

rotork® Process Controls

Established Leaders in Valve Actuation

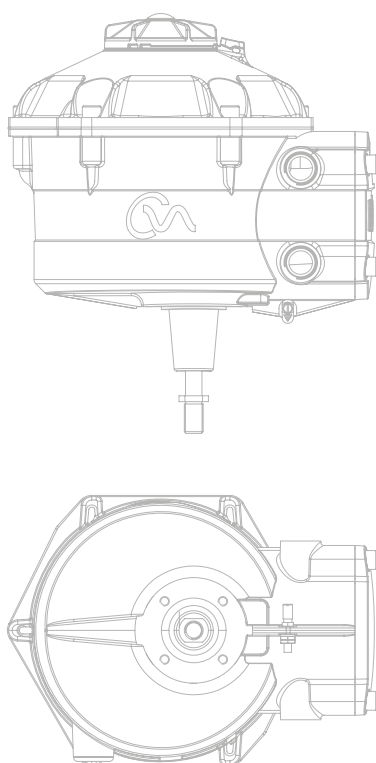


⚠ This Manual contains important safety information. Please ensure it is thoroughly read and understood before installing, operating or maintaining the equipment.

CVL Range

Linear Control Valve Actuator (CVL)
Installation & Maintenance Instructions

Contents



Building on Rotork's historical success with innovative technology, the CVL offers a highly accurate and responsive method of automating control valves without the complexity and cost of a pneumatic supply. With an increased focus on production costs and efficiency, accurate control of the process variable is paramount.

With resolution figures better than 0.1% and the ability to eliminate position overshoot, the Rotork CVA range helps to maximize product quality and plant capacity.

CVL range actuators are self contained, purpose designed and built for continuous remote electrical operation of control valves.

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This Manual covers the Linear Control valve Actuator Range (CVL).

Models: CVL 500 & CVL 1500

Refer to Rotork Publication P110E for full specification.

The actuator comprises:

- DC brushless electric motor.
- Reduction gearing with linear output shaft.
- Motor controller with speed, travel and thrust limitation.
- Electronic logic controls and monitoring facilities housed in a double sealed watertight enclosure.
- Hazardous area certification meeting international and national requirements.

All thrust and position settings as well as configuration of the actuator are made using a non-intrusive Bluetooth™ device, typically a PDA (not supplied).

Bluetooth™ PDA Enlight software is available for free download from www.rotork.com.

General Information



This manual has been produced to enable a competent user to install, operate, adjust and inspect the Rotork Range of Control 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 their duties under the Health and Safety at Work Act 1974.

For the USA: NFPA70, National Electrical Code® is applicable.

The mechanical installation should be carried out as outlined in this manual and also in accordance with any relevant national standard codes of practice. If the actuator nameplate indicates that it is suitable for use in a Potentially Explosive Atmospheres (Hazardous Areas) then the actuator is suitable for use in Zone 1 and Zone 2 (or Div 1 and Div 2) hazardous area classifications, as defined by the actuator's nameplate marking.

Any equipment connected to the actuator should be of an equivalent (or better) hazardous area certification. The installation, maintenance and use of the actuator installed in a hazardous area must be carried out by a competent person and in accordance with all relevant codes of practice for the particular Hazardous Area certification.

Any inspection or repair of Hazardous Area approved actuators should not be undertaken unless it conforms to National Legislation and Statutory Provisions relating to the specific Hazardous Area. Only Rotork approved actuator replacement parts should be used. 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 a Hazardous Area unless it 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.

Enclosure Materials

The enclosures on the Rotork Range of Control Valve Actuators are manufactured from aluminium alloy with stainless steel fasteners and a polycarbonate window. The Local Control Knob and Manual Override Knob (when fitted) are manufactured from a Polycarbonate/PBT plastic blend. There is a potential electrostatic charging hazard associated with these components and therefore they must only be cleaned with a damp cloth.

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 Control Valve Actuator Range be required, it will be provided on request.



Hazardous Area Approvals



Refer to the actuator nameplate for its specific approval details.

The CVA is built in accordance with: -

European—Hazardous Area ATEX (94/9/EC) II 2 GD c

Ex d IIB T4 Gb, Ex t IIIC T120°C Db

EN60079-0, EN60079-1, EN13463-1,
EN13463-5 and EN61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

Ex d IIC T4 Gb, Ex t IIIC T120°C Db

EN60079-0, EN60079-1, EN13463-1,
EN13463-5 and EN61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

Ex de IIB T4 Gb, Ex t IIIC T120°C Db

EN60079-0, EN60079-1, EN60079-7,
EN13463-1, EN13463-5 and EN61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

Ex de IIC T4 Gb, Ex t IIIC T120°C Db

EN60079-0, EN60079-1 and EN60079-7,
EN13463-1, EN13463-5 and EN61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

International-Hazardous Area IECEx

Ex d IIB T4 Gb, Ex t IIIC T120°C Db

IEC60079-0, IEC60079-1 and IEC61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

Ex d IIC T4 Gb, Ex t IIIC T120°C Db

IEC60079-0, IEC60079-1 and IEC61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

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Ex de IIB T4 Gb, Ex t IIIC T120°C Db

IEC60079-0, IEC60079-1, IEC60079-7 and IEC61241-1

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-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

Ex de IIC T4 Gb, Ex t IIIC T120°C Db

IEC60079-0, IEC60079-1, IEC60079-7 and IEC61241-1

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

USA– Hazardous Area

FM. Explosionproof, Class I, Div 1, Groups C & D, T4

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

FM. Explosionproof, Class I, Div 1, Groups B, C & D, T4

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)

FM. Dust Ignitionproof, Class II, Div 1, Groups E, F & G, T4

Ambient Temperature Range:

-20 °C to +60 °C (-4 °F to +140 °F)

*Option -40 °C to +60 °C (-40 °F to +140 °F)



CVL Linear Actuator

WARNING

Before installing the actuator, make sure that it is suitable for the intended application. If you are unsure of the suitability of this equipment for your installation consult Rotork prior to installation.

WARNING: ELECTRIC SHOCK HAZARD

Installation and servicing must be performed only by qualified personnel.

WARNING: ELECTROSTATIC DISCHARGE

This equipment houses static sensitive devices. To protect the internal components never touch the printed circuit boards without using electrostatic (ESD) control procedures.

WARNING: ENCLOSURE MATERIALS

CVL 500 and CVL 1500 actuator castings are manufactured from aluminium alloy with stainless steel fasteners. The user must ensure that the operating environment and any materials surrounding the actuator cannot lead to a reduction in the safe use of, or the protection afforded by the actuator.

Where appropriate the user must ensure the actuator is suitably protected against its operating environment.

WARNING: OPERATING BY HAND

Where actuators are supplied with the optional hand-wheel, note that under no circumstances should any additional lever device such as a wheel key or wrench be applied to the hand-wheel in order to develop more force when closing or opening the valve. This may cause damage to the valve and/or actuator and it may also cause the valve to become stuck in the seated or back seated position.

WARNING: RESERVE POWER PACK

Where actuators are supplied with the reserve Power Pack Assembly please note that the actuator output shaft may move after removal of the power supply.

Move the Knob Selector to the 'STOP' position to prevent any unwanted electrical movement. The CVA actuator and in particular the power pack contain no user serviceable components and the top cover assembly must be removed by suitably qualified personnel only.



Storage

Receiving / Inspection

Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling. Report all damage immediately to the freight carrier and your local CVA distributor.

Unpack the product and information packet taking care to save the shipping carton and any packing material should return be necessary. Verify that the items on the packing list or bill of lading agree with your own documentation.

Storage

If your actuator cannot be installed immediately store it in a dry place until you are ready to connect incoming cables.

If the actuator has to be installed but cannot be cabled it is recommended that any plastic transit cable entry plugs are replaced with PTFE sealed metal plugs.

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 CVL 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.

Identification Label

www.rotork.com		ROTORK CONTROLS LIMITED BATH, ENGLAND.		Unit weight <input type="text"/> Kg	
Serial number	<input type="text"/>	CE	Year of manufacture	<input type="text"/>	
Wiring diagram	<input type="text"/>				
Actuator type	<input type="text"/>				
Output max.	<input type="text"/>				
Enclosure	<input type="text"/>				
Actuator supply	<input type="text"/>				
Rated current	<input type="text"/>				
MADE IN ENGLAND 49165-1					



Operating your actuator



The following instructions must be followed and integrated with your safety program when installing and using Rotork Controls products.

- Read and save all instructions prior to installing, operating and servicing this product.
- If you don't understand any of the instructions contact Rotork for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate personnel in the proper installation, operation and maintenance of the product.

Install equipment as specified in Rotork Controls installation instructions and as per applicable local and national codes of practice. Only connect to electrical power supplies having the correct voltage, current and rating (refer to nameplate).

- To ensure proper performance, use only qualified personnel to install, operate, update and maintain the unit.
- When replacement parts are required, ensure that the qualified service technician uses only replacement parts specified by Rotork.
- Substitutions will invalidate any hazardous area certification and may result in fire, electrical shock, other hazards or improper operation.
- Keep all product protective covers in place (except during installation or maintenance by qualified personnel) to prevent electrical shock, personal injury or damage to equipment.
- Operation of the actuator in an inappropriate fashion may cause harm or damage to the unit or surrounding equipment.

WARNING: OPERATING BY HAND

Where actuators are supplied with the optional hand-wheel, note that under no circumstances should any additional lever device such as a wheel key or wrench be applied to the hand-wheel in order to develop more force when closing or opening the valve. This may cause damage to the valve and/or actuator and may also cause the valve to become stuck in the seated or back seated position.

Where actuators are supplied with optional hand wheel device the valve can be operated manually independent of the power supply.

Move the Selector Knob to the STOP position before attempting to operate the actuator manually.

Push and turn simultaneously to manually operate the actuator.



WARNING: OPERATING ELECTRICALLY

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

Do not switch on the power supply until you have checked that the actuator has been connected correctly.

Local Controls

The actuator is supplied with a 3 position selector knob located on the top cover assembly. The knob assembly has a locking latch to enable the control knob to be padlocked in position. In the centre of the knob assembly is a tri state LED. Refer to Table 1 for full details of LED indication.

The LED has 3 colour states RED, GREEN or BLUE.

The LED can be 'ON' or FLASHING depending on the actuator status.

Stop

With the selector knob in the 'STOP' position no electrical operation is possible.

Run

With the selector knob in the 'RUN' position the actuator will respond to remote control commands. During commissioning or diagnostic procedures using PDA or Smartphone Bluetooth™ enabled devices the actuator may not be operated remotely.

Note: When STOP or RUN is selected the control knob can be rotated between the two positions without having to depress the locking latch. It is also possible to lock the selector in the 'RUN' or 'STOP' only position.

Test

With the selector knob in the 'TEST' position an auto test routine will be initiated if the function is enabled.

This is a quick method of testing the actuators ability to control its output independent of the external control system. The actuator will perform a series of step and cycle routines centred around the last demand position. No greater than +/- 4% of last set point.

The test will measure the following parameters:

- Deadtime
- Step Response Time.
- Setting time
- Average Thrust/Torque in each direction of travel
- Full Stroke Speed
- Valve Friction

The user LED on the selector knob will fast flash for 10 seconds.

Flashing Green - All Parameters in acceptable limits

Flashing Red - One or more parameters outside of acceptable limits.



Fig. 11.1



Fig. 11.2

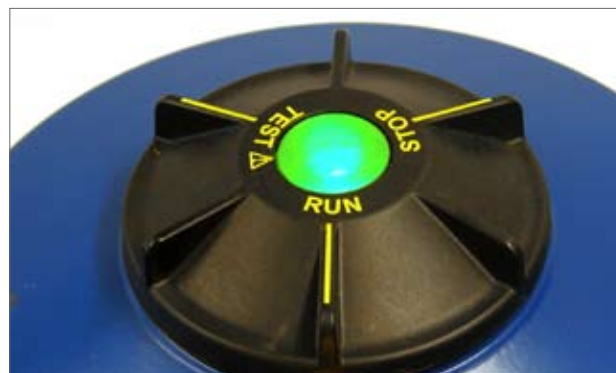


Fig. 11.3



Fig. 11.4

Operating your actuator














LED Indication	Actuator Status	Mode of Operation
	Solid Green - No Faults	Run or Test Note - Electrical operation is not possible whilst the RPP is charging.
	Green - Slow Flash - Auto Test in progress or Reserve Power Pack (RPP) charging (if fitted).	
	Green - Fast Flash Auto Test completed successfully.	
	Blue - Fast Flash Initiating Bluetooth™ connection	
	Blue - Slow Flash Bluetooth™ Communication Active.	Run
	Green/Blue - Alternate Flash Bluetooth™ communication active No faults.	Run or Test
	Red/Blue - Alternate Fast Flash Initiating Bluetooth™ connection	
	Red/Blue - Alternate Slow Flash Bluetooth™ communication active Fault found or Stop selected.	Stop
	Solid Red Major Fault Found.	Run/Test/Stop
	Flashing Red Stop selected or minor fault found.	Stop
	Red/Green Alternate Flash Power Failure and UPS active	Run/Test/Stop

Table 1

Note: Slow Flash = 0.5Hz
Fast Flash = 1.0Hz

RESERVE POWER PACK - (OPTIONAL)

The actuator can be fitted with an optional 'Reserve Power Pack' consisting of Super Capacitors to allow the actuator to go to a pre-determined position on power failure.

On power up the super capacitors require a charging period during which time the actuator electrical operation will be inhibited. This could take up to two minutes.

NOTE: Electrical operation is inhibited and the LED will flash during the charging period.

On loss of power supply the actuator will carry out its designated fail-to-position function. The LED remains illuminated until the energy stored in the capacitors has depleted.

WARNING

Where actuators are supplied with the reserve Power Pack Assembly please note that the actuator output shaft may move after removal of the power supply. Move the Knob Selector to the 'STOP' position to prevent any unwanted electrical movement before carrying out any maintenance or removal of the unit from the valve.

After disconnection of the actuator power supply wait until the LED indicator on the top cover assembly has extinguished before attempting to remove the actuator from the valve. Under no circumstances attempt to remove the actuator or adjust the output drive shaft connection to the valve stem whilst the top cover LED is illuminated.

The CVA main housing of the actuator and in particular the power pack contain no user serviceable components and the top cover assembly must be removed by suitably qualified personnel only.

DO NOT REMOVE ANY COVER ASSEMBLY TO GAIN ACCESS TO THE ELECTRICAL COMPARTMENTS WHILST THE LED LOCATED ON THE SELECTOR KNOB IS ILLUMINATED.



Installation & Setup Guide



Commissioning

The Rotork CVA Range of actuators provide simple, safe and rapid non-intrusive commissioning using a Bluetooth enabled PDA. Actuator limit setting can be achieved using the automatic setup feature.

Tools & Equipment Required

Bluetooth™ enabled hand held computer (PDA) or Smartphone (screen resolution 240 x 320 minimum) running Windows™ Mobile operating system.

Note: Local operation is only possible with a PDA or Smartphone. Alternatively if the HART option card is fitted a Hart communicator can be used.

Software

The Rotork Enlight CVA software must be installed on the PDA or Smartphone before carrying out any commissioning procedures. The software is free issue and is available for download from the Rotork website at www.rotork.com.

⚠ CAUTION

It is essential that the setup procedure is carried out when the valve is not under working process conditions, as full valve movement will occur. If actuators are fitted with a failsafe capacitor pack the unit may operate the valve on removal of the power supply. To prevent this occurrence, it will be necessary to re-configure the failsafe action, see Page 39. Alternatively 'STOP' can be selected to prevent unwanted movement.

⚠ IMPORTANT

It is essential that the actuator is mounted correctly to the valve.

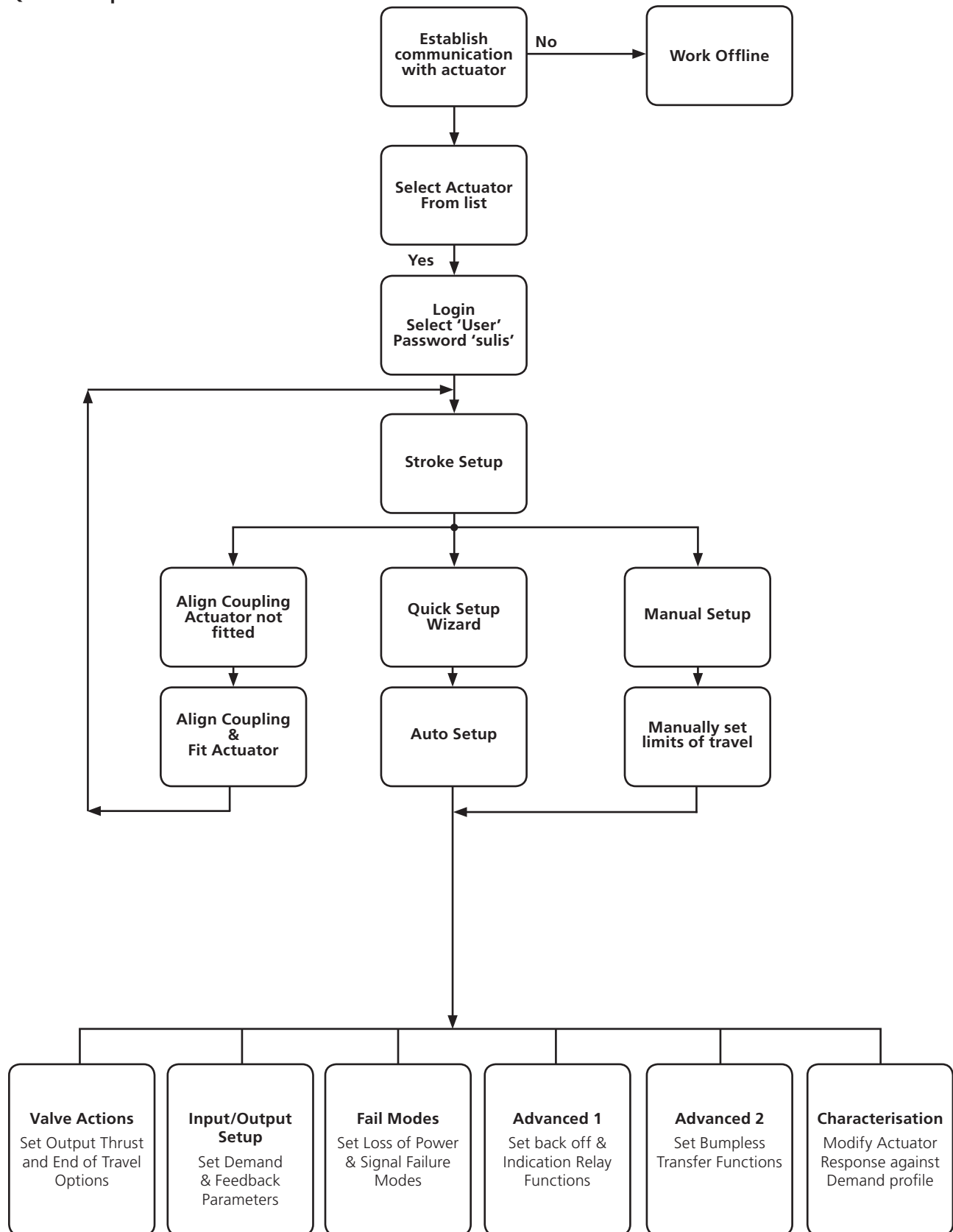
The height of the yoke or pillar and mounting plate, in relation to the top of the valve spindle is critical to ensure full stroke movement of the valve. Refer to Rotork publication P110E for further details.

The Installation & Setup will include the following procedures:

1. Ensure valve is closed and safe (Offline).
2. Actuator output shaft is retracted.
(May be necessary to apply power).
3. Mount and align actuator to valve.
4. Use the PDA to set limits of travel.
5. Use the PDA to configure control and indication parameters.



Quick Setup Flow Chart



Installation & Setup Guide



Mounting the Actuator

Move valve stem to the closed position

To enable the actuator to be installed correctly the valve must be in the closed position to allow fitting of the valve stem/ actuator coupling.

Actuator Output Shaft

The actuator is supplied with the output shaft in the fully retracted position. If the output shaft is in the extended position it may be necessary to apply a temporary power supply or manually operate the actuator using the optional hand-wheel to the retracted position to allow installation.

Installing Actuator

Whilst no international standard currently exists for linear flange interfaces, we conform dimensionally to MSS SP-101 and ISO 5212 for the specific flange sizes.

Actuator to mounting flange assembly fixings must conform to Material Specification ISO Class 8.8. Delta GZ coated Grade A4 stainless steel fixings are recommended.

Position actuator on to the valve mounting flange.

Fit securing bolts/studs and tighten down to the required torque.

See Table 2

Thread Size	Torque Nm	Torque Lbs/ft
5/16 UNC	12.6 Nm	9.3
M8	12.8 Nm	9.4

Table 2



Fig. 16.1



Fig. 16.2



Fig. 16.3



Fig. 16.4

Cable Connections

Move the mode selector knob on top of the required actuator to the 'STOP' position. This will inhibit electrical operation.

WARNING

Ensure all power supplies are isolated before removing actuator covers.

Check that the supply voltage agrees with that stamped on the actuator nameplate. A fuse or circuit breaker must be included in the wiring installation of the actuator. The switch or circuit breaker must be installed as close as possible to the actuator and shall be marked to indicate that it is the disconnecting device for that particular actuator. The actuator must be protected with an over current protection device rated in accordance with publication No. P110E, which details the electric motor performance data for CVA range actuators.

Earth Ground Connections

An internal earthing point is provided for water tight applications. In addition a mandatory 6mm external earthing stud is provided for all explosion proof applications.

Removing Terminal cover

Using an 8mm Allen key loosen the captive fixings securing the terminal compartment cover. 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. Remove the power terminal insulated cover and connect temporary or site wiring in accordance with the supplied wiring diagram.

Note: The Red Power and Control terminal protective covers should be replaced prior to refitting of the electrical cover assembly.

When the actuator is supplied with an Intrinsically Safe terminal compartment, the unit is supplied with a Red and Blue terminal cover. The Blue terminal cover identifies the IS Circuit connections.

Covers must be fitted to maintain certification.



Fig. 17.1



Fig. 17.2



Standard Terminal Block - Fig. 17.3



Fig. 17.5



IS Terminal Block Fig. - 17.4

Installation & Setup Guide

Cable entry

The cable entries are tapped either $\frac{3}{4}$ " NPT or M25. Remove any plastic transit plugs. Make off 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 steel or brass threaded plugs.

If the actuator is to be installed in a hazardous area, a suitably certified cable gland must be fitted with the use of a certified thread adaptor where appropriate.

Unused entries must be closed with a suitably certified stopping plug.

Wiring installation must comply with local statutory regulations.

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 to identify functions of terminals. Check that the supply voltage is the same as that marked on the actuator nameplate.

Remove power and control terminal screens. Begin by connecting the power cables followed by the control cables (as required). Refit power and control terminal screens.

When all connections are made, refit protective terminal covers.

Note: The Power and the Control terminal protective covers should be fitted prior to refitting of the electrical cover assembly.

When the actuator is supplied with an Intrinsically Safe terminal compartment the Red and Blue terminal covers MUST be fitted to maintain certification.

Replacing Terminal Cover

Ensure cover 'O' ring seal and spigot are in good condition and lightly greased before refitting cover.



Fig. 18.1



Fig. 18.2



Standard Terminal Block - Fig. 18.3



Fig. 18.5



IS Terminal Block Fig. - 18.4

Commissioning

Move the actuator selector knob to the 'STOP' position

Apply Electrical Power

On completion of the correct assembly and electrical connection procedures, the electrical power supply can now be applied to the actuator.

NOTE: If the unit is fitted with failsafe capacitors the Green or Red LED (depending on Mode selected) on the selector will flash until the capacitors are fully charged.

Movement is not possible whilst the LED is flashing.



Fig. 19.1

Establish Bluetooth™ Communications

It is now required to establish communications in order to complete the fitting procedure.

Ensure Bluetooth is enabled on the PDA then click on the Enlight Icon to start the program.

The maximum range of Bluetooth communication is 10 Meters.

The first screen gives the option to connect to an actuator or open a saved file.



Fig. 19.2

WORK OFF LINE

If there is a configuration file stored in the PDA it can be opened to review files.

RECONNECT AN ACTUATOR

If a link between the PDA and actuator has previously been established a list will appear and a search for new devices will not occur.

DISCOVER A NEW ACTUATOR

The PDA will search a radius of 10 meters for CVA actuators.

QUIT

Exit the menu.

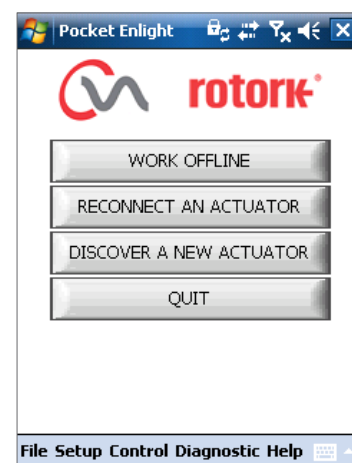


Fig. 19.3

Installation & Setup Guide



Reconnect or discover an actuator

Searching for Actuator

The PDA will now search for any CVA actuators within Bluetooth range.

If there is more than one device a list will be generated.

Highlight, then select the required actuator from the list of units within range.

The actuator will generally report its identity by its serial number (shown on nameplate).

This can be modified to add an MOV or Tag reference.
(See full PDA menu details)

If there are numerous Bluetooth devices in range the search process will take longer to complete and in some cases may have to be repeated.

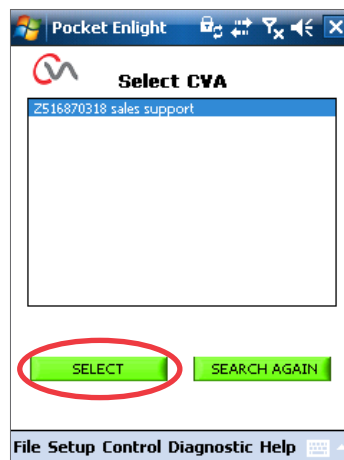


Fig. 20.1

Login procedure

Before the link can be established it is necessary to log in.

There are three levels of login with password protection to limit higher level access.

View

Allows review of actuator settings only. No changes can be made.

Password : **view**

User

Allows access to review and change actuator settings. Includes the facility to set limits of travel and take local control of the actuator.

Default Password : **sulis**

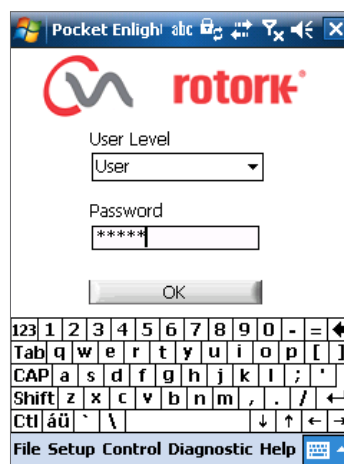


Fig. 20.2

This password can be changed using the 'file' menu to provide additional site security.

DO NOT LOSE THE PASSWORD INFORMATION

Rotork Engineer

Rotork use only.

Login

Select '**User**' on the User Level drop down menu.
Note, user is the default and will appear in the box.

Using the keyboard at the bottom of the screen, type in the password then click on 'OK' to start the procedure. If communication is successful you will be prompted to wait whilst the setup data is retrieved from the actuator.



Fig. 20.3

Stroke Setup Menu

There are three choices from this menu.

Align Coupling

If the actuator is not fully fitted to the valve this procedure must be carried out to enable correct assembly and alignment of the actuator coupling to the valve stem.

Quick Setup Wizard

Use this menu to automatically set actuator limits of travel.

Go to Page 24

Manual Setup

Use this menu to manually set actuator limits of travel.

Go to Page 29

It is possible on this screen to choose Imperial or Metric units. The actuator serial number, current valve stroke and position are also displayed.

⚠ WARNING

The default setting of a new actuator is **minimum thrust and extend to close**. If the actuator has previously been commissioned it is essential that its basic settings are checked before fitting the coupling and operating the actuator electrically. Check the settings in the Manual Setup menu and adjust if necessary.

⚠ WARNING

When RUN mode is selected the actuator will respond to any active remote control commands.

Select 'STOP' on the Actuator Selector Knob to prevent any unwanted movement.

Fitting Actuator to Valve

Select the '**ALIGN COUPLING**' option.

Select Metric or Imperial Units as required.

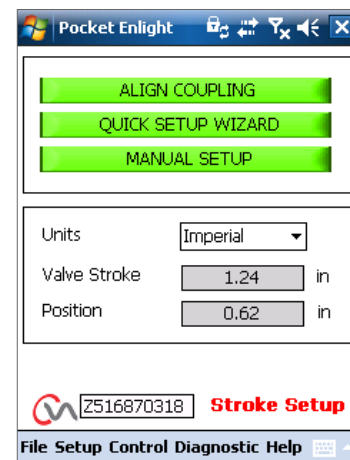


Fig. 21.1



Fig. 21.2

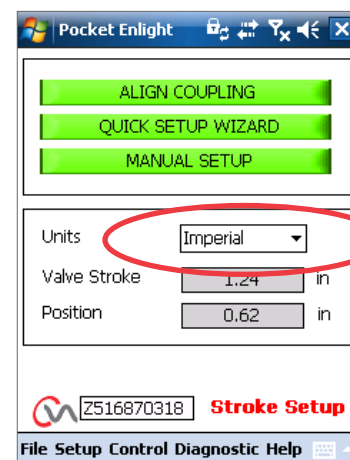


Fig. 21.3

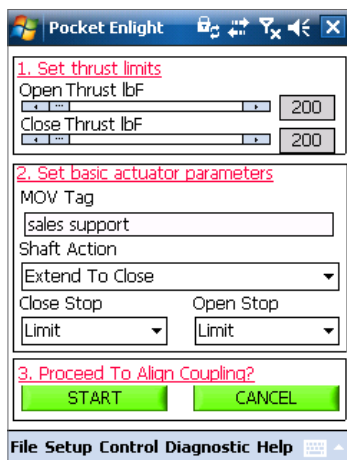


Fig. 22.1

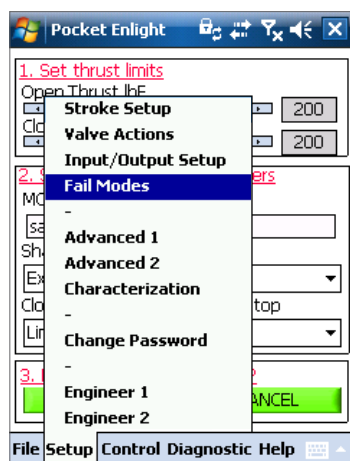


Fig. 22.2

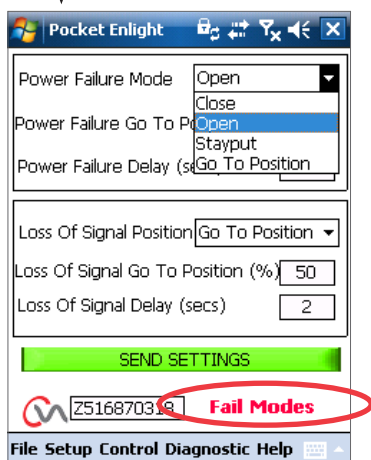


Fig. 22.3

1. Set thrust limits

The maximum amount of thrust available for the open and close direction of travel can be adjusted by dragging the slider from left to right.

2. Set basic actuator parameters

MOV Tag

The actuator can be given a TAG number for ease of identification in the field.

Shaft Action

Set open or closed direction to extend the output drive shaft.

Close/Open Stop

Thrust - Apply set thrust to the valve stem at end of travel limit where valve tight shutoff is required.

Limit - Stop the actuator at the set limit where valve does not require tight shutoff.

Select the START option to save changes and proceed to align the coupling.

Select basic parameters and thrust limit settings as required.

3. Proceed To Align Coupling

To commence manual alignment of shaft, click on the start box to align the actuator to the valve.

⚠ WARNING

When RUN mode is selected the actuator will respond to any active remote control commands.

If no Analogue request is applied, the actuator will carry out its loss of control signal fail to position function. If necessary go to the Fail Modes Menu and select the Disabled option and send the settings back to the actuator.

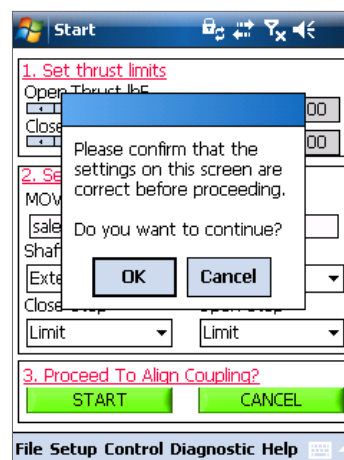


Fig. 22.4

Align Coupling

It is now possible to operate the actuator using the Enlight program. Moving the position control slider will extend or retract the output shaft to enable it to be connected to the valve spindle. Coarse control will allow full travel of the actuator. Fine control is used for small adjustments of the actuator spindle.

Incrementing the position slider using the arrows will vary position by 1% for coarse and 0.1% for fine control.

When the position control is operated for the first time a warning will appear to indicate that the actuator will be taken offline and will not respond to remote control commands.

⚠ CAUTION

The actuator will move to the indicated position on the Position Control Slider.

Select OK

Click on the 'OK' button and the actuator will be taken offline and will now move to the position as indicated on the position control slider.

The actuator is now unavailable for remote control.

Connect the output shaft to valve spindle.

Using the position control slider move the output shaft to the full actuator output shaft travel limit or until it reaches the valve spindle leaving minimal gap and ensure there is no misalignment between the two shafts. If the actuator output shaft reaches its fully extended position it will be necessary to retract the shaft a sufficient distance to ensure a tight shut off in thrust seating valves.

⚠ WARNING

It is critical that there is correct alignment between actuator output shaft and the valve stem.

Note: Mis-alignment will result in increased mechanical wear and possible damage to the valve stem.

If the output shaft and valve stem are not aligned correctly then adjust the mounting position of the yoke and actuator as necessary.

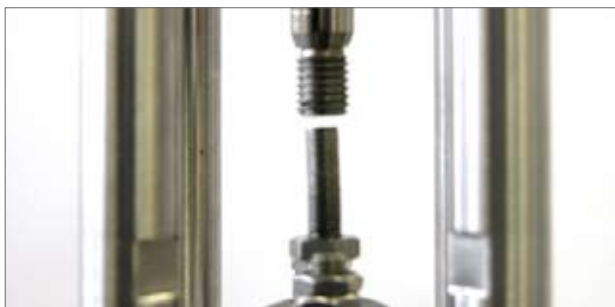


Fig. 23.4

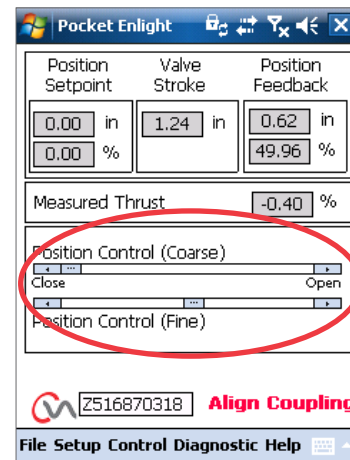


Fig. 23.1

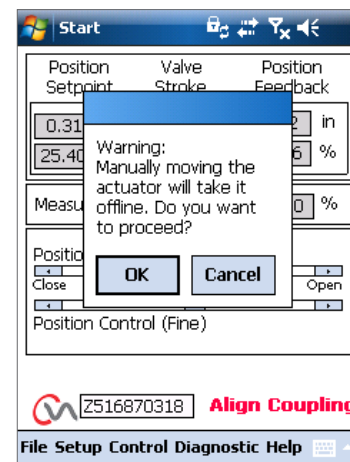


Fig. 23.2

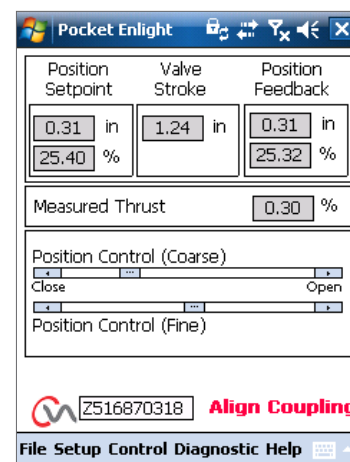


Fig. 23.3

Installation & Setup Guide



Connect the output shaft to the valve spindle using a suitable coupling.

It is now possible to set the end of travel limits.



Quick Setup Wizard

If the valve is to be commissioned over its full stroke the quick setup wizard is a fast and efficient way to set the end of travel limits. The quick set up wizard will allow the actuator to find the end of travel by measuring the output thrust. If the valve is not capable of accepting thrust in the open direction it is possible to set a fixed limit.

Select Quick Setup Wizard

Set thrust limits

The default thrust values for the Auto setup are automatically set to 40% of rated thrust in both directions. Adjust if more thrust is required to move the valve through stroke.

Set basic actuator parameters

The MOV tag can be edited. Use the keyboard to edit the MOV tag field.

Shaft Action

Select Extend or Retract output shaft to suit valve operation.

Close/Open Stop

Set the end of travel stop function for Thrust or Limit to suit the characteristics of the valve.

Thrust

The actuator can be set to apply its selected output 'Thrust' to the valve at the end of travel where tight shut off is required.

Limit

Alternatively it can be set to the 'Limit' function to disengage motor drive and stop the valve at a predetermined position where the valve does not require the seating force to be applied to the valve seat or end of mechanical valve travel.

Click on the 'START' box to save changes to the actuator and initiate the Auto Setup routine.

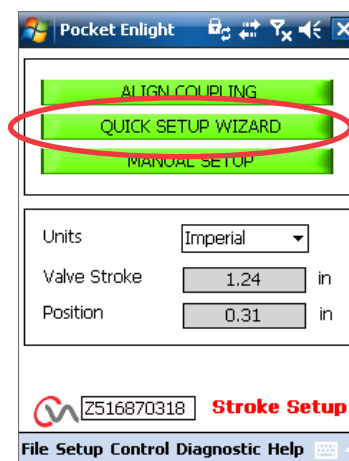


Fig. 24.1

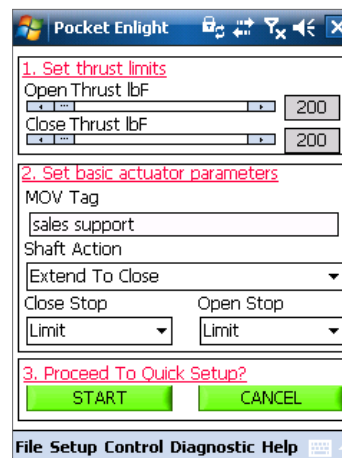


Fig. 24.2

Move the selector Knob to the 'RUN' position



⚠ CAUTION

Initiating an Auto Setup will move the valve through its full stroke.

⚠ WARNING

Steps 1 and 2 must be checked to ensure the thrust, shaft action and end stops are correctly set or damage to the valve may occur.

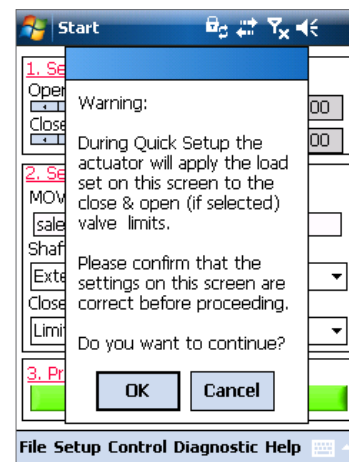


Fig. 25.1

AUTO LIMIT will initiate the auto setting procedure.

FIXED LIMIT will allow the actuator to find the closed limit by measuring the thrust but will allow the open limit to be set at a measured distance. The distance can be edited in the text box.

NOTE: Ensure that limit is selected for the open stop if fixed limit is applied.

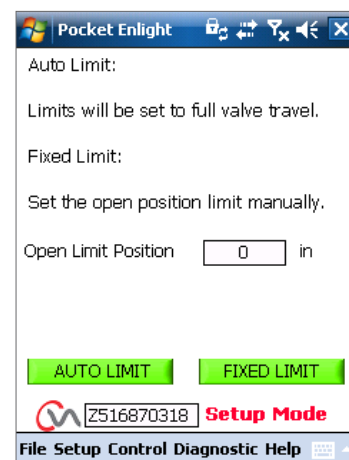


Fig. 25.2

Installation & Setup Guide

The Auto Setup is fully automatic and requires no user input

Start Auto Setup?

Click on the 'START' box to initiate the Auto setup procedure.
Click on the OK box to continue. All other menus will be disabled until the process is completed.

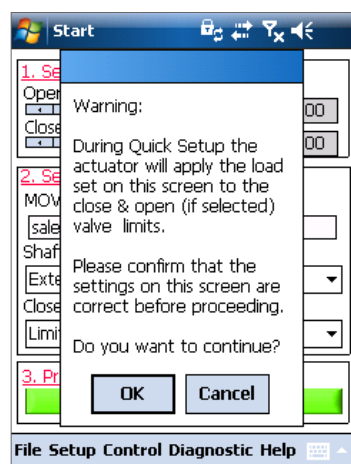


Fig. 26.1

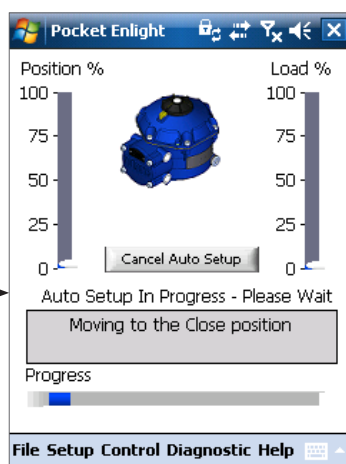


Fig. 26.2

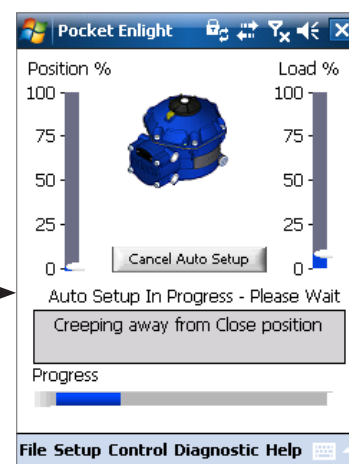


Fig. 26.3

Finding the Extended (Closed) Limit

The actuator will move its output shaft to the maximum CLOSED limit of travel.

Actuator will then move its output shaft away from the Closed limit of travel and repeat the procedure to eliminate any inertia effects and re-adjust the end of travel limit as necessary.

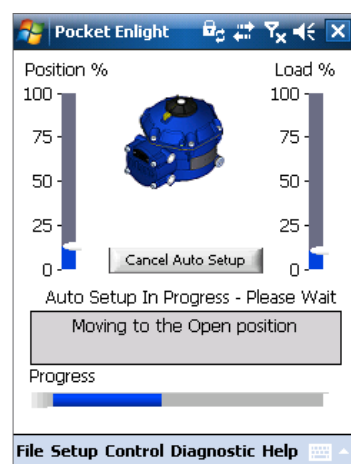


Fig. 26.4

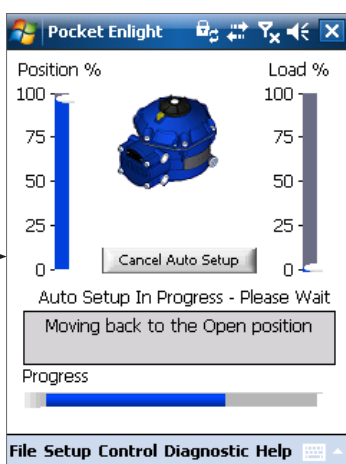


Fig. 26.5

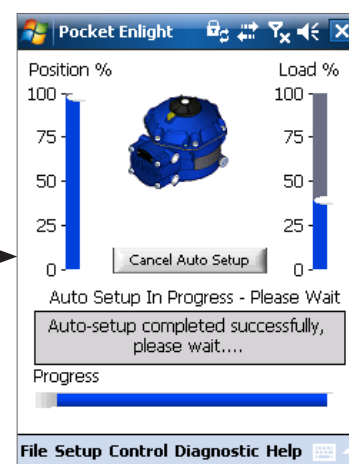


Fig. 26.6

Finding the Open Limit

The actuator will move its output shaft to the maximum CLOSED limit of travel. Actuator will then move its output shaft away from the Closed limit of travel and repeat the procedure to eliminate any inertia effects and re-adjust the end of travel limit as necessary.

The Open position limit is now set and Auto Setup is Complete.

ACTUATOR AUTOMATIC SETUP IS NOW COMPLETE

Auto setup is now complete and both ends of travel tight shut off limits have been defined and set.

PDA screen will return to the Stroke Set up menu.

If no further settings are required move the Mode selector to the 'STOP' or 'RUN' positions depending on desired Operation. Exit the menu.

For further settings continue on Page 34.

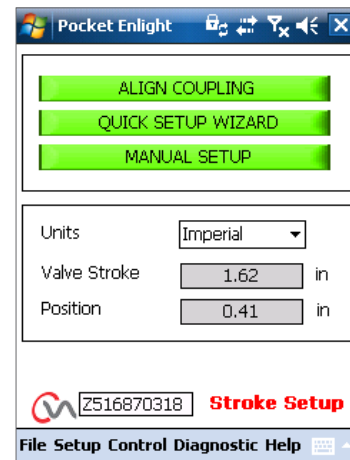
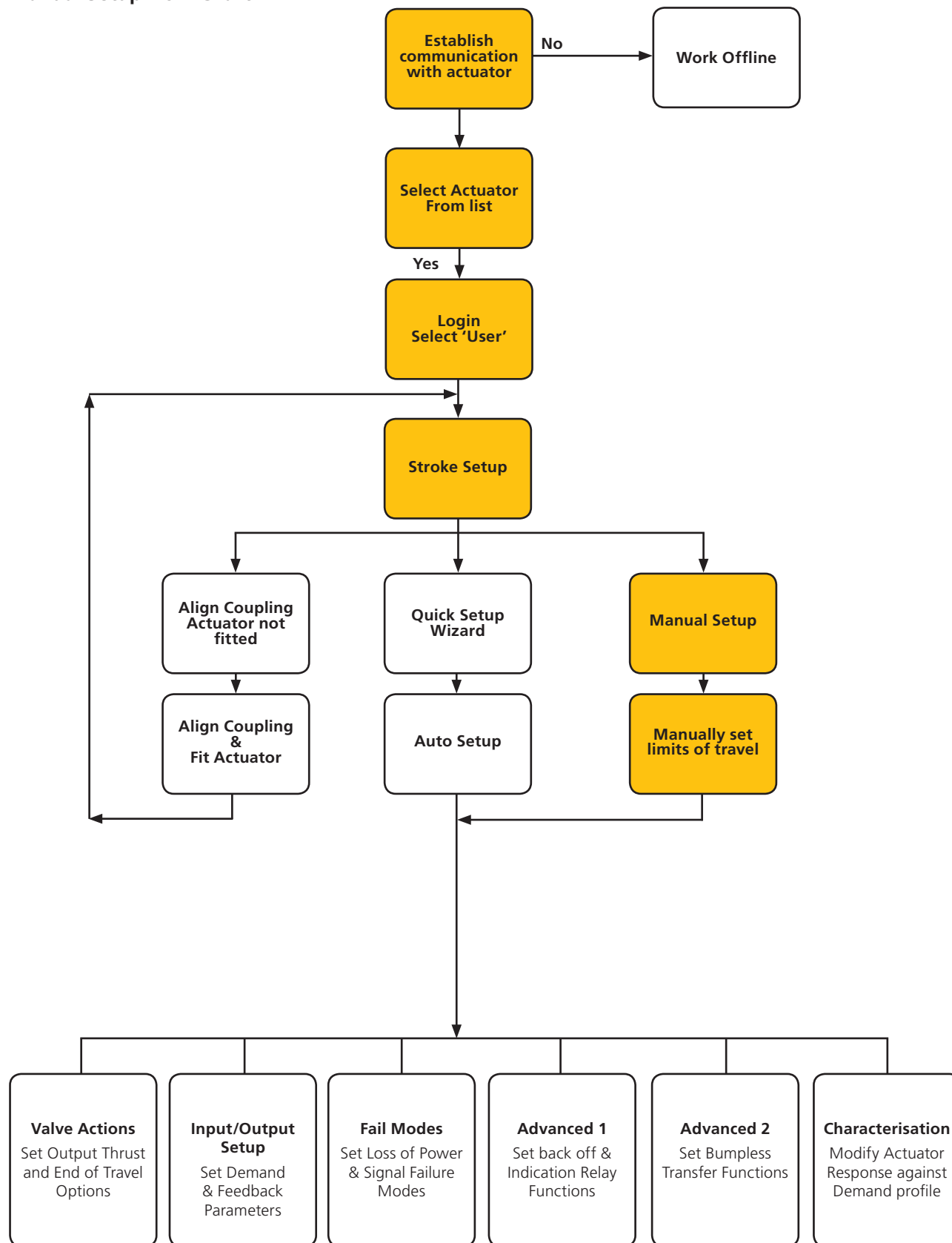


Fig. 27.1



Manual Setup Flow Chart



Manual Setup

⚠ CAUTION

To prevent unwanted electrical operation move the selector knob to the 'STOP' position.

If manual setting is required or if the limits are to be set for a reduced stroke operation the **Manual Setup** can be utilised.

From the Stroke Setup page select the Manual Setup option.

⚠ WARNING

Before carrying out this procedure verify that the thrust limits and basic actuator parameters are set correctly to prevent damage to the valve.

Set Thrust Limits

The default thrust values for the Manual setup are automatically set to a low value for the commissioning procedure.

Open value 40% thrust (200lbf on a CVL 500).

Close value 40% thrust.

Increase the thrust if necessary.

Set Basic Actuator Parameters

The MOV tag can be edited by using the keyboard at the bottom of the screen.

Shaft Action

Select Extend or Retract output shaft to suit valve operation.

Close / Open Stop

Set the end of travel stop function for Thrust or Limit to suit the characteristics of the valve.

Thrust

The actuator can be set to apply its selected output 'Thrust' to the valve at the end of travel where tight shut off is required.

Limit

Alternatively it can be set to the 'Limit' function to disengage motor drive and stop the valve at a predetermined position where the valve does not require the seating force to be applied to the valve seat or end of mechanical valve travel.

Proceed to Manual Setup

Click on the 'START' box to confirm changes and commence the Manual Setup procedure.

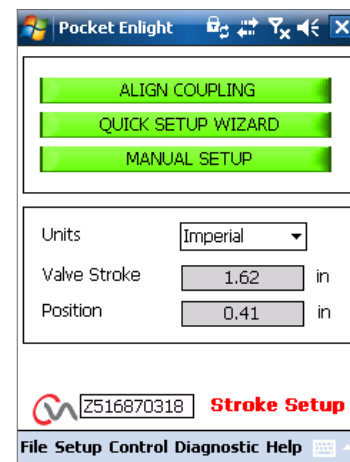


Fig. 29.1

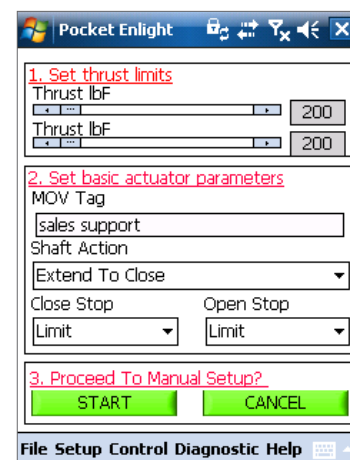


Fig. 29.2

Installation & Setup Guide



To Enable electrical operation move the Selector Knob to the RUN position.

CAUTION

Note the actuator may respond to any present remote control requests during loss of Bluetooth commands or when navigating between screens.

It is now possible to move the output shaft to the desired Position using the position control slider.

CAUTION

The actuator will be taken offline and will respond to the position control slider.

Confirm that settings are correct before attempting to move the actuator.

Click on OK to proceed.

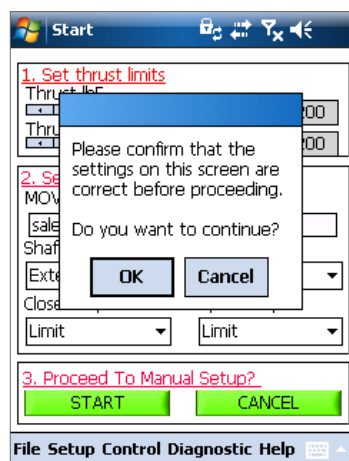
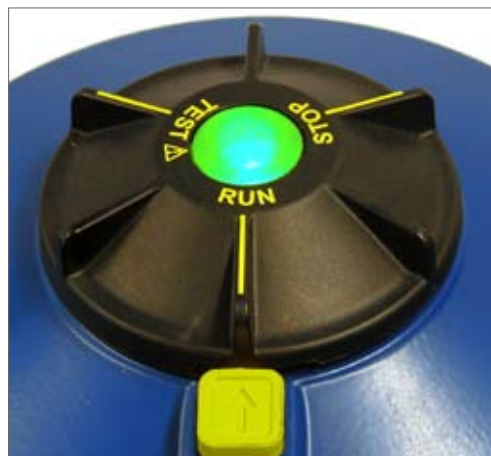


Fig. 30.1

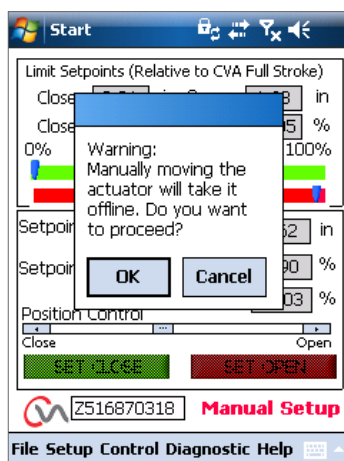


Fig. 30.2

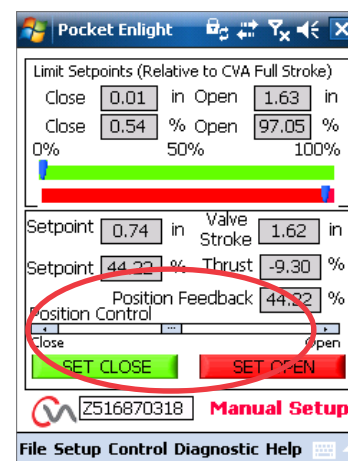


Fig. 30.3

When the output shaft is in the desired position, the travel limit can be set using the SET OPEN / SET CLOSE box.

Set Close Limit

Use the Position Control Slider to move the actuator output shaft to the required Closed position. Fig 30.2.

Click on the 'Set Close' box to calibrate the closed limit of travel. The 'Set Close' and the 'Serial' number boxes are 'greyed' out during the calibration procedure and indicate acceptance of the new settings when cleared. Fig 30.3.

The new close limit position is now shown on the main scale Indicator. Fig 30.4.

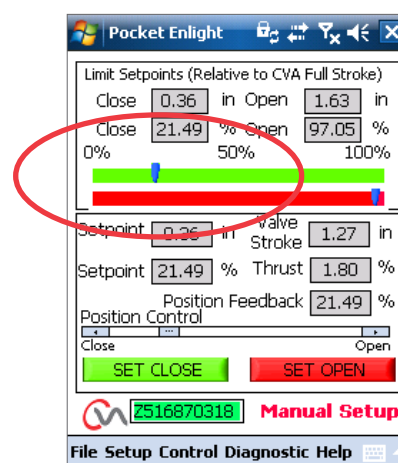


Fig. 30.4

Set Open Limit

Use the Position Control Slider to move the actuator output shaft to the required Open position.

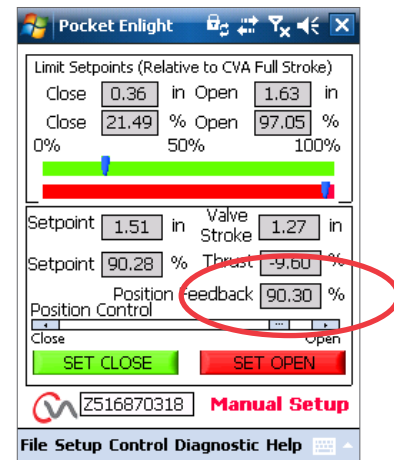


Fig. 31.1

Click on the 'SET OPEN' box to calibrate the closed limit of travel. The 'Set OPEN' and the 'Serial' number boxes are 'greyed' out during the calibration procedure and indicate acceptance of the new settings when cleared.

The new open limit position is now shown on the main scale indicator.

The new limits of travel are shown on the green and red scales and as inches/mm position and percentages relative to the actuators full mechanical stroke.

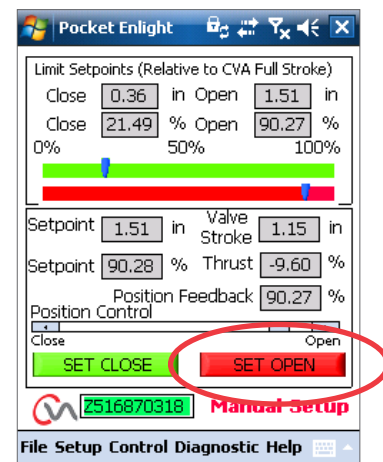


Fig. 31.2

Manual Setup is now Complete.

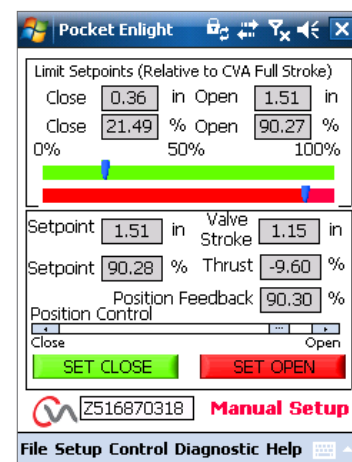
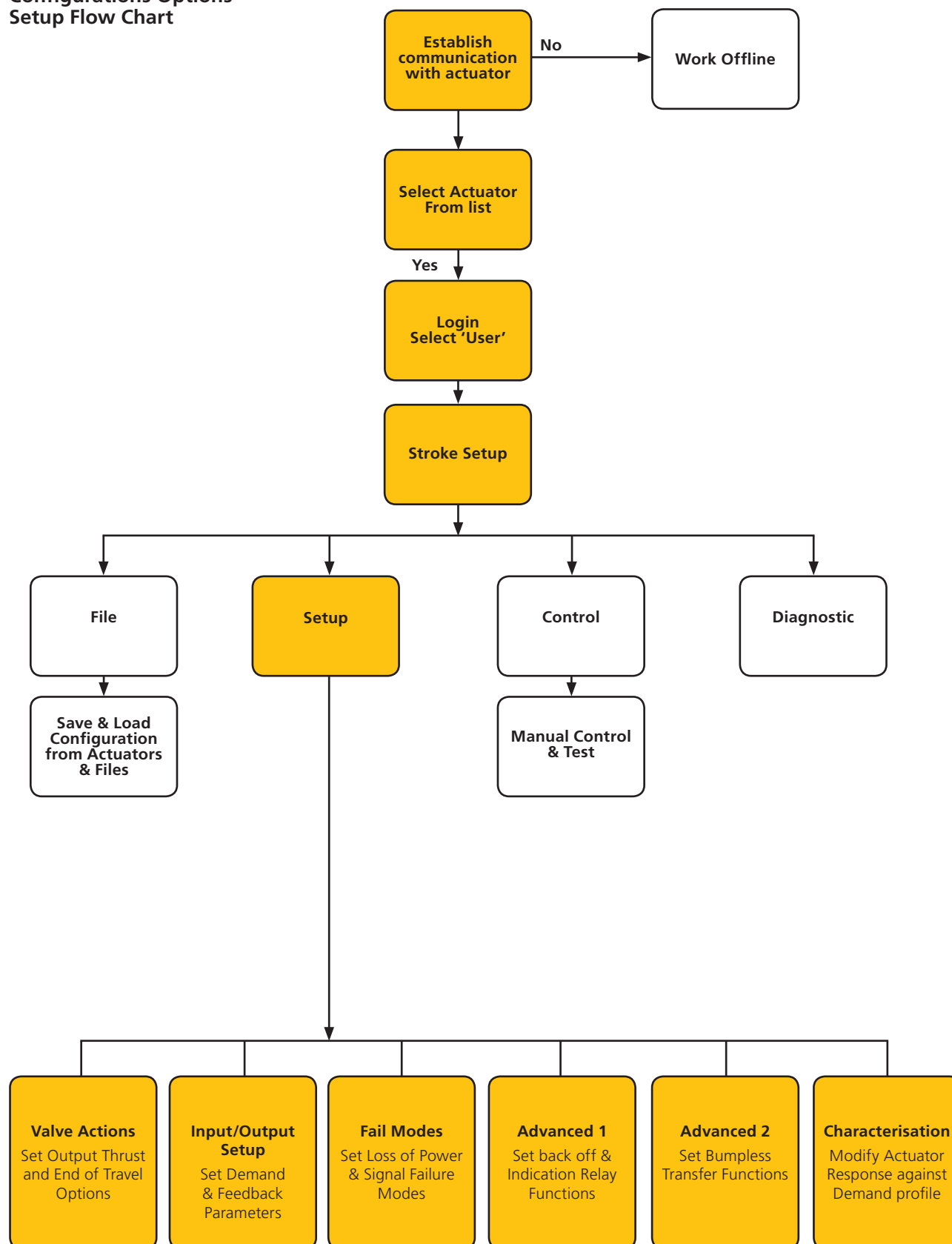


Fig. 31.3

Installation & Setup Guide



Configurations Options Setup Flow Chart



File

From the lower tool bar the menus allow configuration settings to be stored and updated.

Load Config from CVA

This option will download the actuator configuration of the currently connected actuator to the PDA to allow verification of the settings.

The 'Transferring data' screen will be active during the download.

Save Config to CVA

Upload the current configuration stored from the PDA to the actuator.

The 'Transferring data' screen will be active during the download.

Load Config from File

VIEW

Use this screen to load a configuration file for review. On the PDA. This will disconnect the current actuator.

UPDATE

Use this screen to update the current actuator with a previously saved file.

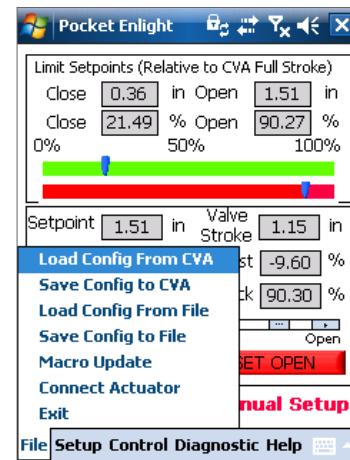


Fig. 33.1



Fig. 33.2

Configurations Options

Use this option to Save actuator configuration to the PDA or actuator memory.

Load configuration data from previously saved files from PDA to the actuator.

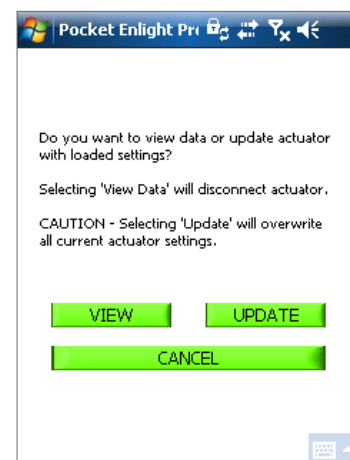


Fig. 33.3

Installation & Setup Guide



Save Config to file

Save the current actuator configuration to a file location on the PDA.

'Save config to file' will open a new screen to save file in PDA. File will be identified by actuator serial number. This can be edited. The file location can also be selected from this screen.

Save will initiate the process

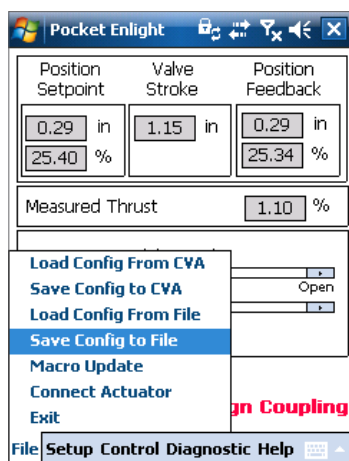


Fig. 34.1

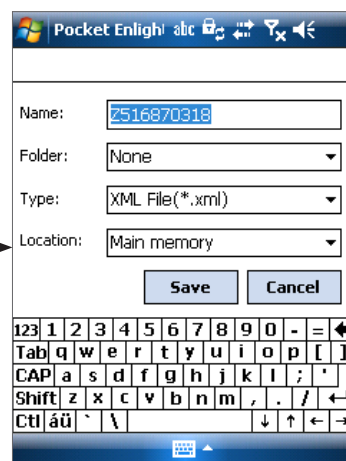


Fig. 34.2

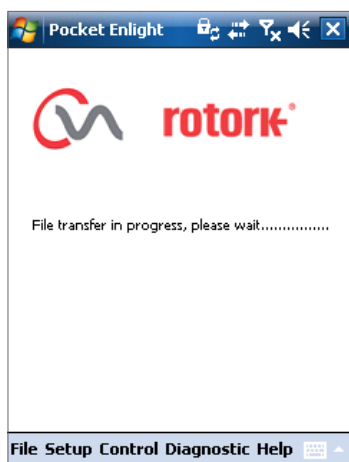


Fig. 34.3

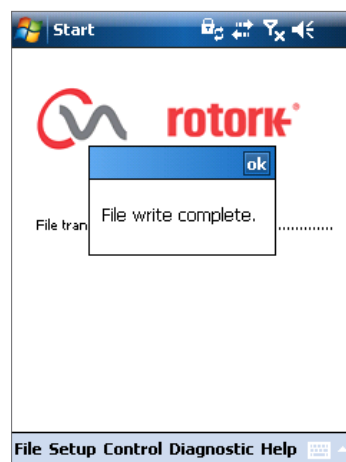


Fig. 34.4

Macro Update ROTORK USE ONLY

No USER function.

Configuration Settings

Further menu options are available from the lower tool bar as follows:

Setup

Stroke Setup

Align Coupling
Quick Setup Wizard
Manual Setup.

Valve Actions

Configure thrust output options, direction to close and MOV tag.

Input/Output Setup

Configure Analogue demand and Feedback options.

Fail Modes

Configure Power and loss of signal failure actions.

Advanced 1

Configure backoff and status relay options.

Advanced 2

Configure bumpless transfer options.

Characterisation

Configure actuator response to demand characteristic.

Change Password

Change Actuator Password.

DO NOT lose the Password information if changed from the Default.

Control

Manual control

Operate the actuator manually by Bluetooth™ command.

Run test

Run a selection of step and wave tests.

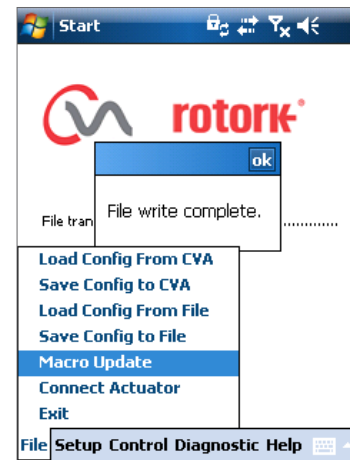


Fig. 35.1

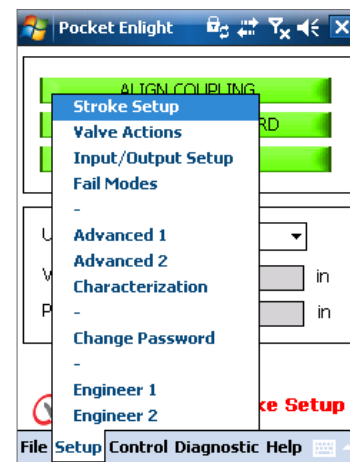


Fig. 35.2

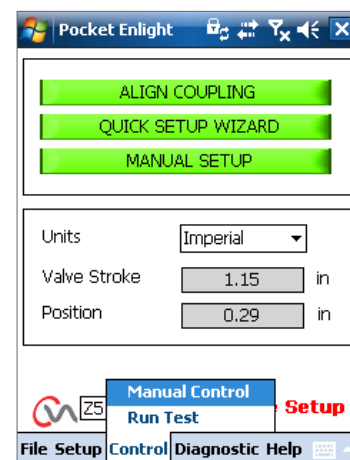


Fig. 35.3

Valve Actions

From the lower tool bar menu select **Valve Actions**.

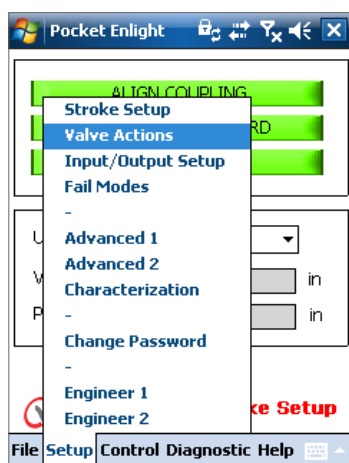


Fig. 36.1

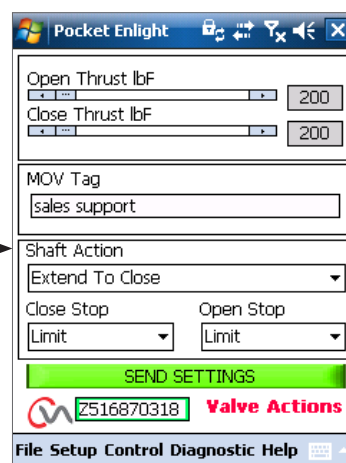


Fig. 36.2

The following settings are available:

Open/Close Thrust

Maximum allowed output thrust can be varied between 40% to 100% of rated in both Open and Close directions.

The thrust is displayed in lbf or N.

MOV Tag

Modify as required.

Shaft Action

Extend or Retract to close (Extend is Default).

Close / Open Stop

Set the end of travel stop function for Thrust or Limit to suit the characteristics of the valve.

Thrust

The actuator can be set to apply its selected output 'Thrust' to the valve at the end of travel where tight shut off is required.

Limit

Alternatively it can be set to the 'Limit' function to disengage motor drive, where the valve does not require the seating force to be applied.

Send Settings

Send modified settings to the actuator.

Input / Output Setup

From the lower tool bar select **Input/Output Setup**.

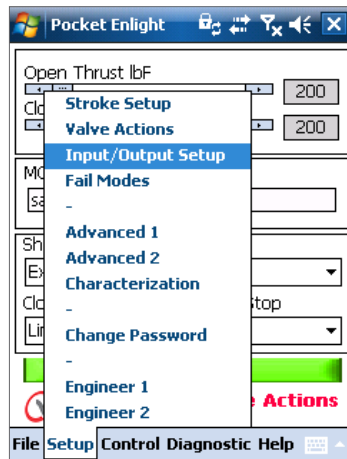


Fig. 37.1

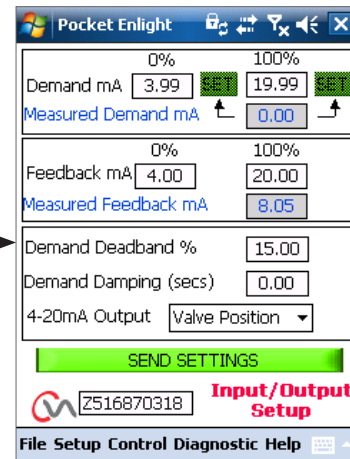


Fig. 37.2

Close Demand mA Calibration

Set mA Demand level at fully Closed position.

Apply minimum (0%) Setpoint Signal to the actuator demand input terminals and use the appropriate 'SET' box to calibrate.

The setpoint will be calibrated to the Measured Demand mA value displayed in the box.

Open Demand mA Calibration

Set mA Demand level at fully Open position.

Apply maximum (100%) Setpoint Signal to the actuator demand input terminals and use the appropriate 'SET' box to calibrate.

The setpoint will be calibrated to the Measured Demand mA value displayed in the box.

Close Feedback mA Calibration

Set required mA Feedback level at the fully Closed position by typing in the value directly to the 0% Feedback box. Select **SEND** settings to save changes.

Open Feedback mA Calibration

Set required mA Feedback level at the fully Open position by typing in directly to the 100% Feedback box. Select **SEND** settings to save changes.

Demand Deadband

If the actuator hunts or responds unnecessarily to a fluctuating setpoint signal, the Deadband may be increased. The Deadband can be varied between 0% and 10%.

Damping

If the actuator responds unnecessarily to a rapidly fluctuating setpoint signal the Damping feature can be used to 'damp' out the response by applying a delay in the response to a change in signal.

Adjust the damping time delay (milliseconds) setting to achieve stable system operation.

4-20mA Output

Can be configured to show the actuator position or output thrust.

Send Settings

Send modified settings to the actuator.

Installation & Setup Guide



Fail Modes

From the lower tool bar select **Fail Modes**.

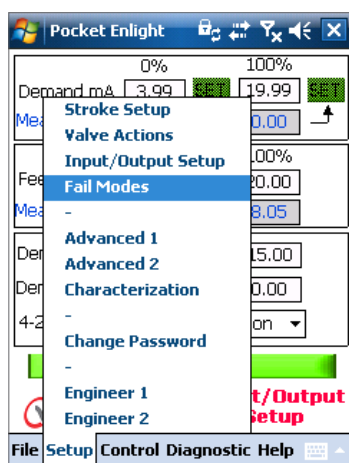


Fig. 38.1

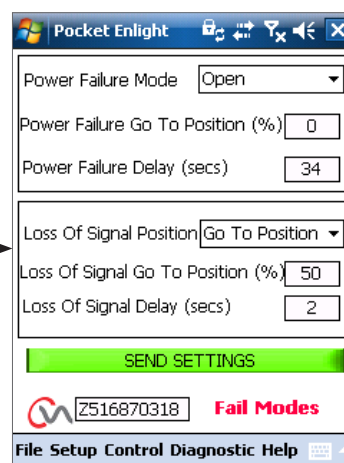


Fig. 38.2

Power Failure Mode

(Units fitted with Reserve Power Pack option only).

On power failure the actuator can be set to carry out the following actions:

Move to Closed limit of travel

Move to Open limit of travel

Stayput

Go To Position

Power Failure Delay

Delay before failsafe action is adjustable up to a maximum of 10 seconds.

NOTE: The LED on the mode selector will remain illuminated until the Reserve Power Pack failsafe capacitors are fully discharged.

Loss of Signal Position

On loss of the 4 - 20mA analogue control signal the 'Fail to Position' can be set to carry out one of the following actions:

Move to Closed limit of travel

Move to Open limit of travel

Move to a pre- determined position

Delay Fail to Position response up to 10 seconds.

Advanced 1

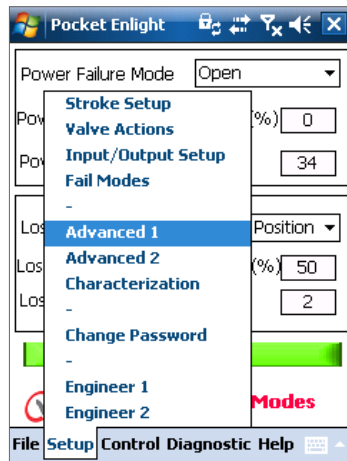


Fig. 39.1

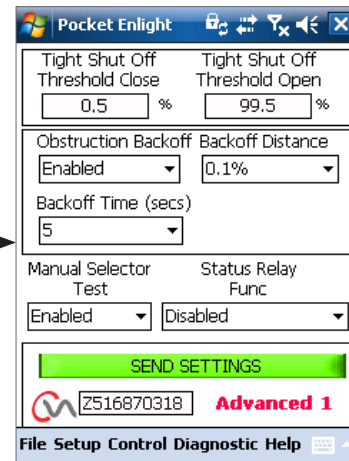


Fig. 39.2

Tight Shut Off Threshold Close

This box indicates the highest level analogue mA setpoint as a percentage that will fully close (tight shut off) the valve.

The example shown in Fig 39.2 states that a 0.5% or lower control request will give a tight shut off (closed) on the valve

Tight Shut Off Threshold Open

This box indicates the lowest level analogue mA setpoint as a percentage that will fully open the valve.

The example shown in Fig 39.2 states that a 99.5% or greater control request will give a tight shut off (open) on the valve.

Obstruction Back off

If enabled the actuator will back off the movement if the maximum thrust is exceeded during travel. The actuator will make 3 attempts to back off and return to the setpoint.

If disabled the actuator will remain stationary until a request to move in the opposite direction is received or the obstruction is removed.

Back off Distance

The distance the actuator backs off can be selected on the drop down menu as shown.

Back off Time

Can be set to a maximum of 5 seconds before back off is executed.

Test Knob

The Mode Selector Knob can be disabled to prevent the actuator carrying out a pre-determined test routine when the 'TEST' position is selected on the control knob.

Installation & Setup Guide



Status Relay

The actuator has a programmable fault relay that can be set to indicate one of the following conditions shown in Table 3.

Mode	Description
Disabled	Always de-energised to reduce power consumption
Availability	Active when the CVA is capable of being remotely controlled Actuator is in Remote Mode Actuator has no faults which would prevent operation
Fault	Active with any detectable fault within the actuator, control or valve
Open Limit	Active when the actuator is at the Fully Open position
Closed Limit	Active when the actuator is at the Fully Closed position
Open Thrust	Active when the actuator has reached the Opening Thrust Limit
Close Thrust	Active when the actuator has reached the Closing Thrust Limit
Thrust Limit	Active when the actuator has reached the Opening or Closing Thrust Limit
Failsafe	Active when the actuator is performing its Failsafe action

Table 3

The relay contact type can be configured for Normally Open (NO) or Normally Closed (NC) by using a different wiring configuration. This can be selected during the ordering stage and will be reflected in the Wiring Diagram number.

See Table 3 for details of relay functions.

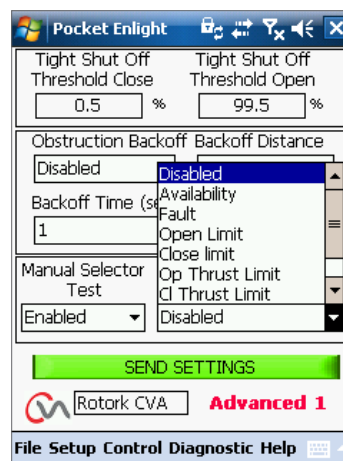


Fig. 40.1

Advanced 2

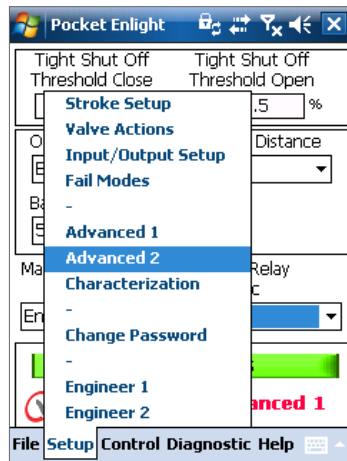


Fig. 41.1

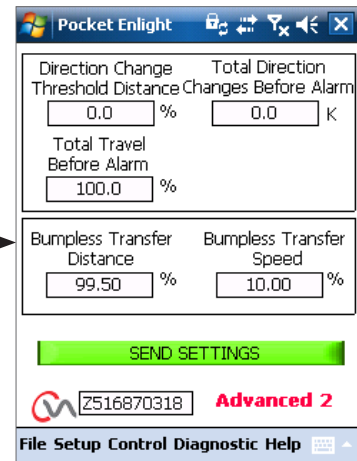


Fig. 41.2

Direction Change Threshold Distance

The distance the actuator must move before a direction change is registered by the datalogger as a cycle.

This is used to prevent small dither movements from being counted as these are considered too small to cause valve wear.

The default setting is 0.25% of overall valve travel.

Total Direction Changes Before Alarm

Can be used to generate an alarm when a set number of direction changes has occurred.

Total Travel Before Alarm

Can be used to generate an alarm when a set distance has been travelled by the actuator output drive shaft ft/meters.

Bumpless Transfer

On start up of the process or after manual intervention the actuator could be required to move a long way to its setpoint. If the actuator moved at too great a speed this could cause a 'bump' or instability in the control system loop leading to valve overshoot and oscillation.

To reduce this effect the 'bumpless transfer' reduces the actuator output speed to a lower level if the distance to travel is more than a pre-determined value. Once the actuator arrives within the Bumpless Transfer Distance (BTD) area it will resume travel at its normal speed.

Bumpless Transfer Distance (BTD)

The bumpless transfer distance is a pre defined percentage of position error that will reduce the actuator speed to a pre-determined speed.

The Default Bumpless Transfer Distance is 5%.

Bumpless Transfer Speed

The speed in % of rated maximum speed that the actuator will revert to if the bumpless transfer distance is exceeded.

The actuator will resume normal set speed once it arrives within the preset BTD.

The Default Bumpless Transfer Speed is 40% of rated.

Send Settings

Upload the Advanced 2 configuration changes to the actuator.

Installation & Setup Guide



Characterization

The actuator relationship between the Demand Request and the Demand Signal is Linear by default.

Use the Valve Characteristic drop down menu to select between the following:

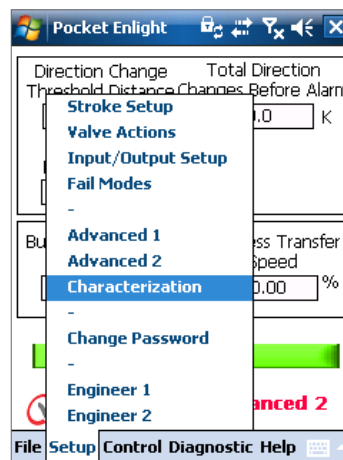


Fig. 42.1

Linear

The actuator position responds directly to the mA demand request.

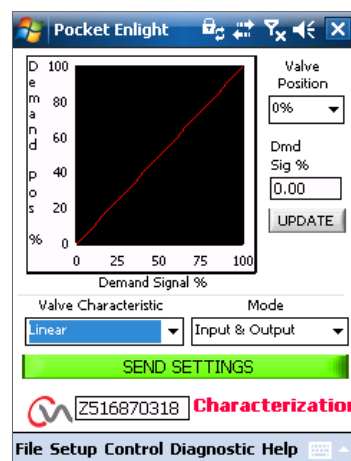


Fig. 42.2

Quick Opening

The actuator responds quickly to the demand signal at the lower end of travel. Reduced response near the open position.

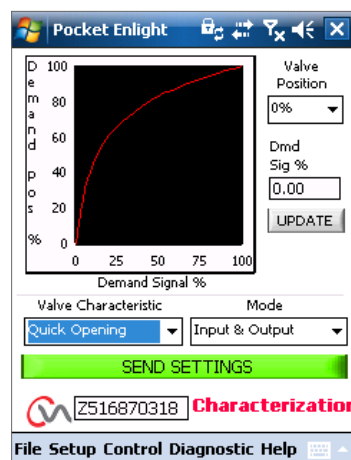


Fig. 42.3

Equal Percentage

The change in actuator position is directly proportional to the demand request.

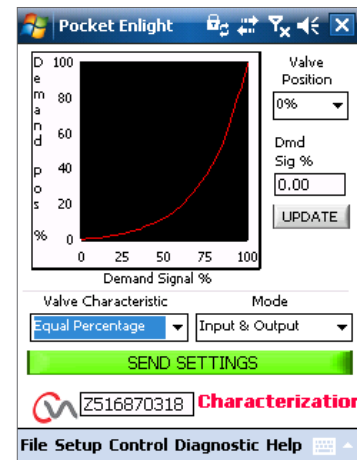


Fig. 43.1

Valve Position & Demand Signal

The position against demand profile can be tailored to suit the valve application by plotting the characteristic at up to 20 co-ordinate points on the graph.

Click on the Valve Position box and highlight the required valve position (5% increments).

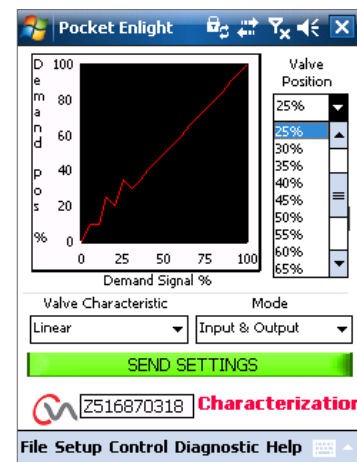


Fig. 43.2

Type in the corresponding Desired Signal % and click on the Update box.

Use the update box to store the co-ordinate point.

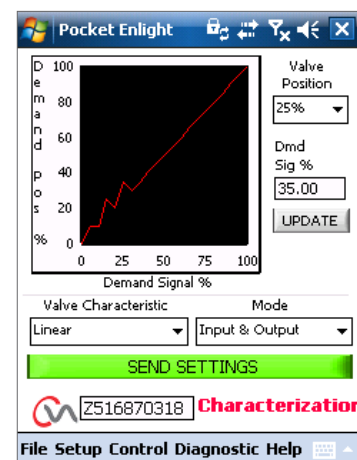


Fig. 43.3

Installation & Setup Guide



Mode

The characteristic Profile can be applied to both the Input and Output signals or individually if required.

Click on the **SEND SETTINGS** box to save the changes to the actuator configuration.

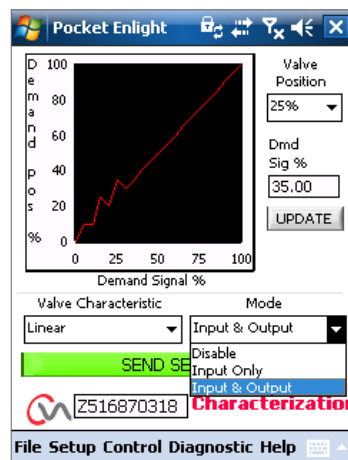


Fig. 44.1

Change Password

This menu allows the actuator password to be changed.

Note: If the actuator Password is changed it will not be possible to communicate with the unit, unless the correct password is used.

DO NOT LOSE THE PASSWORD INFORMATION.

CONTACT ROTORK IN CASE OF LOST PASSWORD INFORMATION.

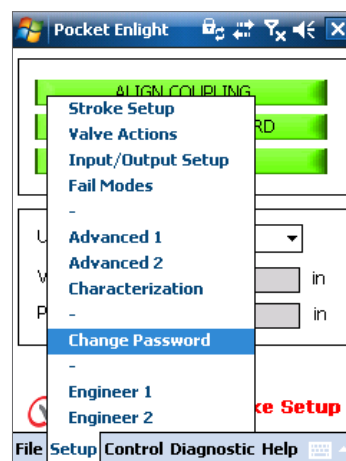


Fig. 44.2

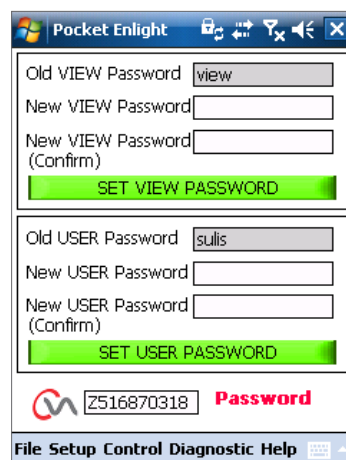


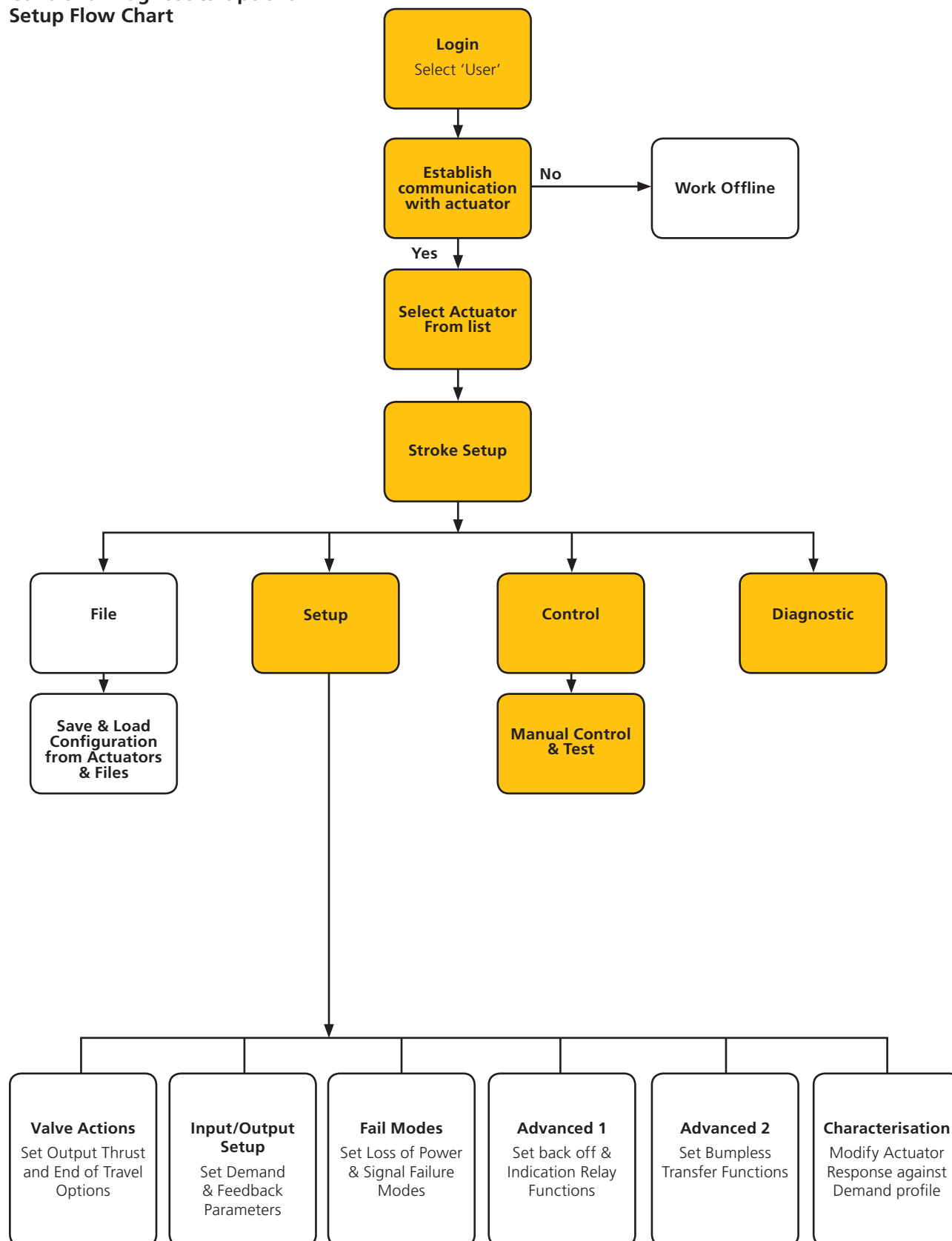
Fig. 44.3

Note

Engineer 1
Engineer 2

These screens are for Rotork use only.

Control & Diagnostics Options Setup Flow Chart



Installation & Setup Guide



Manual Control

Move and test the function of the actuator locally using the PDA independently of the control system.

Any changes to the actuator setup or position will be confirmed prior to being implemented.

Position Control

Use the slider (Coarse or Fine) to position the valve.

Note any manual request to move will put the actuator offline and will override any system commands.

Click on 'OK' to initiate manual override.

Setpoint & Feedback

Displayed as position and percentage the Setpoint and Feedback are updated continuously during actuator movement.

Valve Stroke

Indicated as distance between the set limits of travel.

Close Limit

Illuminated at closed end of travel.

Open Limit

Illuminated at Open end of travel.

Rated Speed

Output shaft speed is variable between 5% and 100% of rated speed.

Thrust

The output thrust is a live indication of mechanical effort required during valve travel.

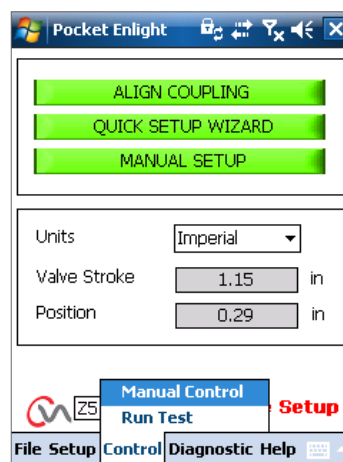


Fig. 46.1

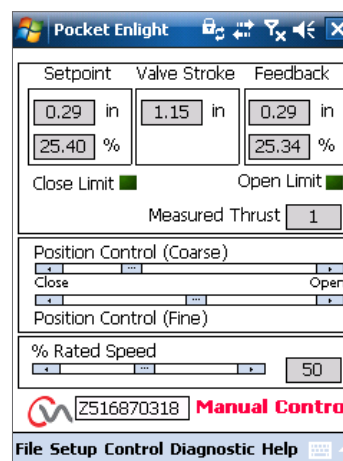


Fig. 46.2

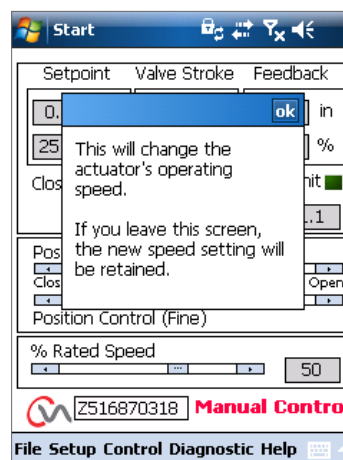


Fig. 46.3

Note

Run Test is a Rotork only function.

Diagnostic Menus

Datalogger

The data logger function is used to download historical data from the actuator for review on a PDA or PC.

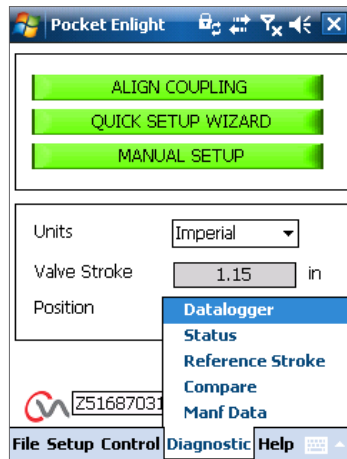


Fig. 47.1

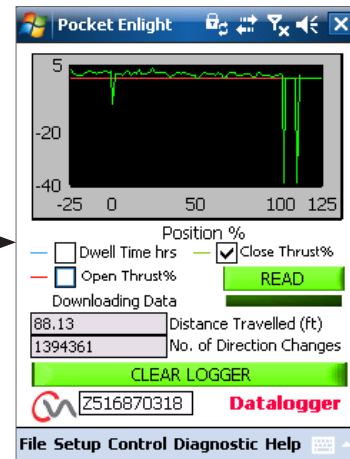


Fig. 47.2

The data logger page graph can display open / close thrust and dwell time. Dwell time is total time spent at any position during the valve stroke.

To download a file click on **READ**.

Note: Only open one graph at a time as this can affect the scaling.

Other data available is total distance of output shaft travelled and number of direction changes.

The data logger file can be stored in the PDA memory for future reference.

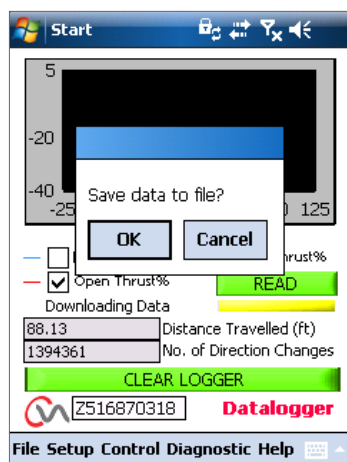


Fig. 47.3

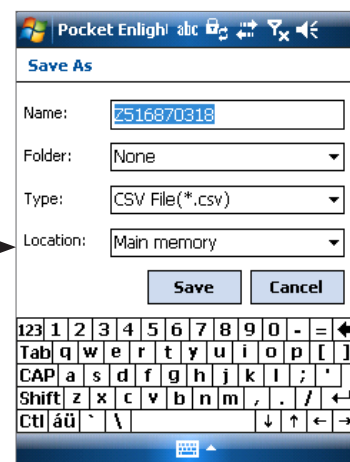


Fig. 47.4

Installation & Setup Guide



Status

Active alarms and status are displayed.

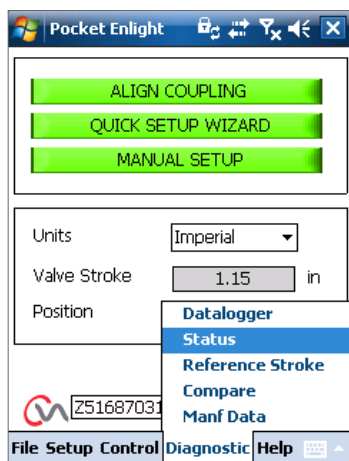


Fig. 48.1

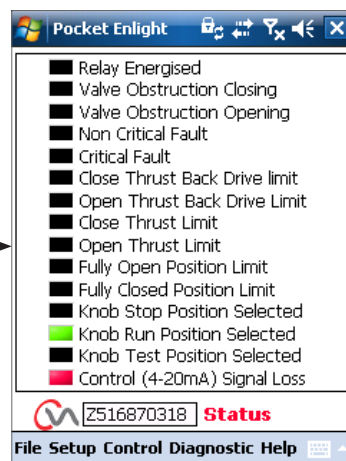


Fig. 48.2

Reference stroke

When the actuator has been commissioned it is possible to set a reference stroke to record thrust. This can be compared against a current recording to determine if any parameters have changed.

Set Reference stroke

Will record the last valve stroke for future reference.

Read Reference stroke

Displays the reference stroke on the graph against the current performance.

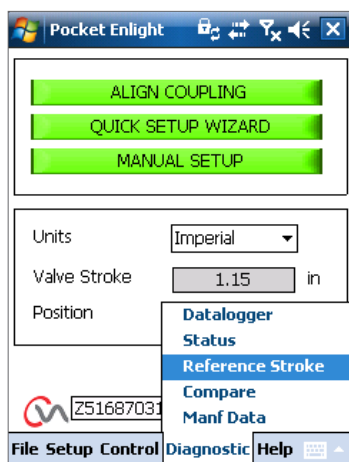


Fig. 48.3

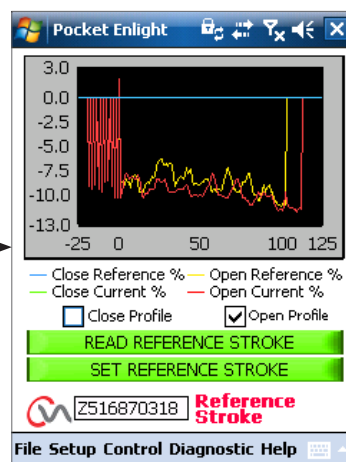


Fig. 48.4

Compare

If a configuration file has previously been saved it can be compared to the current settings.

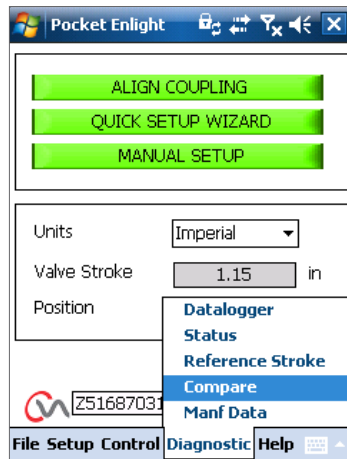


Fig. 49.1

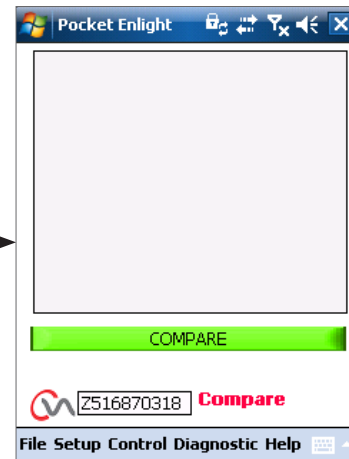


Fig. 49.2

When the compare screen appears click onto the compare box and you will be prompted to find a previously stored configuration file. When the file is opened a list will be generated showing any modifications to the settings since the original file was created.

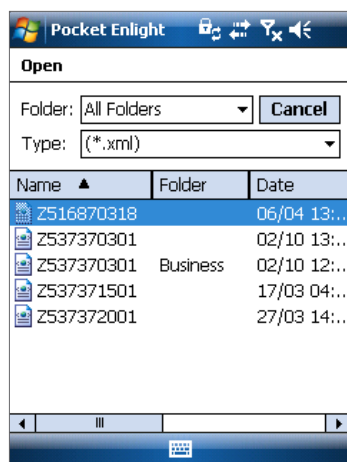


Fig. 49.3

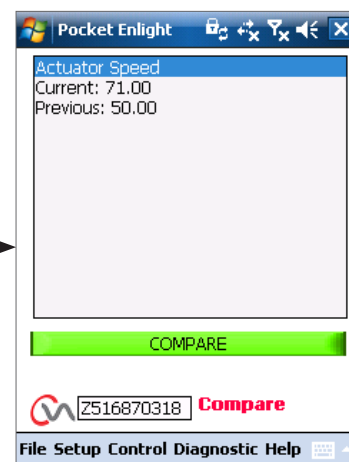


Fig. 49.4

Installation & Setup Guide



Manufacture Data

Display manufacturing data including software version and serial numbers.

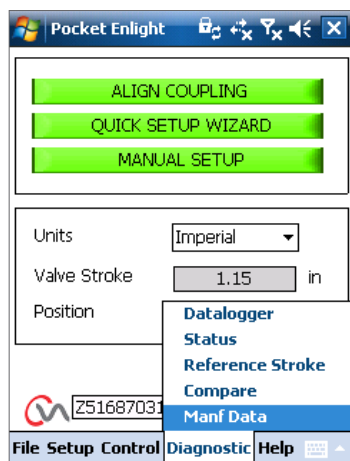


Fig. 50.1

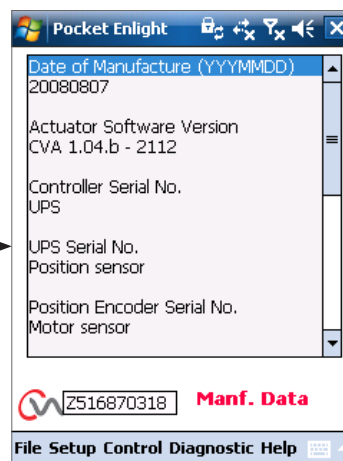


Fig. 50.2



Rotork Sales and Service



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

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

Local representative:



ISO 9001:2000
Rotork Process Controls, Milwaukee, USA



Rotork Controls Ltd, Bath, UK

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