111	8F	143
1001 0000	90	144
1001 0001	91	145
1001 0010	92	146
1001 0011	93	147
1001 0100	94	148
1001 0101	95	149
1001 0110	96	150
1001 0111	97	151
1001 1000	98	152
1001 1001	99	153
1001 1010	9A	154
1001 1011	9B	155
1001 1100	9C	156
1001 1101	9D	157
1001 1110	9E	158
1001 1111	9F	159

BINARY	HEX	DEC
1010 0000	A0	160
1010 0001	A1	161
1010 0010	A2	162
1010 0011	A3	163
1010 0100	A4	164
1010 0101	A5	165
1010 0110	A6	166
1010 0111	A7	167
1010 1000	A8	168
1010 1001	A9	169
1010 1010	AA	170
1010 1011	AB	171
1010 1100	AC	172
1010 1101	AD	173
1010 1110	AE	174
1010 1111	AF	175
1011 0000	B0	176
1011 0001	B1	177
1011 0010	B2	178
1011 0011	B3	179
1011 0100	B4	180
1011 0101	B5	181
1011 0110	B6	182
1011 0111	B7	183
1011 1000	B8	184
1011 1001	B9	185
1011 1010	BA	186
1011 1011	BB	187
1011 1100	BC	188
1011 1101	BD	189
1011 1110	BE	190
1011 1111	BF	191

BINARY	HEX	DEC
1100 0000	C0	192
1100 0001	C1	193
1100 0010	C2	194
1100 0011	C3	195
1100 0100	C4	196
1100 0101	C5	197
1100 0110	C6	198
1100 0111	C7	199
1100 1000	C8	200
1100 1001	C9	201
1100 1010	CA	202
1100 1011	CB	203
1100 1100	CC	204
1100 1101	CD	205
1100 1110	CE	206
1100 1111	CF	207
1101 0000	D0	208
1101 0001	D1	209
1101 0010	D2	210
1101 0011	D3	211
1101 0100	D4	212
1101 0101	D5	213
1101 0110	D6	214
1101 0111	D7	215
1101 1000	D8	216
1101 1001	D9	217
1101 1010	DA	218
1101 1011	DB	219
1101 1100	DC	220
1101 1101	DD	221
1101 1110	DE	222
1101 1111	DF	223

BINARY	HEX	DEC
1110 0000	E0	224
1110 0001	E1	225
1110 0010	E2	226
1110 0011	E3	227
1110 0100	E4	228
1110 0101	E5	229
1110 0110	E6	230
1110 0111	E7	231
1110 1000	E8	232
1110 1001	E9	233
1110 1010	EA	234
1110 1011	EB	235
1110 1100	EC	236
1110 1101	ED	237
1110 1110	EE	238
1110 1111	EF	239
1111 0000	F0	240
1111 0001	F1	241
1111 0010	F2	242
1111 0011	F3	243
1111 0100	F4	244
1111 0101	F5	245
1111 0110	F6	246
1111 0111	F7	247
1111 1000	F8	248
1111 1001	F9	249
1111 1010	FA	250
1111 1011	FB	251
1111 1100	FC	252
1111 1101	FD	253
1111 1110	FE	254
1111 1111	FF	255

Refer to actuator nameplate for unit specific approval details

European – Hazardous area

EExd IIB T4. ATEX (94/9/EC) II 2GD

CENELEC Norm EN50014 and EN50018

Temperature -20°C to +70°C (-4°F to +158°F).

*Option -30°C to +70°C (-22°F to +158°F).

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

*Option -50°C to +40°C (-58°F to +104°F).

EExd IIC T4. ATEX (94/9/EC) II 2GD

CENELEC Norm EN50014 and EN50018.

Temperature -20°C to +70°C (-4°F to +158°F).

EExde IIB T4. ATEX (94/9/EC) II 2GD

CENELEC Norm EN50014, EN50018 and EN50019.

Temperature -20°C to 70°C (-4°F to +158°F).

*Option -30°C to +70°C (-22°F to +158°F).

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

*Option -50°C to +40°C (-58°F to +104°F).

EExde IIC T4. ATEX (94/9/EC) II 2GD

CENELEC Norm EN50014, EN50018 and EN50019.

Temperature -20°C to +70°C (-4°F to +158°F).

International – Hazardous area

IEC. Exd IIB T4

IEC60079-0 and IEC60079-1 for Exd IIB T4

Temperature -20°C to +60°C (-4°F to +140°F)

IEC. Exd IIC T4

IEC60079-0 and IEC60079-1 for Exd IIC T4

Temperature -20°C to +60°C (-4°F to +140°F)

USA – hazardous Area

FM. Class 1, Division 1, Groups C, D, E, F, G hazardous areas.

Factory Mutual - Explosionproof to NEC Article 500.

Temperature -30°C to +60°C (-22°F to +140°F).

*Option -40°C to +60°C (-40°F to +40°F).

*Alternative for Group B hazardous area. Temperatures as for Groups C and D.

Canada – hazardous Area

CSA EP. Class 1, Division 1, Groups C and D hazardous areas.

Canadian Standard Association - Explosionproof

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

*Option -50°C to +40°C (-58°F to +104°F).

*Alternative for Group B hazardous area. Temperatures as for Groups C and D.

International Non hazardous

WT: Standard watertight, BS EN 60529 :1992, IP68, 7 metres/72 hours.

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

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

*Option -50°C to +40°C (-58°F to +104°F).

US – Non hazardous

NEMA 4, 4X and 6.

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

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

*Option -50°C to +40°C (-58°F to +104°F).

Canada – Non hazardous

CSA WT: Canadian Standard Association –Watertight.

Wiring and components complying with CSA Enclosure 4 and 4X.

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

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

*Option -50°C to +40°C (-58°F to +104°F).

Rotork can supply actuators to national standards not listed above.

For details please contact Rotork.

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.

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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.
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