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IS210F FISCO

FISCO enabled Compact Electronic Actuator Positioner – for use in EXD2010 System

Features

- Large backlit liquid crystal display
- Local communication via IR900 infra red keypad for adjustments within Hazardous Areas
- Simple two-step calibration
- Calibration trim for fine adjustment
- Compatible with Foundation Fieldbus ITK 6.0
- All instrument parameters available within Foundation Fieldbus Transducer Block
- 4-20mA current or potentiometer feedback signal.
- Local MANUAL mode available
- Stepping mode with adjustable ON and OFF times
- Selectable solenoid drive sense for failsafe operation
- Selectable default operation on feedback signal break
- ESD solenoid output on fault - 24Vdc open drain
- Fault output - 24Vdc open drain
- Hydraulic pump drive controlled by demand or external pressure sensors
- External fault contact monitoring
- Selectable interlock between ESD and fault outputs
- Local adjustment inhibit by remote contact closure
- Fault and status logging
- Low power - normal operation less than 3W
- Direct mounting within Compact Ex d Enclosure System EXD2010

The IS210F FISCO can be used in any positioning system relying on the on-off control of the position driver including electro-hydraulic actuators and reversing ac motors (with the addition of suitable relays or contactors). The IS210F FISCO can accept positional feedback from a three-wire potentiometer or a position transducer with a current output. The IS210F FISCO is mounted to a special chassis plate and fitted within an Ex d enclosure - EXD2010. All field and customer wiring is taken through a close-coupled Ex e enclosure. Comprehensive power supply and signal isolation allows connection to any user DCS system without the need for further signal isolation.

This handbook describes the configuration and operation of the basic IS210F FISCO. Other hardware and firmware options will be described in additional sections published separately.

Contents

What the IS210F FISCO does

The instrument communicates with a remote master via Foundation Fieldbus. An analog signal, representing the actual position (**feedback signal**) from a position transducer mounted on the actuator is compared with the bus demand parameter and a difference will cause one or both of the IS210F FISCO outputs to operate electro-hydraulic solenoids, driving the actuator to the desired position.
A positional **dead-zone or dead-band** may be adjusted to overcome "hunting" problems associated with mechanical overrun of the actuator.
The speed of transit of the actuator can be reduced by selecting the **stepping mode** that provides independently adjustable on and off times for the open and close solenoid operation.
All parameters can be modified via the Fieldbus or via the IR900 infra-red keypad.

Please read this handbook carefully before operating the IS210F FISCO. The instrument will have been set up during factory trials so please avoid changing any parameters until you have gained some familiarity with the operation of the positioner. The bulk of this handbook describes the local configuration of the system using the IR900. Please check the FF supplement for Fieldbus configuration for remote adjustment of parameters.

The IS210F FISCO is designed to operate within a Zone1/2 hazard environment. Please follow the instructions in the accompanying EXD2010 enclosure system handbook regarding field connections. The IS210F FISCO is NOT powered from the Fieldbus and requires a 24Vdc safe area power supply, capable of delivering 150mA plus and actuator solenoid current.

What the IS210F FISCO looks like

The IS210F FISCO is mounted on a chassis plate and housed within an Ex d enclosure. It has an 8 line x 20 character display and 8 LEDs above the display. The circuit boards are coated with a resist layer that protects the track from moderate condensation and mould growth problems. Connections within the Ex d enclosures are by factory assembled 0.1" connectors and must not be disturbed or re-wired. The IS210F FISCO requires the Intrinsically Safe (Ex'ia') IR900 keypad for calibration, configuration and manual operation.

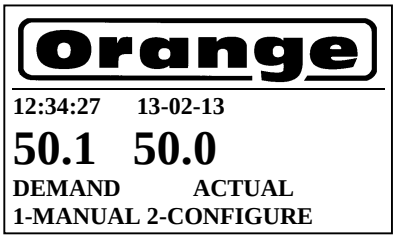
How to connect the IS210F FISCO

Not all installations will have the same wiring arrangement. Only use the hook-up drawing provided for the specific installation. Wiring to the Ex e enclosure terminals should be completed by suitably trained personnel taking into account the following notes:

- To ensure RFI compliance the analogue signals should be routed in copper braided screened cables with a fill factor density of at least 0.7.
- The screens should be terminated to the metal of the actuator housing, ideally at a suitable metal cable gland.
- Signal cables should be routed separately from power and switching conductors.
- The Fieldbus signal requires the use of appropriately specified cable

Switching on the IS210F FISCO for the first time

When the IS210F FISCO is first switched on the display it should show the normal running status:



Normal Display

A Company Logo is displayed over the first three lines. The first text line shows the time as hrs:mins:secs (24 hour clock) followed by the date as dd:mm:yy. The main display shows the current demand signal as a percentage, followed by the actuator stroke as a percentage of the full stroke.

The actuator should not be moving and the Actual display should reflect its physical position. Similarly, the Demand display should reflect the Fieldbus demand signal.

If the Company Logo does not show and/or either the Demand or Actual display shows -99.9, then there is a problem with the external components of the system e.g. the wiring, Fieldbus configuration, hydraulic supply or electrical supply. Please see the section **Why doesn't the IS210F FISCO work?**

If the actuator has been fitted to a valve and passed through factory commissioning, then all that is necessary will be 'tuning' the actuator to the site conditions i.e. the valve operating under process conditions with the local hydraulic supply. If there is any doubts as to the calibration of the unit then proceed first to **How do I calibrate the IS210F FISCO?**

How to 'tune' the actuator system

Ideally, the IS210F FISCO will position the actuator exactly to the position directed by the Demand signal without any overshoot or instability.

Why do we need to 'tune' the actuator system?

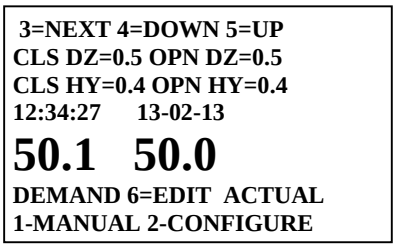
As the speed of the actuator increases, by increasing the flow rate of the hydraulic system, the stability decreases as more unwanted fluid is passed during the electro-mechanical operation of the solenoids valves. This unwanted fluid causes the actuator to overshoot the desired position.

If we can cause the solenoid to switch a little earlier when approaching the desired position then the overshoot is turned into a 'coast' to this position. This offset is the **dead-zone or dead-band** and can be set independently for each direction of travel. The dead-zone can be adjusted in increments of 0.1% of the total stroke of the actuator.

In addition to the dead-zone, an additional parameter is available for each direction of travel, **open hysteresis and close hysteresis**. This is an additional offset that is added to the dead-zone as the actuator commanded to move away from its stable position and ensures that no instability at the edge of the dead-zone due to small analog to digital conversion variations in processing on the incoming signals.

How to adjust the dead-zone or dead-band interactively

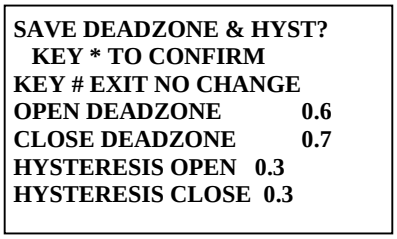
1) Before attempting 'tuning' make sure that the hydraulic flow rate is set to give a stroking speed that is acceptable for the process being controlled. Where possible, make this speed *as low as possible* to give the best potential performance of the system. The hydraulic flow rate should be set according to the actuator Manufacturer's Instructions and is best performed with the IS210F FISCO in **manual mode** see **How to operate the IS210F FISCO in Manual Mode.**
2) In the **Normal Display** press Key 9 in the IR900
3) The display will be modified:



Tuning Display

4) The first of the four parameters, **CLS DZ** (close dead-zone) will be shown in reverse, indicating that this parameter can be edited. Pressing Key 3 on the IR900 will cycle the highlight round the other three positions.
5) Because it may be difficult to arrange a remote control of the command signal via the Fieldbus the tune option has a built in function to set a local demand signal. If Key 8 is pressed then the demand signal changes to 50%. Pressing Key 7 toggles the demand between 50% and 55%. This will allow the operator to check and tune the response of the actuator to a 5% step change in either direction. Pressing Key 8 again, waiting until the 120 second timer finishes or leaving the tuning option by pressing Key 9 will return the demand to that currently available via the Fieldbus.
6) If there is any instability in positioning as the demand signal changes then select either CLS DZ or OP DZ and press Key 6 on the IR900. The display will show a highlighted **'EDITING'** label. The actuator solenoids will relax to their stop position.
7) Use Key 5 (up) to increase the close dead-zone, perhaps by 5 (0.5%).
   Press Key 6 again.
8) Repeat steps 6) and 7) until the overshoot disappears. Confirm the best adjustment by reducing the dead-zones (Key 4) and finding the transition between stability and instability.
9) If any 'flickering' of the IS210F FISCO solenoid indicator LEDs occurs, then the **CLS HY** (close hysteresis) and **OPN HY** (open hysteresis) parameters can be adjusted in the same fashion as the dead-zones to reduce this band-edge instability.

10) When all adjustments have been completed satisfactorily, press Key 9. The display will change:



Tuning 'accept' Display

11) Press Key * to accept the changes or Key # to return to the Normal Display.

How can I get into the IS210F FISCO Manual and Configuration Modes?

The IS210F FISCO has some protection against unauthorised entry into these modes. If the instrument is left in either Manual or Configuration then it will not spontaneously return to automatic mode and the remote operator will lose control of the process.

Hardware access enable

Access can be controlled by an external volt free contact or +24V level between Terminal 30 and the +24Vdc, Terminal 19.

The sense of the contact can be selected – see **How do I configure the digital I/O**.

If unrestricted access to the IS210F FISCO is desired then select NORmal for choice 4 ENABLE, to enable access without any external connections.

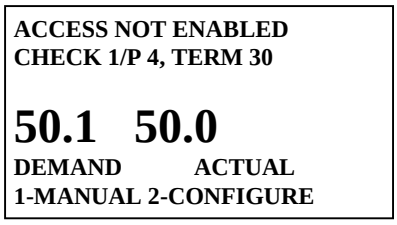
When enabled, LED 6 is lit and an external output on Terminal 26 changes state to give a remote alert that instrument access is enabled.

Communications (HART or FF) access enable

For HART or FF enabled IS210F FISCO positioners, there is a further software enable. Please see the appropriate HART or FF Supplement.

How do I know if access is enabled or not?

If you press Keys 1 or 2 from the Normal Display and you see this display, then IS210F FISCO access is NOT enabled.



Access 'Not enabled' Display

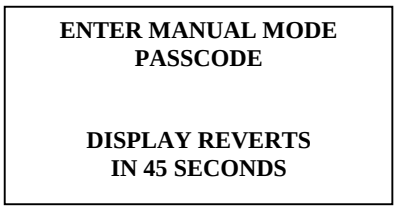
This display will show for several seconds during which time the positioner will continue to operate in automatic mode.

Passcode protection for Manual and Configuration modes

In addition to the hardware enable described above, both Manual and Configuration Modes are protected by different four digit passcodes. These passcodes are only effective if a demand signal of 4mA or greater is present.

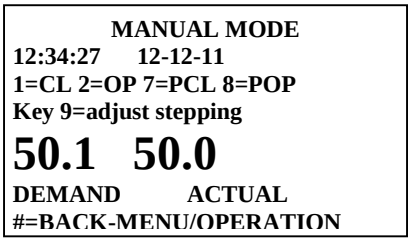
How do I get into Manual Mode and operate the actuator with the IR900?

1) Press Key 1. If hardware access is enabled then the following display shows:



Manual passcode entry display

1) The counter drops in one second increments, giving time to enter the required four digits.
2) If the incorrect code is entered or the counter goes to zero then the display reverts to normal.
3) If the correct code is entered, the following display is seen:



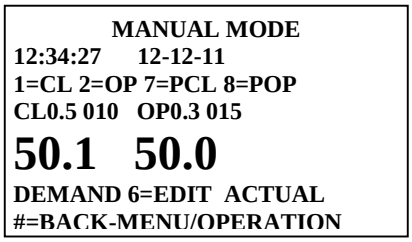
Manual mode main display

4) The DEMAND paameter is displayed but ignored for automatic positioning and the ACTUAL signal reflects the position of the actuator. The actuator solenoids are in their 'stop' position.
5) Key 1 to close the actuator, **1=CL** will be highlighted. The actuator will continue to close until Key 1 is pressed again. The same applies to Key 2, **2=OP**, to open the actuator.
6) Key 7, **7=PCL** applies a chain of brief pulses to close the actuator, similarly Key 8, **8=POP** pulses the actuator open. The action is stopped by pressing the key again.
7) If any Key 1,2,7 or 8 is 'active' then no other key will have any effect.
8) The actuator can be operated, under the control of the IR900, to adjust open and close speed via the hydraulic flow controls or to position the actuator in the absence of a demand signal.

How can I adjust the stepping mode timers interactively?

As well as providing a continuous on-off drive to the solenoids, the IS210F FISCO can pulse them with an adjustable mark-space ratio. Normally the ON time is adjusted to the shortest pulse that will reliably cause a movement of the actuator and the OFF time can be set to give the required stroking time. This is particularly useful if the desired stroke time is too slow to allow adjustment via the hydraulic flowrate.

1) In Manual Mode, press Key 9. The normal Manual display changes to:

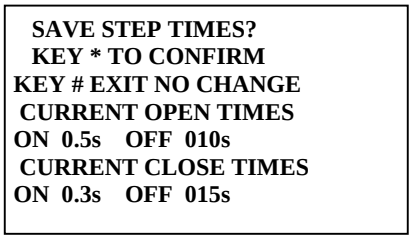


Stepping mode adjust display

2) Normal operation with Keys 1 and 2 continues but not the solenoids are pulsed according to the displayed times:
   CL0.5 010 – indicates the CLOSE solenoid will pulse with an ON time of 0.5s and an OFF time of 10s
   OP0.3 015 – indicates the OPEN solenoid will pulse with an ON time of 0.3s and an OFF time of 15s
3) Pressing Key 3 cycles an editing highlight over each of the four parameters
4) If Key 6 is pressed the highlighted parameter can be edited using Keys 4 to reduce and 5 to increase the value. Pressing Key 6 again ends the edit and the new value can be seen operating if Keys 1 or 2 are pressed.
5) Press Key 9 to leave the stepping adjustment routine back to Manual mode

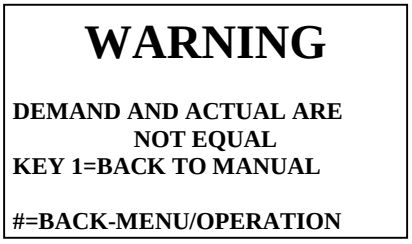
How do I leave Manual Mode?

1) Press Key # to leave Manual mode.
2) If any of the timers have been changed during the Manual session then the following display is shown:



Stepping change save display

3) Press Key * to accept the changes or Key # to return to the Normal Display.
4) If, on exit from Manual operation, the actuator position differs from the demanded position by more than 5% then the following screen warns of the potential of and unwanted step change in valve position when automatic operation resumes.



Manual exit warning display

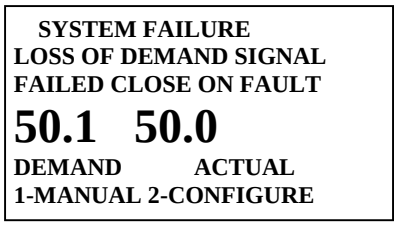
5) Key 1 will return to manual mode and Key # will resume automatic mode with the Normal display.
6) If the IS210F FISCO is left in Manual mode then it will remain there indefinitely, however, if the Hardware Enable state is changed – see **How can I get into the IS210F FISCO Manual and Configuration Modes?** – then the operation will revert to automatic operation without any local operator intervention.

What other displays might I see in Automatic mode?

Status displays

Changes to the external conditions of the IS210F FISCO can be displayed as they occur. These are normally fault conditions selected for display – see **What faults can the IS210F FISCO detect?** and **What does the IS210F FISCO do when a fault occurs?**

If a fault condition is selected for display then the normal display will change:



System fault and action display

Descriptions of faults can include the following:

LOSS OF F/B SIGNAL
FAILURE TO POSITION
EXTERNAL FAULT INPUT

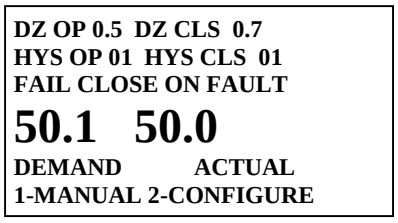
Positioner actions on fault can include the following:

FAILED CLOSE ON FAULT
FAILED OPEN ON FAULT
FAILED STAY PUT
GO TO POSN. ON FAULT
AT REST PUMP OFF

The failed system information will be reset to a normal display when the fault condition has been resolved, or, in the case of a failure to position, Key 0 is pressed to de-latch the fault and restart the failure to position timer.

Tuning parameter detail display

Pressing key 3 on the IR900 keypad toggles an alternative display. The Company Logo is overwritten by the current dead zone, band edge hysteresis data and the current fail-mode setting:

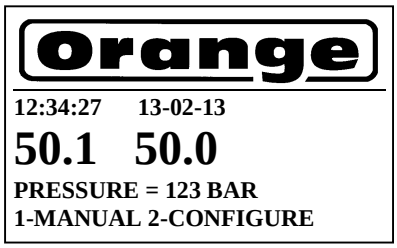


Tuning parameter display

Line 1 – OPEN dead-zone, CLOSE dead-zone
Line 2 – OPEN hysteresis, CLOSE hysteresis
Line 3 – Current fail mode
Pressing Key 3 again restores the Normal display.

Pressure input display

Pressing key 5 on the IR900 keypad toggles an alternative display.



Pressure display

The current calibrated hydraulic pressure, as read on analog input B, is shown. If there is no connection at this input then 'O/C' – open circuit is shown.

What do the LEDs above the display mean?

There are 8 LED indicators above the main display and they have the functions, running clockwise from top right:

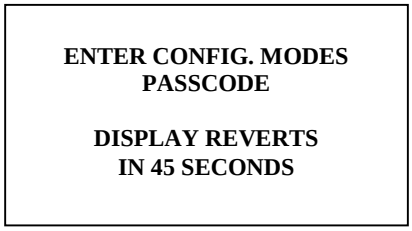
CLOSE 8	**1 OPEN**
FAULT 7	**2 MANUAL**
ENBL 6	**3 STEP**
5 PUMP	**ESD 4**

1. OPEN – lit when the open solenoid is energised
2. MANUAL – lit when the IS210F FISCO is in manual mode
3. STEP – lit when stepping mode has been selected
4. ESD – lit when the ESD output is energised – this may be 'fail-safe i.e. energised healthy
5. PUMP – lit when the hydraulic pump is ON if pump control is selected
6. ENABLED – lit when the enable contact has been made, enabling access to manual and configuration
7. FAULT – lit when there is a fault within the IS210F FISCO system– this may be 'fail-safe i.e. energised healthy
8. CLOSE – lit when the close solenoid is energised

How do I get into Configuration and Calibration modes?

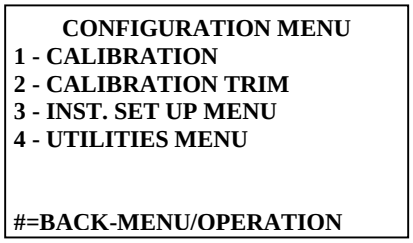
You should only need to configure or calibrate the IS210F FISCO one time during its site life. Note down any changes made to the parameters for future reference.

1) Press Key 2. The Configuration Passcode Display will show if entry is enabled – see **How can I get into the IS210F FISCO Manual and Configuration Modes?**



Configuration mode entry display

2) If enabled and the correct passcode is entered (note that the demand signal should be 4mA or greater), automatic positioning is suspended; the actuator is left in its stay put position and the pump is stopped.



Configuration mode Menu

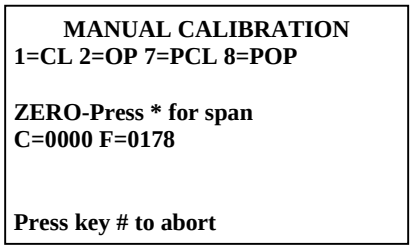
3) Key 1 to 4 selects one of the options shown and key # returns the display and operation to automatic mode. If the Enable Input is changed whilst the unit is in this Main Configuration Menu then operation is immediately transferred back to normal, automatic operation. However, there is no automatic exit from Configuration from within any of the four choices displayed in this menu.

How do I calibrate the IS210F FISCO?

Calibration ONLY sets the relationship between the Demand parameter and the Actual Position of the actuator and, as a consequence, the displayed values of Demand and Actual. Recalibration will NOT solve problems associated with positional accuracy and response. These need to be addressed via the hydraulic fluid flow rate and the Tuning Parameters – see **How to 'tune' the actuator system.**

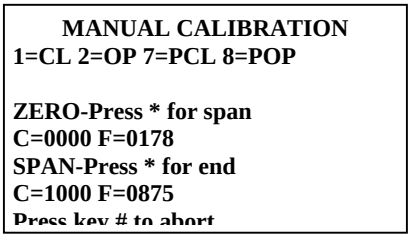
Calibration is a two-stage procedure requiring control of the Fieldbus demand parameter to the IS210F FISCO and a view of the physical position of the actuator. The actuator and valve may need to be isolated from the process as full stroke operation of the actuator is required. It is usually best if the calibration procedure is done locally to the IS210F FISCO and actuator.

1) Select Calibration from the Configuration Menu by pressing key 1. A flag within Fieldbus alerts the remote user that a local calibration is being undertaken.



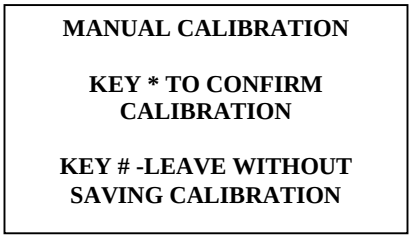
Zero calibration display

2) The demand signal is automatically set at 0%
3) Set the actuator position to the required ZERO position, operating the solenoids as described in - **How do I get into Manual Mode and operate the actuator with the IR900?**
4) Press Key * to proceed to the SPAN position calibration or Key # to abort the procedure and return to the Configuration Manu.
5) The display changes for the SPAN calibration:



Span calibration display

6) The demand signal is automatically set at 100%.
7) Set the position of the actuator using manual operation of the solenoids as in 3) above.
8) Press Key * to continue or Key # to abort the calibration and return to the Configuration Menu.
9) At the end of the calibration, the following screen is shown:



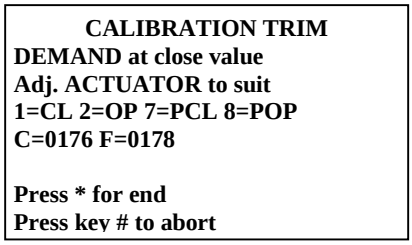
Calibration accept display

10) Press Key * to accept and store the calibration parameters or Key # to leave without saving the calibration. The calibration flag in Fieldbus is relaxed.

How can I 'trim' the zero end of the calibration?

You can 'trim' the ZERO end of the calibration, maybe to set the seating of a valve.

1) Press Key 2 in the main Configuration Menu. The following display will show:



Trim calibration display

2) The demand signal is automatically set at 0%..
3) Set the actuator position to the required ZERO position, operating the solenoids as described in - **How do I get into Manual Mode and operate the actuator with the IR900?**
4) Press Key * to proceed to end the trim or Key # to abort the procedure and return to the Configuration Manu.

5) An accept display is shown:

CALIBRATION TRIM KEY * TO CONFIRM KEY # EXIT NO CHANGE

Trim calibration accept display

6) Press Key * to accept and store the trim calibration parameters or Key # to leave without saving the calibration.

How do I set up the IS210F FISCO basic operating parameters?

You should NOT need to change any of these parameters as they will have been set and checked during tests at the actuator manufacture's facility, when the valve was fitted to the actuator and during final FATs. Please discuss any proposed changes with your suppliers before adjustment. Note that all the parameters are available via the Fieldbus Transducer Block.

These sub-menus allow the setup of the positioner to suit the hydraulic hardware, the control signals and the process control required.

INSTRUMENT SETUP MENU 1 - SOLENOID SENSE 2 - INST. FAIL MODE 3 - PUMP CONTROL 4 - SET STEPPING MODE 5 - SET DEADZONE, HYST 6 - MORE CHOICES #=BACK-MENU/OPERATION

Setup Menu - 1

1) Press Key 1-6 to select the required action.
2) If Key 6 is pressed, Page 2 is displayed.

SETUP MENU - PAGE 2 1 - SET I/P,O/P SENSE 2 - SET FAULT MATRIX   #=BACK-MENU/OPERATION

Setup Menu - 2

3) Press Key # when in Page 1 to return to normal positioning.

How do I set the IS210F FISCO Solenoid Sense?

This allows the matching of the solenoid control with the particular hydraulic circuit used and is normally a one-off adjustment completed during factory tests. The open and closed solenoids can be assigned to cause flow either when energised or when de-energised. This allows the three common hydraulic configurations, stay put, fail close or fail open, under fault conditions. The following screen is displayed:

SET SOLENOID SENSE CURRENT CHOICE IS 1 1 - STAY PUT 2 - FAIL CLOSE 3 - FAIL OPEN #=BACK-MENU/OPERATION

Set solenoid sense display

1) Press Key 1-3 to select the desired solenoid configuration.
2) Press Key # to save changes and return to the Configuration Menu

How do I set the IS210F FISCO Fail Mode?

The IS210F FISCO can detect failures in the systems connected. The actual position feedback signal is monitored and an alarm is set if it strays outside the normal expected range – the detection points are less than 1mA or greater than 21mA for a actual position signal of 4-20mA. The time taken to position is monitored and an alarm set if position has not been attained. An external contact input, possibly monitoring hydraulic pressure unit operation is also monitored. Any or all of these points can cause the positioner to fail to a predetermined position – see **How do I select positioner action on a fault?**. Normally the fault mode will reflect the solenoid sense setting described above.

```
        ACTION ON FAULT
CURRENT CHOICE IS  1
1 - STAY PUT
2 - FAIL CLOSE
3 - FAIL OPEN
4 - FAIL TO POSN 50.0
5 - FAST/SLOW    SLOW
#=BACK-MENU/OPERATION
```

Fail mode display

1) Press Key 1-5 to select the required choice. Pressing Key # will return to the main Set up Menu and save any changes.

2) The key choices are:
   1. **Stay put** – normal for a double acting system where both solenoids are de-energised when the actuator is at the required position.
   2. **Fail close** – normal for an actuator with a mechanical spring or hydraulic accumulator to close with the solenoids de-energised.
   3. **Fail open** – normal for an actuator with a mechanical spring or hydraulic accumulator to open with the solenoids de-energised.
   4. **Fail to position** would normally be used on a double acting system where the process required a particular fail position.
   5. **Fail fast or slow** – if the actuator is set to Stepping Mode – see **How do I set Stepping Mode?** then the chosen fail mode can operate with either continuous (Fast) or stepped (slow) solenoid operation.

Choice 4 - Fail To Position

This choice requires the setting of the stroke position that the actuator would drive to on fault.

```
FAIL TO POSITION

ANY KEY TO CONTINUE
ENTER POSITION

50.0 percent

#=BACK-MENU/OPERATION
```

Set fail position display

The current fail position is displayed. Pressing any key will place a flashing cursor on the value, waiting for a position to be entered in the range 00.0 to 99.9%. The operation can be finished and the current valued saved by either modifying the value or pressing Key #

Choice 5 – Fast / Slow fail operation

Pressing Key 5 toggles the choice of fast (continuous) or slow (pulsed) solenoid operation during fault-induced positioning.

How do I set Self Contained pump control?

The IS210F FISCO can oversee the control of the hydraulic power unit pump supplying the hydraulic fluid to the actuator system. This menu lists the choices available for that control and the associated settings.

```
PUMP CONTROL MODES
CURRENT CHOICE IS  1

1-NO PUMP CONTROL
2-ON DEMAND R/O  005s
3-PRESSURE SWITCHES
4-PRESSURE TX
#=BACK-MENU/OPERATION
```

Pump control display

1) Press Key 1-4 to select the required choice. Pressing Key # will return to the main Set up Menu and save any changes.

2) The choices are:

1. **No pump control** – this is selected for systems with a ring-main type hydraulic supply.
2. **On demand** – this would be selected for systems with some local hydraulic accumulation and a low to moderate duty cycle. The pump would start to operate when the actuator was caused to move either by a change in demand signal or in manual operation. The control is sensitive to the particular solenoid sense set for the system thus the pump would not run for actuator closing if *fail close* was selected or fail open if *fail open* was selected. Similarly, the pump would not run if the system had detected a system fault as described above. The overrun time, which can be set for the recharge of any hydraulic accumulators, is displayed.
3. **Pressure switches** – external contact inputs 1 and 2 can be used as low pressure and high pressure controls respectively. These switches, fitted within the hydraulic system, will stop the pump at high pressure and start it again at low pressure. The sense of the inputs can be set in **How do I set the IS210F FISCO digital Input and Output sense?**
4. **Pressure transmitter** – the pressure switches mentioned above can be replaced with a pressure transmitter to monitor the HPU pressure.

Choice 2 – Set pump on demand run on time

```
      ON DEMAND PUMP
        RUN-ON TIME
ANY KEY TO CONTINUE

RUN-ON TIME  010  SECS


#=BACK-MENU/OPERATION
```

Set run-on timer display

The current run on time is displayed. Press any key to start and enter the required time in the range 0 to 999 seconds. The operation can be finished either by entering a value or pressing Key #.

Choice 4 – Pump control Pressure Transmitter set points

```
   PTX PUMP CONTROL
    3=NEXT  6=EDIT
CURRENT PTX VAL.   100
Set LOW Press   050bar
Set HIGH Press  120bar
Calibrate PTX

#=BACK-MENU/OPERATION
```

Set pressure TX control

The scaled current pressure and the set points are displayed.

1. Press Key 3 to cycle around the low and high pressure and the Calibrate PTX option
2. Press Key 6 to edit the current selection.
3. Press Key # to exit back to the Pump Control Menu and save any new values.

How do I calibrate the Pressure Transmitter used for pump control?

Selecting the 'Calibrate PTX' option in Choice 4 above gives the following display:

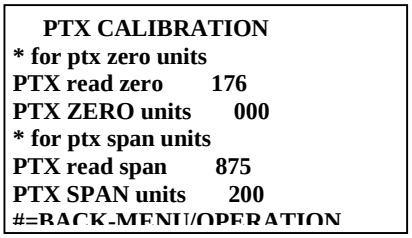
```
   PTX CALIBRATION
* for ptx zero units
PTX read zero      176
PTX ZERO units     000



#=BACK-MENU/OPERATION
```

Calibrate Press Transmitter – 1

The display shows current PTX raw digital conversion and the ZERO end engineering units (bar) value.

1. Set the system at a PTX low pressure value – any known value will do.
2. Press * Key and enter the value in bar (whole numbers)

The display will change to:



Calibrate Press Transmitter – 2

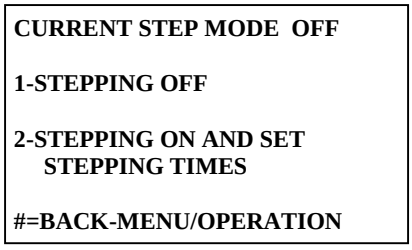
3. Set the system at a PTX high pressure value
4. Press * Key and enter the value in bar (whole numbers)
5. The display will return to the Set pressure TX screen above. Pressing Key # at any time, apart from data entry, will also return to the Set pressure TX screen above.

How do I set Stepping Mode?

These parameters can be adjusted whilst in Manual Mode – see **How can I adjust the stepping mode timers interactively?**

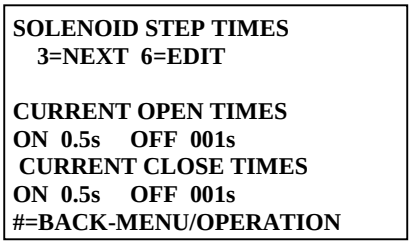
The IS210F FISCO can operate its control solenoids intermittently in order to slow down the actuator speed in situations where the process cannot tolerate sudden changes in flow. This stepping mode applies preset on and off times to both the close and open solenoids, giving the option for different speed operation for opening and closing.

1) Press Key 1 and to select the required option. Pressing the # Key saves the selection and returns the display to the main Set up Menu.



Stepping mode menu

2) Selecting Option 2 opens a new menu:



Set stepping timers display

3) On entry OPEN TIME – ON is highlighted, pressing Key 3 selects the next parameter to change.
4) Pressing Key 6 allows the edit of the highlighted time – ON times 0.1 to 9.9s and OFF times 1 to 999s.
5) Pressing the # key will return to the Set up Menu, saving any changes.

How do I set the IS210F FISCO 'tuning parmeters' – Dead zone and Band edge Hysteresis?

These parameters can be modified interactively during normal operation of the IS210F FISCO – see **How to 'tune' the actuator system**

The dead zone allows an area of control of the actuator position where no movement takes place. Such a zone is required in systems that have on-off control of the hydraulic control elements due to magnetic and mechanical delays inevitable with such components. Control is enhanced by having two settings, one for the open direction and one for the close direction solenoid operations. The hysteresis value provides an additional suppressed band, active only on entry into the deadzone to reduce instability due to conversion and arithmetical errors in the positioner. The dead zone is expressed in percent of full stroke of the actuator whilst the hysteresis is a notional value.

```
SET DEADZONE AND HYST
   3=NEXT  6=EDIT

OPEN DEADZONE       0.5
CLOSE DEADZONE      0.5
HYSTERESIS OPEN     0.3
HYSTERESIS CLOSE    0.3
#=BACK-MENU/OPERATION
```

Deadzone and hysteresis display

1) On entry OPEN DEADZONE is highlighted, pressing Key 3 selects the next parameter to change.
2) Pressing Key 6 allows editing of the highlighted time – DEADZONE and HYSTERESIS - 0.1 to 9.9%.
3) Pressing the # key will return to the Set up Menu, saving any changes.

How do I set the IS210F FISCO digital Input and Output sense?

The IS210F FISCO has four digital inputs that are operated by pulling high to the 24V instrument supply and four open drain outputs acting as low-side switches using the 24V instrument supply. This setpoint allows the inactive state to be set for both inputs and outputs. The first four values are the INPUTS and the last four are OUTPUTS.

```
SET I/P AND O/P SENSE

1=NORM  2=REV  3=NEXT
PRES L  NOR PRES H   NOR
EXT FL  NOR ENABLE  NOR
ESD OP  NOR  FLT OP  NOR
PUMP    NOR  STATUS  NOR
#=BACK-MENU/OPERATION
```

Digital input and output sense

1) On entry, the Pressure Low Input (Input 0) is highlighted. Pressing Key 1 sets a normal state, inputs active low, outputs not energised, and Key 2 set the reverse condition for this input.
2) Key 3 moves to the next choice.
3) Key # is pressed the display will return to the second page of the Set up Menu and save any changes

How do I set the IS210F FISCO action on faults?

The IS210F FISCO has four main fault conditions, divided between positioning faults and external faults, and four possible reactions to a fault condition:

```
FAULT ACTION MATRIX
1=ACTIVE 2=OFF 3=NEXT
FAULT TYPE-POS N EXTR
POSITION    ACTV  OFF
ESD O/P      OFF   OFF
FAULT O/P   OFF    OFF
DISPLAY     ACTV   OFF
#=BACK-MENU/OPERATION
```

Fault action display

There are three possible fault types

Internally sensed positioning faults

Actual position feedback out of range – normally a line break - **POS N** fault above

Failure to position within a pre-set time - **POS N** fault above

Externally sensed faults

External fault contact - **EXTR** fault above

There are four possible actions that can be associated with these faults

Set the actuator to a known position via the fail modes described in **How do I set the IS210F FISCO Fail Mode?**

- **POSITION** – positioner fault action above

Change state of Emergency Shutdown Output - **ESD O/P –** operation of ESD output

Change state of Fault Output - **FAULT O/P –** operation of fault output

Alert operator with a display message and LED changes - **DISPLAY –** displaying the fault on the screen

This option can associate any of the four faults types with any of the four actions. You would normally choose to associate positioner faults to positioner action and permit the display of the fault type

1) Press Key 1 and to select the required option. Pressing the # Key saves the selection and returns the display to the main Set up Menu.
2) The 'positioner fault – position actuator' field will be highlighted. Press Key 1 to make the link active or Key 2 to ignore the link.
3) Press Key 3 to advance to the next action associated with a positioner fault – ESD output. Edit as it 1) above or continue pressing Key 3 through the remaining positioner fault and then external fault action links.

Utilities Menu

The final item in the Main Configuration Menu is the Instrument Utilities Settings. Pressing Key 4 from the Configuration Menu enters the Utilities Menu.

```
UTILITIES MAIN MENU
1-SET DATE AND TIME
2-SET MISC TIMERS
3-SET MANUAL PASSCODE
4-SET CONFIG PASSCODE
5-MORE CHOICES

#=BACK-MENU/OPERATION
```

Pressing Keys 1-6 will access the listed choices and Key # will return the display to the Main Configuration Manu.

1.Set Date and Time

The IS210F FISCO has a real time clock equipped with a short term back up in the event of power loss.

```
   DATE AND TIME
  3=NEXT  6=EDIT

TIME    12:10:54

DATE    12-02-12

#=BACK-MENU/OPERATION
```

1) Pressing Key 3 allows the selection of the individual date and time values.
2) Pressing Key 6 allows the highlighted value to be edited.
3) Pressing Key # returns to the Utilities Menu

2.Set miscellaneous timers

The IS210F FISCO has a number of utility timers that can be reset if desired. These are normally set during factory testing and should only be adjusted after fully understanding the function of the timer and any consequences of the change.

```
  SET MISC. TIMERS
   3=NEXT  6=EDIT
1.POSN. TIME S     999
2.ENABLE WARN S    010
3.TRIM PULSE S              0.1
4.P-CODE WAIT S    030
5.B'LIGHT TIME S   010
#=BACK-MENU/OPERATION
```

1. Pressing Key 3 allows the selection of the individual date and time values.
2. Pressing Key 6 allows the highlighted value to be edited.
3. Pressing Key # returns to the Utilities Menu

    1. **Time to position** – this is the time in seconds allowed for the actuator to move to the desired position before a positioning fault is set. This should be set to at least 50% more than the full stroke time of the actuator to avoid spurious alarms. This timer will be suspended if the positioner is in stepping mode due to the very long potential stroking times. This is normally set to the maximum time 999 seconds.

2. **Operator entry enable warning time** – this is the time in seconds that a warning will show on the display if an attempt is made to enter Manual or Configuration modes without the external enable contact being made.

3. **Trim pulse** – this is the on-time pulse length, in 100mS increments. During the Calibration or Manual operations it may be necessary to finely position the actuator using Keys 7,8. This timer sets a short ON pulse followed by 8 times the pulse time as the OFF pulse. The resulting pulse train can position the actuator more precisely than a continuous pulse.

4. **Pass code entry timer** – this is the down count timer in seconds associated with Manual or Configuration pass code entry.

5. **Backlight timer** – The display backlight is normally off but will light on any key press from IR900 key pad. The display will stay lit for the duration of this timer.

3.Manual Mode pass code

Manual Mode entry is protected by a four digit pass code.

```
SET MANUAL PASSCODE

ANY KEY TO CONTINUE

CURRENT CODE    1234


#=BACK-MENU/OPERATION
```

Press Key # to return to the Utilities Menu. Press any other key to start editing the pass code. The display returns to the Utilities Menu automatically after the entry is complete.

4.Configuration Mode pass code

Configuration Mode entry is protected by a four digit pass code.

```
SET CONFIG PASSCODE

ANY KEY TO CONTINUE

CURRENT CODE    5678


#=BACK-MENU/OPERATION
```

Press Key # to return to the Utilities Menu. Press any other key to start editing the pass code. The display returns to the Utilities Menu automatically after the entry is complete.

6.Page 2 of Utilities Menu

```
UTILITIES MAIN MENU
        PAGE 2
1-VIEW FAULT LOG
2-RESET LOG INDEX
3-LOAD/SAVE STATUS
4-Disabled-NO HART
5-MORE CHOICES
#=BACK-MENU/OPERATION
```

Pressing Keys 1-5 will access the listed choices and Key # will return the display to the Main Configuration Manu.

1.View Fault Log – Note that the fault and Status Logs are not available via Fieldbus

The IS210F FISCO can record up to 512 fault and status events into non-volatile memory to enable analysis of the equipment operation

```
LOG NUMBER        0025
12:34:27     12:12:10
FAULT LOG        NEW
FAILURE TO POSITION


1=BACK       2=FORWARD
#=BACK-MENU/OPERATION
```

The log can be navigated by Key 1 (Back) and 2 (Forward) with Key # returning to Page 2 of the Utilities Menu. The two top lines show the log number and date and time of entry. The new two lines indicate the fault that has been logged and whether it is a new fault or an old one getting cleared. Each fault event should have two entries, one for the fault detection and one for the fault being cleared.

Descriptions can include the following:

LOSS OF DEMAND SIGNAL
LOSS OF F/B SIGNAL
FAILURE TO POSITION
EXTERNAL FAULT INPUT

The next two lines record status events in the equipment

```
LOG NUMBER        0025
12:34:27     12:12:10


STATUS LOG       NEW
INSTRUMENT POWER UP
1=BACK       2=FORWARD
#=BACK-MENU/OPERATION
```

Descriptions can include the following:

INSTRUMENT POWER UP
CONFIG MODE ENTRY
MANUAL MODE ENTRY
EXTERNAL ENABLE OFF
RE-CALIBRATION
LOAD/SAVE STATUS
RESTORE DEFAULTS

2.Reset Log Index

The fault and status log is a circular log with 512 possible entries. To allow the log to be used as a diagnostic tool, the index can be reset to any point in this range

```
RESET LOG POINTER


CURRENT LOG No.    0007



#=BACK-MENU/OPERATION
```

The log pointer can be reset to any value, usually zero, by entering the appropriate number. Key # returns to Page 2 of the Utilities Menu.

3. Load / Save Instrument Configuration – Not available via Fieldbus

The current calibration, set points and utilities configuration of the IS210F FISCO can be saved to a special area of non-volatile memory and this can be accessed at a later date if these conditions need to be restored.

```
LOAD/SAVE INST CONFIG


1 SAVE CURRENT CONFIG
2 LOAD SAVED CONFIG


#=BACK-MENU/OPERATION
```

The current status of the system, i.e. all parameters saved with the non-volatile memory, can be saved, Key 1, or loaded, Key 2, from a previously saved version Key # returns to Page 2 of the Utilities Menu. Pressing Key 1 saves the current status and the following message will appear:

SAVED TO EEPROM

Pressing Key 2 loads a previously saved copy of the instrument status with the message:

LOADED FROM EEPROM

Either action will be logged on the instrument status log.

4. This choice will be disabled for non-HART applications

If there is any other text here please check the HART Communication Option Handbook.

5. More Choices

Press 5 to access Page 3 of the Utilities Menu.

Page 3 of Utilities Menu

```
UTILITIES MAIN MENU
      PAGE 3
1-INSTRUMENT DETAILS
2-LCD CONTRAST ADJUST


#=BACK-MENU/OPERATION
```

Pressing Key 1 will access the listed choice and Key # will return the display to the Main Configuration Manu.

1. Display instrument details – details can be stored in Fieldbus but parameters are not shared

This screen records the individual instrument data. It cannot be edited and should be checked and copied in all communications with the Manufacturer.

```
 INSTRUMENT DETAILS
IS210F FISCO Positioner
Logo 01     COMMS FF
S/N  12345   22/02/11

J/N 3456   P/O 12345
S/W  0200   H/W  0200
#=BACK-MENU/OPERATION
```

2. LCD Constrast Adjustment – not available via Fieldbus

This screen enables the setting of the LCD contrast for different viewing angles.

```
    LCD CONTRAST


KEY 1 = LIGHTER
KEY 2 = DARKER
Contrast value     020

#=BACK-MENU/OPERATION
```

Pressing keys 1 and 2 continuously adjust the contrast ratio in the range 0-63. A value around 20 gives a good contrast in most cases. The set value is save on exit into non-volatile memory.

Using the Emerson 475 Calibrator with the IS210F FISCO

The Emerson 475 can be used examine the IS210F FISCO when powered up and connected to a suitable Fieldbus. The Fieldbus has to be established using a terminated Fieldbus supply on one end and a Fieldbus terminator on the other.

Power up sequence for use with the Emerson 475 – Simulating the command signal

1) Switch on Fieldbus
2) Switch on IS210F FISCO. Display will show -99.9% command initially but restore to the last command signal after around 5 seconds.
3) Connect 475, observe polarity
4) Switch on 475 and select Fieldbus and wait.
5) Select Online. Warning will state that no FF communication is detected. Press OK to continue.
6) Display will show the IS210F FISCO and the communicator on the fieldbus.
7) Select the IS210F FISCOF and wait for Blocks to load.
8) Check that Resource and Transducer Block are in Auto. If not, enter each block and change the Mode from the lower centre button to Auto.
9) Select AO Command Block after checking that it is in Manual Mode. If not then change the Mode after selection from the lower centre button to Manual.
10) Select Connectors. The last item is Output Value. This can be edited to modify the Command Signal to the IS210F FISCO – Select, type in required value.

Other parameters

Other parameters are available within the Transducer Block under the Other heading. In general 'greyed-out' parameters cannot be modified.

Operation without a Foundation Fieldbus connection

In the absence of a Fieldbus connection, the IS210F FISCO will believe that the current demand signal is out of range negative and this will cause the actuator to drive fully closed. It will be possible to enter the Manual and Configuration Modes using an IR900 keypad and the appropriate passcodes and to operate and configure the unit locally. Please refer to the appropriate sections of the Handbook regarding these operations. Please note that in Calibration Mode, the demand signal is forced to pre-set zero and span values (0 and 1000) to match operation with the Fieldbus derived demand signal.

Operation with a Foundation Fieldbus connection – PC based and Emerson 475

As an alternative, the IS210F FISCO can be configured using a PC running the National Instruments Foundation Fieldbus Configurator via a NI USB-8486 Fieldbus interface. This shows the I/O blocks used and the parameters available within the blocks. Most of the functions of the actuator positioner are described within the Transducer Block.

1) Connect the IS210F FISCO to a suitably powered Fieldbus that has a connection to the NI USB-8486 interface.
2) Check that the Configurator library holds the IS210F FISCO Device Description /0A4348/F210/+five DD files or that the FF Registered DD for the F210 0A4383F210_FISCO-00000001 is installed in the Emerson 475.
3) Open the Configurator and select Interface 0-0.
   The interface will communicate with the IS210F FISCO and show the device 0A4383E210_ORG-IS210F FISCO-00000001 and its associated function blocks or F210 0A4383F210_FISCO-00000001 in the case of the Emerson.

   RESOURCE (RB2)
   Positioner Transducer Block (APTB)
   AI Position (AI)
   AI Pressure (AI)
   AO Command (AO)
   DI Open Limit (DI)
   DI Close Limit (DI)
   DO Operate Pump (DO)
   PID (PID)

4) Select all function blocks apart from Resource and PI and pull into the FBAP window. Select Configure Tab and 'Download the configuration'. Open all the function blocks. Select Auto Mode with Periodic Updates.

Parameter descriptions

The following description refers to the NI-FBUS presentation of the parameters. The Emerson 475 lists the same parameters in the same blocks but in a less easily described formate due to the limitations of the handheld device display.

Setpoint or command – Within AO Command FB

Select SP (Setpoint) Value. Edit the value as xx.x in the range 0 to 100.0 and 'Write Changes' and the appropriate setpoint or command signal will be sent to the IS210F FISCO and the solenoids will change state to try and move the actuator to the desired position.

Actual position – Within AI Position FB

PV Value will show the actual position of the actuator as xx.x%

Pressure value – Within AI Pressure FB

PV Value will show the system hydraulic pressure in BAR as calibrated within the IS210F FISCO

Open Limit – Within DI Open Limit FB

The PV_D Value will show the state of the limit (Input 1 on IS210F FISCO) with the sense set via the IPOP mask parameter.

Close Limit – Within DI Close Limit FB

The PV_D Value will show the state of the limit (Input 2 on IS210F FISCO) with the sense set via the IPOP mask parameter.

Position Transducer Block

Process Tab

The Final_Value displays the current setpoint set in AO Command above.
The Final_Position_Value displays the current Actual position as shown in AI Position above.

I/O Config Tab

Transducer_Type – 'Standard Advanced Positioner Valve' embedded statement
ACT_FAIL_ACTION – Gives the choice of the fail mode in the event of an instrument failure or external fault, stay put or freeze, fail close, fail open or fail to a pre-set position. Select the appropriate mode.
VALVE_TYPE – a descriptive label for the valve type; linear, rotary or other. The selection has no effect on the operation of the system.

Limits Tab
This sets the range, units and resolution of the Command Signal set point.
FINAL_VALUE_CUTOFF_HI – this gives the maximum value accepted as common setpoint.
FINAL_VALUE_CUTOFF_LO – this gives the minimum value accepted as common setpoint.

Diagnostics Tab
These are thee actuator and three valve descriptions can be added with the TB in OOS mode. There is no effect on the IS210F FISCO performance.

Calibration Tab
These are three calibration identifiers that can be entered. There is no effect on the IS210F FISCO performance.

Others Tab
WORKING_POS and WORKING_SP VALUEs give the current actual and command parameters read at the IS210F FISCO. Other parameters include:

1) DEVIATION_DEADBAND shows the sum of the current DEAD_ZONE_DRIVING_OPEN and DEAD_ZONE_DRIVING_CLOSE. It is read only.
2) DEVIATION_TIME can be set to inhibit the deviation alarm within the FF master.
3) DEVIATION_VALUE shows the current deviation between WORKING_POS and WORKING_SP in the range 0-1000.
4) Parameters POS_ALERT_HI, POS_ALERT_LO, STOP_HI_POS and STOP_LO_POS can be set to act within the FF Master.
5) RATED_TRAVEL, TRAVEL_ACCUM, TRAVEL_UNITS, XD_FSTATE_OPT and CYCLE_CNTR do not have any interaction with the IS210F FISCO.
6) XD_FSTATE_VAL reads and can set the default position that the actuator would go to in the event of an external fault.
7) SIGNAL_ACTION is read only and describes the calibration sense of the IS210F FISCO.
8) Parameters between READBACK_SELECT and PST_TEST_TOLERANCE are not implemented within the current IS210F FISCO and are normally read as zero. The parameters can be set but have no effect on the operation of the IS210F FISCO. The exception is XD_COMMAND_STATE which is set when the positioner is being calibrated, tuned locally or in Manual Mode. In these conditions, positioner will not respond to the Fieldbus demand signal.
9) PRESSURE_VALUE VALUE shows the calibrated pressure read on the transducer at terminals 5 and 6 in units of BAR.
10) CLOSED_ACTUATOR_LIMIT VALUE shows the state of the digital input at terminal 28 with respect to 0V at 20.
11) INTERMEDIATE_ACTUATOR_LIMIT VALUE shows the state of the digital input at terminal 27 with respect to 0V at 20.
12) OPERATE_HYDRAULIC_PUMP VALUE shows the state of the digital output at terminal 25 with respect to 0V at 20.
13) The IS210F FISCO open and close dead zones and hysteresis are read and set at DEAD_ZONE_DRIVING_OPEN, DEAD_ZONE_DRIVING_OPEN, HYST_OPEN and HYST_CLOSE.
14) The IS210F FISCO stepping mode timers are read and set at OPEN_ON_TIME, OPEN_OFF_TIME, CLOSE_ON-TIME and CLOSE_OFF_TIME.
15) The self-contained hydraulic pump parameters are read and set at HYDRAULIC_PUMP_OVERRUN_TIME, PRESSURE_TX_TO_START_PUMP and PRESSURE_TX_TO_STOP_PUMP.
16) FAULT_TYPE displays the nature of the fault. Only a break to the feedback transducer loop or an external fault (digital input at terminal 29) has an effect.
17) Parameters between CLOSE_PROPORTIONAL_GAIN and PROPORTIONAL_BIAS_ON_PULSE_WIDTH are not implemented within the IS210F FISCO and are normally read as zero. The parameters can be set but have no effect on the operation of the IS210F FISCO.
18) POS_COMMAND allows direct control of the actuator solenoids, Open, Close or Stayput. NO ACTION allows normal positioning.
19) SELECT_LOCAL_MANUAL enables or inhibits the local manual operation of the actuator via the IR900 IR handheld controller.
20) SELECT_LOCAL_PARAMETER_CHANGE enables or inhibits the local modification of the actuator configuration parameters via the IR900 IR handheld controller.
21) MANUAL_CODE is the positioner manual mode access passcode.
22) CONFIG_CODE is the positioner configuration mode access passcode.
23) BACK_LIGHT_TIME can be modified to set the number of seconds that the display is lit after a local keystroke.
24) OPERATOR_ENABLE_TIME can be modified to set the time that the inhibit warning is shown after an attempt to locally enter Configuration mode when inhibited.

25) PASSCODE_TIME can be modified to set the time window allowed to enter the local password.
26) TRIM_PULSE_WIDTH can be modified to set the duration of the trim pulse used in calibration and local manual mode.
27) SOLENOID_SENSE can be modified to set the hydraulic action of the solenoids to give 'stay put', 'fail close' or 'fail open'.
28) PUMP_CONTROL_MODE can be modified to set the control mode of the hydraulic pump system to give 'No pump control', 'On demand control', 'Pressure switch control' or 'Pressure transducer control'.
29) FAIL_FAST can be modified to set whether, when there is a fault within stepping mode, the IS210F FISCO fails continuously or pulsing to its default value.
30) STEP_MODE can be modified to set the IS210F FISCO to operate in a stepped rather than continuous mode.
31) IPOP_MODE can be modified to set the sense of the digital inputs and outputs of the IS210F FISCO.

Why doesn't the IS210F FISCO work?

1. The vast majority of first time use failures are a result of incorrect electrical connections or compatibility problems in control signals. Remember, the positioner and actuator system will have been tested before shipment, so double-check all electrical connections and signal excitation sense against drawings and descriptions *specific to the particular installation* before any power is applied.

2. In fault-finding the system, always work from the known towards the unknown. Operating the system in Manual Mode confirms a large part of the system as being ok – hydraulics, power to the positioner, general IS210F FISCO operation. If the manual mode display shows correct variations of the demand and actual position signals then these signals are also proved.

3. At the most basic level, disconnect the actuator solenoids – ALWAYS with the IS210F FISCO power OFF – and operate the solenoids directly with 24Vdc. This will isolate hydraulic problems from electrical control ones.

4. Problems in instability and precision of positioning can be address by adjustment of the dead zone and hysteresis bands or, more directly, by adjusting the speed of the actuator via hydraulic flow regulation. Positional overshoot is caused by a failure of the control solenoids to act quickly enough to stop the actuator where required. Slowing down the actuator stroke speed is the ONLY way of improving positional accuracy.

5. Reversed or incorrect connection of external fault sensing devices can cause a failure to operate in automatic mode when there is, apparently, no fault seen in manual mode. Also, check the fault display, input and output sense setting and the fault matrix setting against the required fault environment.

6. In the event of 'losing' the manual and configuration mode pass codes factory defaults can be retrieved as follows:
    a) Set the actual position signal to 0mA, or temporarily disconnect
    b) Enter the Configuration Mode and use the pass code 8765
    c) Go to the Utilities Menu and reset the pass code as required.
    d) Reconnect and reset the demand signal

Similarly, Manual Mode can be accessed, when no command signal is available via Fieldbus, by pressing Key 1 from the Normal Run Display and then entering the code 8765.

7. The IS210F FISCO is not user serviceable. In the event of suspected failure:
    a) check all the advice above to eliminate external system faults
    b) record the instrument details as seen on the display on Page 24
    c) produce a full a failure report as possible, with times, dates, photographs, logs etc – anything to help us to understand the environment surrounding the failure
    d) carefully remove the IS210F FISCO from the EXD2010 housing and unplug the free sockets
    e) package the unit in anti-static bubble wrap and a good solid outer box and return to the supplier

Physical Description
Size with chassis plate – 80mm wide, 80mm high, 85mm deep
Weight with chassis plate – 0.25kg

Specification
FISCO connection
Approved FISCO Foundation Fieldbus data connection direct to Certified MAU board

FEEDBACK SIGNAL INPUT
Potentiometer 3-wire, any value greater than 1K
4-20mA nominal 130R input impedance – signal common with instrument supply

Three additional analog inputs with the same specification as above.

SOLENOID OUTPUTS x 2
Maximum 2A for each, low side switched, 24Vdc common with instrument supply

SWITCHED OUTPUTS x 4
Maximum 1A for each output – low side switched 24Vdc common with instrument supply

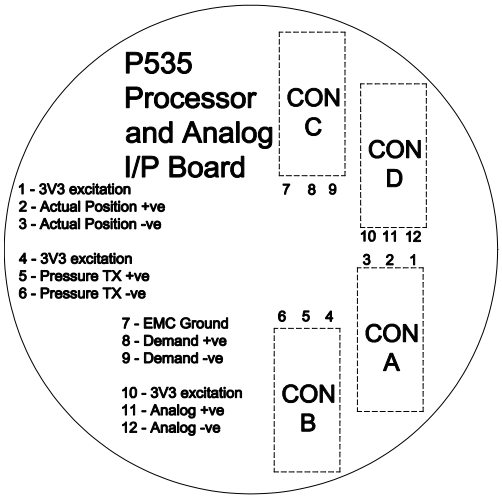
CONTACT CLOSURE/24V dc INPUTS X 4
Active when pulled high to instrument power supply or +24V dc applied with respect to 0V supply (Terminal 20).

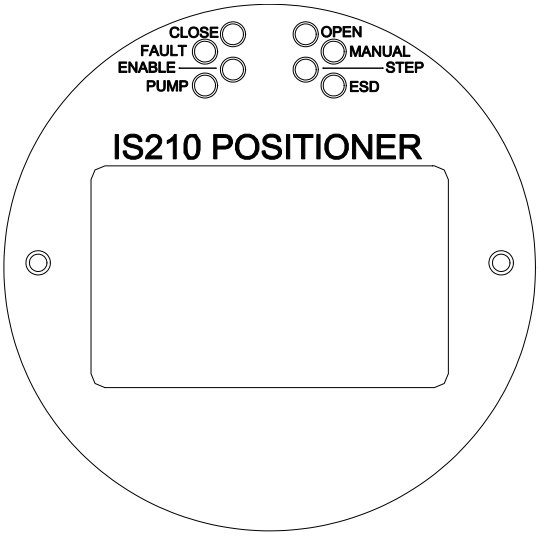
INSTRUMENT AND SOLENOID SUPPLY
24V dc nominal **(18V – 30V** maximum range) – 2.8W excluding solenoids

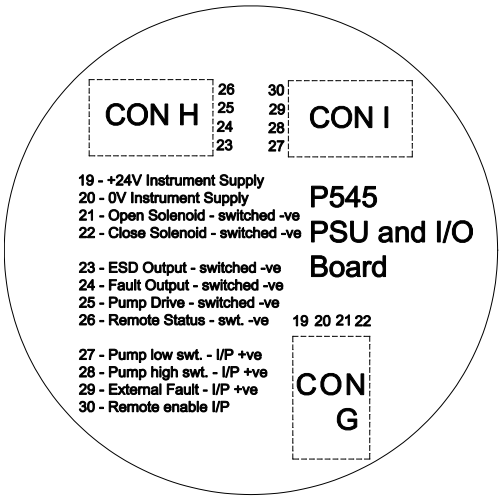
USER ADJUSTMENTS
All adjustments via IR900 Infra Red Keypad

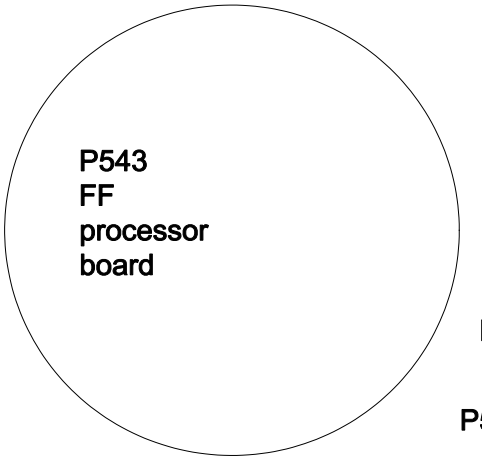
ENVIRONMENT
Operating temperature -40ºC to +59ºC ambient
Storage temperature -40ºC to +115ºC

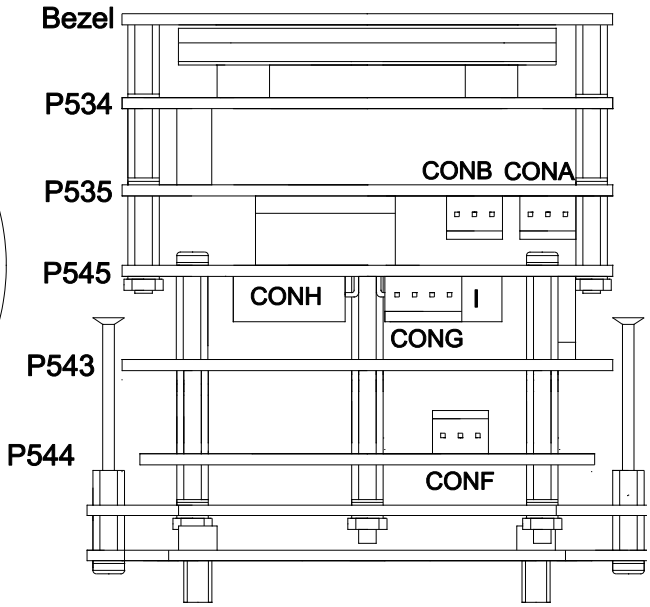
PERFORMANCE - the following applies to the IS210F FISCO only, characteristics of the feedback element and actuator system response will have additional effects.
Conversion 10 bit max normal conversion range (4-20mA) = 1 in 1000.
Solenoid operation resolution - +/-1 bit theoretically, modified to up to +/-9.9% of span by dead band
Solenoid operation response - 20mS following a step change in demand conditions

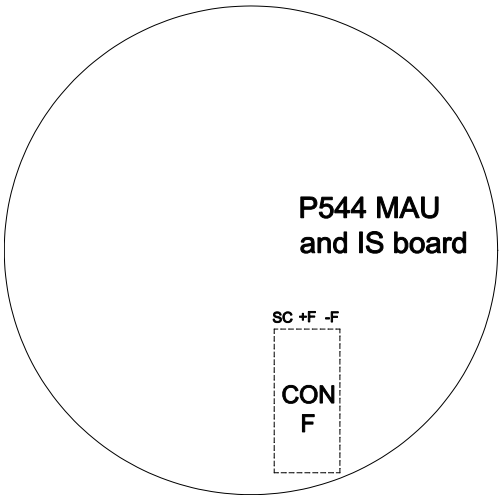

P535
Processor
and Analog
I/P Board
CON C
7 8 9
CON D
10 11 12
3 2 1
CON A
6 5 4
CON B
1 - 3V3 excitation
2 - Actual Position +ve
3 - Actual Position -ve
4 - 3V3 excitation
5 - Pressure TX +ve
6 - Pressure TX -ve
7 - EMC Ground
8 - Demand +ve
9 - Demand -ve
10 - 3V3 excitation
11 - Analog +ve
12 - Analog -ve


CLOSE
FAULT
ENABLE
PUMP
OPEN
MANUAL
STEP
ESD
IS210 POSITIONER


CON H
26
25
24
23
30
29
28
27
CON I
P545
PSU and I/O
Board
19 - +24V Instrument Supply
20 - 0V Instrument Supply
21 - Open Solenoid - switched -ve
22 - Close Solenoid - switched -ve
23 - ESD Output - switched -ve
24 - Fault Output - switched -ve
25 - Pump Drive - switched -ve
26 - Remote Status - swt. -ve
27 - Pump low swt. - I/P +ve
28 - Pump high swt. - I/P +ve
29 - External Fault - I/P +ve
30 - Remote enable I/P
19 20 21 22
CON G


P543
FF
processor
board


Bezel
P534
P535
P545
P543
P544
CONB CONA
CONH
I
CONG
CONF


P544 MAU
and IS board
SC +F -F
CON F

IS210F FISCO Terminal Descriptions

Note – Always use specific drawings and hook-up diagrams *supplied with the job* for site wiring. The descriptions below are for information only.

Connections are made via up to nine 3 and 4 way polarised 0.1" free sockets. The free sockets are marked A to I as are the printed circuit board pin headers. Double check all connections when removing or replacing the IS210F FISCO from the enclosure.

No.	*Conn.*	*Description*	*Voltage*	*Comment*
1	A	3V3/24V transducer excitation	24V	Not usually connected
2	**A**	**Actual Position +ve – 4-20mA into 130R**	**3.2V**	**Actual Position +ve – common with Instrument Supply**
3	**A**	**Actual Position –ve – instrument 0V**	**0V**	**Common instrument supply**
4	B	3V3/24V transducer excitation	24V	Not usually connected
5	B	Pressure TX +ve – 4-20mA into 130R	3.2V	For pump control
6	B	Pressure TX -ve – instrument 0V	0V	Common instrument supply
7	C	External analog inputs EMC ground	0V	Connect to signal ground
8	C	Uncommitted analog input +ve – 130R	3.2V	Not normally connected
9	C	Uncommitted analog –ve – instrument 0V	3.2V	Not normally connected
10	D	3V3/24V transducer excitation	24V	Not usually connected
11	D	Uncommitted analog input +ve – 130R	3.2V	Not normally connected
12	D	Uncommitted analog –ve – instrument 0V	3.2V	Not normally connected
19	**G**	**Instrument and solenoid supply +ve**	**24Vdc**	
20	**G**	**Instrument and solenoid supply –ve**	**0V**	
21	**G**	**Open Solenoid –ve switched**	**24Vdc**	**Solenoid +ve to +24V**
22	**G**	**Close solenoid –ve switched**	**24Vdc**	**Solenoid +ve to +24V**
23	H	ESD solenoid output –ve switched	24Vdc	Output +ve to +24Vdc
24	H	Fault output –ve switched	24Vdc	Output +ve to +24Vdc
25	H	Pump control output –ve switched	24Vdc	Output +ve to +24Vdc
26	H	Remote status output –ve switched	24Vdc	Output +ve to +24Vdc
27	I	Pump control low press switch +ve	24Vdc	Switch to inst. 24V
28	I	Pump control high press switch +ve	24Vdc	Switch to inst. 24V
29	I	External fault input +ve	24Vdc	Switch to inst. 24V
30	I	Operator enable input +ve	24Vdc	Switch to inst. 24V
SC		**FISCO screen**	**19V**	**FISCO Hazardous area connections**
+FF		**FISCO +ve signal**	**19V**	**FISCO Hazardous area connections**
-FF		**FISCO –ve signal**	**19V**	**FISCO Hazardous area connections**

Bold connections are normally present in all FISCO installations.

EXD2010 Enclosure Assembly

Manufacturer and Approvals Details

The EXD2010 is manufactured and maintained solely by Bifold Orange, formerly:
Orange Instruments Limited
Lower Farm Road
Moulton Park
Northampton
NN3 6XF
United Kingdom

The EXD2010 system has the following specific approvals:

Name and Type	Compact Ex d electro-hydraulic positioning system EXD2010
Certificate Number	IECEx BAS 11.0048
EC Type Certificate	Baseefa09ATEX0327
Specific Marking of Explosion Protection	
DC supply	Ex d IIC T6 Gb (-40ºC ≤Ta ≤ +60ºC) Ex tb IIIC T85ºC Db (-40ºC ≤Ta ≤ +60ºC) IP66
AC supply	Ex d IIC T5 Gb (-40ºC ≤Ta ≤ +60ºC) Ex tb IIIC T100ºC Db (-40ºC ≤Ta ≤ +60ºC) IP66
IS210F FISCO Version Incorporating FISCO Field Device IS210F FISCO Instrument IECEx BAS 14.0027U Baseefa 14ATEX0059U	Ex d [ia Ga] IIC T6 Gb (-40°C≤Tamb≤60°C)
ATEX Directive Marking	⟨Ex⟩II 2 G D
Notified body	CE1180

Instructions for Safety
The equipment must be installed by skilled electricians or instructed personnel in accordance with National Legislation and relevant technical standards.

The equipment must NOT be operated in Zone 0 hazardous area.
The technical data listed on the enclosure label must be observed.
Changes to the design of the equipment are not permitted.
The equipment shall only be operated as intended and only in an undamaged condition.
The enclosure must not be opened in a hazardous atmosphere
No parts of the equipment are user-serviceable.

EC Declaration of Conformity

CE

Manufacturer
Bifold Orange - formerly
Orange Instruments Limited
Lower Farm Road
Moulton Park
Northampton NN3 6XF UK

Notified body
Baseefa 1180
Rockhead Business Park
Staden Lane, Buxton
Derbyshire SK17 9RZ
United Kingdom

Signed

A.G.McCormick

Anthony G. McCormick
ATEX Manager
Orange Instruments Limited

Harmonised Standards
EN 60079-0:2012
EN 60079-1:2007
EN 60079-31:2008

Equipment description
Electro-hydraulic Positioning System EXD2010
⟨Ex⟩II 2 G D
DC supply version
Ex d IIC T6 Gb (-40ºC ≤Ta ≤ +60ºC)
Ex tb IIIC T85ºC Db (-40ºC ≤Ta ≤ +60ºC) IP66
AC supply version
Ex d IIC T5 Gb (-40ºC ≤Ta ≤ +60ºC)
Ex tb IIIC T100ºC Db (-40ºC ≤Ta ≤ +60ºC) IP66
IS210F FISCO version
Ex d [ia Ga] IIC T6 Gb (-40ºC ≤Ta ≤ +60ºC)

Description

The EXD2010 comprises of an Ex d enclosure, containing an electronic assembly, close coupled to an sheet steel Ex e enclosure containing terminals for field and customer connections. All field and customer wiring is to the Ex e enclosure and the cover of the Ex d enclosure is only removed for commissioning and periodic adjustment. Detailed instructions on the wiring, first time use and normal operation of the system are described in the accompanying electronics system manual –

Assembly EXD2010 EX200 DC and AC supplies	EX200 Electro-hydraulic Positioner Manual – 4078-007
Assembly EXD2010 EX210 DC and AC supplies	EX210 Electro-hydraulic Positioner Manual – 4055-007
Assembly EXD2010 EX200H DC supply only	EX200 H Electro-hydraulic Positioner Manual – 4078-014
Assembly EXD2010 IS210F FISCO DC supply only	IS210F FISCO Positioner Manual – 5319-009

Normal Use

The EXD2010 normally operates within a Hazard Zone 1 / 21. All electrical signals to and from the unit are protected by suitable cables, glands and conduits. In normal use the unit reacts to a command signal from a safe area and causes electro-hydraulic solenoids to move an actuator. A signal is returned to the safe area indicating the position of the actuator.

Installation and Calibration

The EXD2010 must be installed and commissioned by suitably trained personnel. In the case of the IS210F FISCO Positioner, the Intrinsically Safe FISCO Bus must be wired in the appropriate cable, segregating this wiring from other circuits. Normally, the unit is mounted on, and wired to, the hydraulic actuator prior to installation, if this is not the case then specific instructions will be provided. The user is required to make electrical connections to their systems according to the wiring instructions in the accompanying manual using suitable cables and connection components. No changes to the equipment or the wiring instructions are permitted. Following connection, and with no hazard present, the complete actuator system can be checked for manual operation and calibrated according to instructions in the accompanying manual.

Maintenance

The cover on the Ex d enclosure must not be removed when a hazardous atmosphere is present. The unit must be left for 30 minutes with power off before the cover is removed. With access to the instrument, it is possible to operate the actuator and modify the configuration according to the accompanying manual. In the event of suspected damage to the electronic assembly, the internal chassis plate carrying the instrument can be removed by unscrewing the securing fixings, unplugging the polarised rear connectors and removing the instrument. Do not remove the chassis plate. The instrument should be packed in antistatic material and sent to the Manufacturer for evaluation. No part of the system is user-serviceable.

Zone of Operation

The EXD2010 can be used hazardous area Zone 1 where a hazardous atmosphere is likely to occur occasionally. The equipment must not be installed in a Zone 0 area. The enclosure is protected to a liquid ingress rating of IP66 - it is dust-tight and can withstand liquids exposure equivalent to heavy seas, if the Ex d enclosure lid threads are liberally coated with a conductive lubricant.

Physical Description

Overall Size – 215 x 309 x 120
Weight – 2.5kg (Ex d enclosure), 2.5kg (Ex e enclosure)
Material – 316L Stainless Steel
Equipment rating – IP66 – Ex d enclosure lid threads liberally coated with conductive lubricant
Earth point – lower left side M6 internal/external stud
Cable entries – normally in the Ex e enclosure base. Unused entries must be plugged with Ex e certified plugs