HCDL/ 4RL / Flexicap System

Installation & Setting up Instructions

Comprising

HCDL/4RL Flexicap Level Sensing Electrode

.

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This product has been designed and complies to the relevant standards as listed in its certificate of conformity
The installer/user must ensure system compliance.
The Crossed-out bin symbol, placed on the product, reminds you of the need to dispose of the product correctly at the end of its life.

1.0 Overview of the System

The HCDL/4RL when used with the Flexicap Electrode fitted with a Capacitance Transmitter Module will provide Digital Indication of level with four control/alarm relays programmable over the range being measured. Isolated Retransmission Current and voltage signals are also available to drive additional digital and analogue indicators or for input to PLC and BMS systems.

The Flexicap houses a plug-in Capacitance Transmitter Module within the terminating head. Mounted vertically in the vessel, the electrical capacitance of the Electrode increases as liquid rises up the Electrode, this is converted to a milliamp signal by the Capacitance transmitter Module. A two core screened cable connection to the HCDL/4RL powers the module and conveys the milliamp signal back to the controller.

THE FOUR BASIC ELECTRODE TYPES

Insulated Rod for use with conducting liquids.
Max length 3 metres - **FCP2/4-20**

Concentric having Bare Inner electrode for use with low viscosity non-conducting liquids. Max length 3 metres - **FCP3/4-20**

Concentric having Insulated Inner electrode for use with clean low viscosity conducting liquids. Max length 3 metres - **FCP4/4-20**

Flexicap Insulated Cable & Weight electrode for use with conducting liquids.
Max length 10 metres - **FCP201/4-20**

Electrodes are supplied to a specified length. Insulated electrode must not be cut. Bare electrodes may be cut. All cut edges must be left smooth and without burrs. Ensure swarf is not left in the annular gap of concentric electrodes

Electrodes are despatched carefully packed. If damage is discovered please report it to us right away. Handle the electrode with care paying particular attention not to damage the plastic sheath of insulated electrodes. Do not bend.

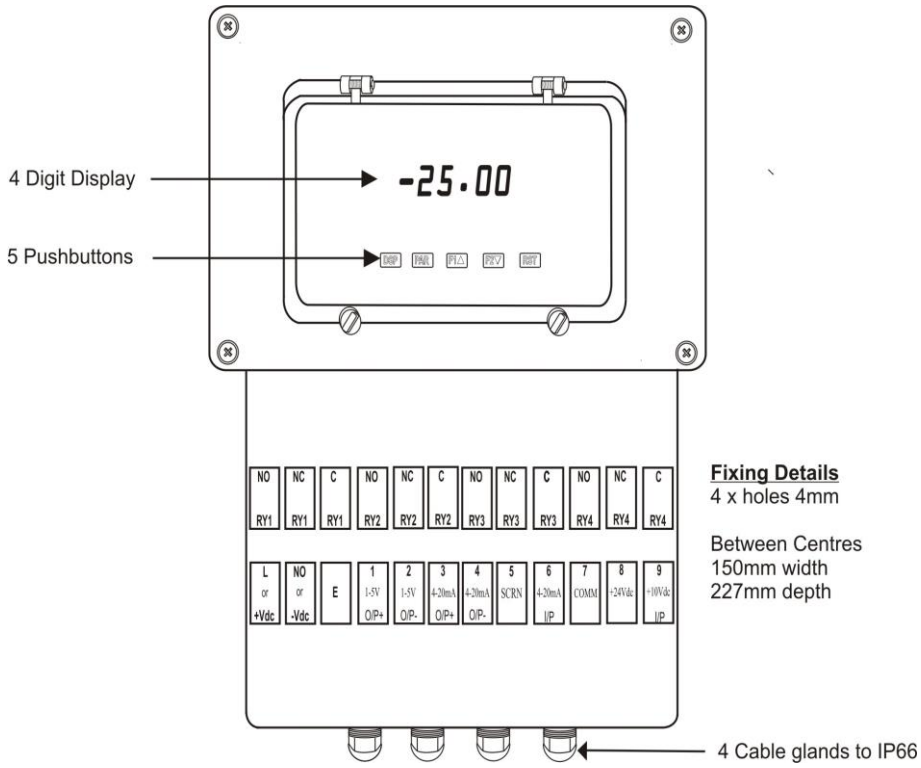
2.0 General Specification - HCDL/4RL

Technical Data

Display	5-digit 9mm LED configuration between -19999 to 99999.The decimal point can be poisoned to suit
Input	Within the range 0-20mA (min span 2mA). Input circuit fully isolated.
Input resistance	11 ohms at 20mA
Zero Suppression	A live zero can be set anywhere within the range
Accuracy	Better than 1% for 4-20mA input
Resolution	0.1%
Input supply	85 to 250V AC 11 to 36V DC (Please state on order)

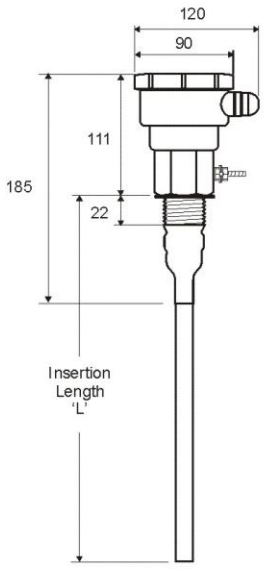
Outputs

Sensor supply	Nominal 24vDC for loop powered transducer fully isolated from the input and supply.
Four Control Relays	Each having fully adjustable hysteresis with programmable fail to safe action.
Relay Display	4 illuminated texts when relay is energised
Re-Transmission	Programmable 0-20mA 4-20mA 0-10 V
Enclosure	Weather resistant to IP66, clear Polycarbonate, Polystyrene base, fascia (235 x 160 x 155). Weight: 1.3Kg

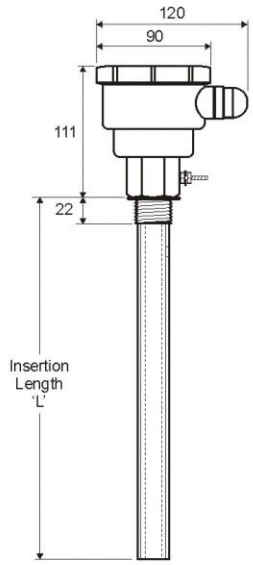


3.0 General Specification – Flexicap Probes

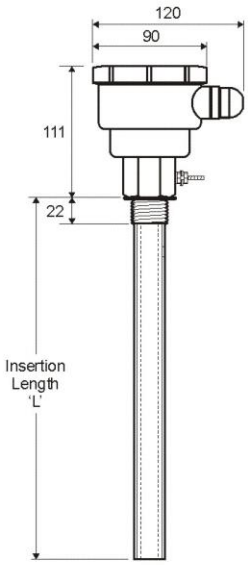
Flexicap FCP	2	3	4	201
Measuring Range	0.5 – 3m	1 – 3m	0.5 – 3m	3m – 10m
Process Pressure	100psi	300psi	100psi	100psi
Supply	From Controller			
Output	To Controller (4-20mA)			
Combined non Linearity hysteresis & repeatability	+/- 1.5% Full Scale BSL			
Temperature Compensation	Over the range			
Operating temperature	- 20 to 60 degrees C			
Max Process Temperature	100 degrees C			
Weatherproof	IP66			
Gland thread	M20			
Connection	1 inch BSP			
Material of Construction	Polypropylene housing Polypropylene for insulated electrodes Stainless steel 316L for bare electrodes Polyolefin shroud & polyurethane cable for FCP201 Polyolefin heatshrink sleeving & PTFE spacers on FCP3 & 4			
Connecting cable	2 core cable 16/0.2 screened cable			



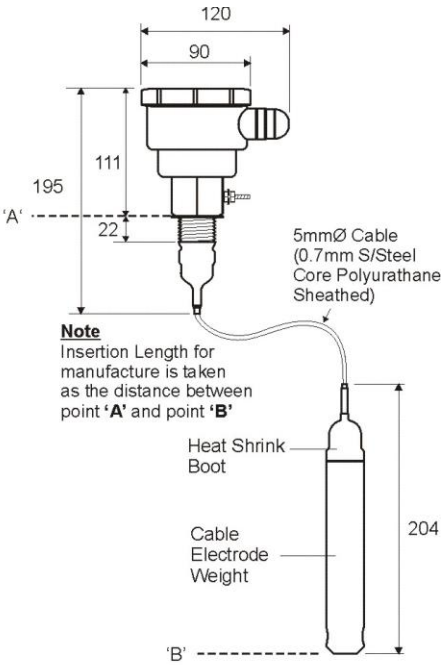
FCP2/4-20



FCP3/4-20



FCP4/4-20



FCP201/4-20

4.0 Installation of Equipment

Electrodes are usually mounted vertically in the vessel. Where the mounting point is metal, there must be a good electrical connection with electrode mounting boss

Where the vessel contents are Electrically Non-Conducting such as fuel or lubricating oils, hydrocarbons etc. A concentric is normally supplied. This type of electrode can be mounted anywhere in the vessel avoiding incoming flow and excessive turbulence. The concentric electrode can be used in either metal or non metal vessels. Where the electrode is not of the concentric type, electrode position is important and advice should sought from Hawker Electronics.

Where the vessel contents are Electrically Conducting such as most water based liquids the electrode should be mounted clear of the vessel side and away from any incoming flow. A stainless steel bracket is available for fixing to a vertical surface and holds the electrode 150mm from the side. Drawing No 2657 refers.
The electrode mounting boss must have good electrical contact with the contents of the vessel in order to provide the 'earthy' reference necessary for capacitance operated systems. This can be achieved using one of the following methods.

Mounting the electrode directly to a metal vessel. (see diagram 4.1)

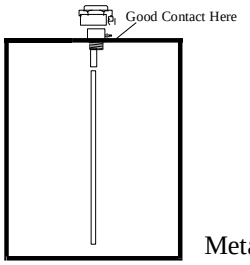
Connecting the 'earth stud' of the mounting boss to existing metal in the vessel providing it extends down below the tip of the electrode. This may be a metal pipe or ladder etc. (see diagram 4.2)

Install an 'earthing' electrode such as Hawker HPE7 having a bare stainless steel electrode rod. (see diagram 4.3).

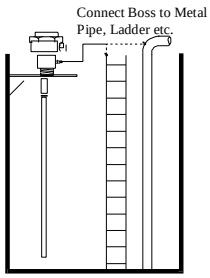
The Concentric Electrode having an Insulated Inner Electrode has an outer sleeve extending from the boss and is therefore complete in itself. (see diagram 4.4)

For turbulent conditions it may be necessary to mount the Electrode within a stilling pipe, particularly the Flexible Cable type. If the pipe is metal it must be used down the length of the pipe and connected to the mounting boss. A stainless steel wire with weight can be supplied for this. For insulated rod electrodes, a stainless steel steady bracket is available and can be used with the mounting bracket to hold an electrode 150mm from a vertical surface. See drawing No 2657

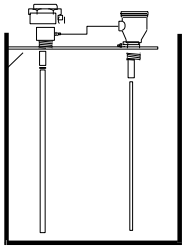
Examples for obtaining the 'earthy reference



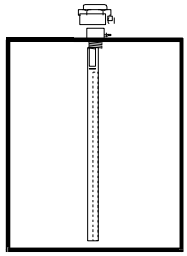
Metal Tank



Concrete Sump



Concrete Sump
or Plastic Tank



Plastic Tank
Or Drum

5.0 Electrical Connections

The Capacitance Transmitter Module plugs into the electrode within the terminating head. The Electrode is normally despatched with the module in place and the 'B' terminal connected to the internal green wire providing connection to the electrode mounting boss.

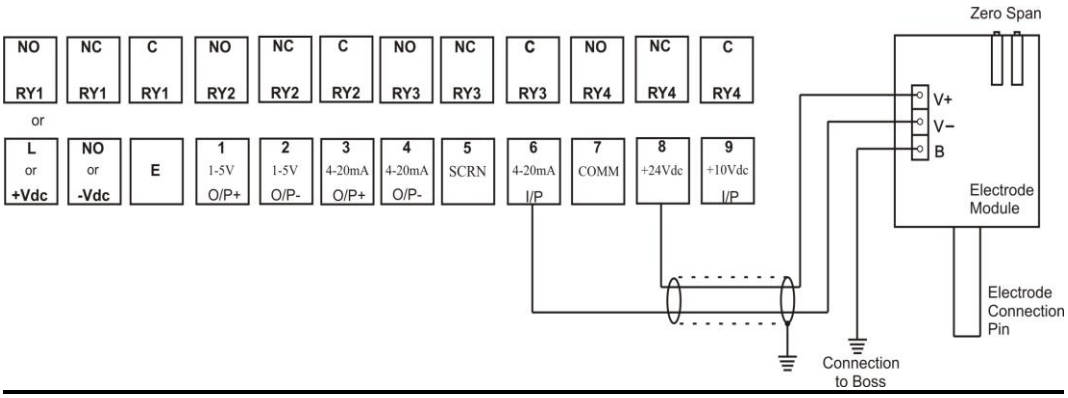
Connection should be made to the HCDL/4RL using two core screened cable from V- and V+ observing polarity. Suitable conductor size being 16/0.2mm (0.5mm²). The cable screen is not connected at the Transmitter Module. The 20mm cable entry must be correctly glanded to provide a watertight seal to IP67 or better. No adjustments are required at the electrode.

The standard HCDL/4RL enclosure is weatherproof to IP66. If mounting outside additional protection should be provided bearing in mind that setting up requires the enclosure to be opened. The enclosure has four 15mm holes fitted with cable glands. Any unused glands must be sealed.

Connect the relay volt free contacts as required for control and/or alarm purposes using N/C or N/O contacts to suit the required fail to safe action. Where contactors are being controlled it is advisable to fit them with transient suppressors to prevent damage to the contacts of the PCB mounted relays.

6.0 Setting up the System

Terminal Connections



The Flexicap module is calibrated at our factory prior to despatch. There may be slight tolerances due to standing capacitance once installed. Follow these instructions if futher calibration is needed for the probe. Insert a milliamp meter measuring 4-20mA in series with the V+ terminal at the electrode termination head.

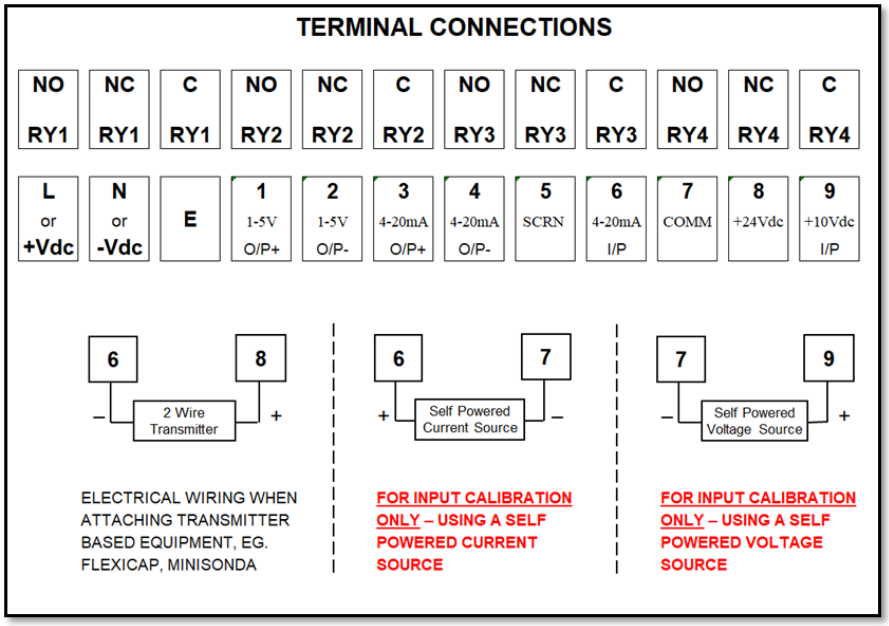
Note. The zero and span potentiometers require 15 turns for a fill travel of the wiper. Due to a slipping clutch, end of travel can only be confirmed by observing the position of the Red wiper through the transparent side of the housing. The red wiper is at the top when fully clockwise

With the vessel empty the SPAN adjustment should be turned fully clockwise. The ZERO adjustment should then be adjusted to obtain a reading of 4.00 mA. Turn the ZERO anticlockwise to decrease the reading – clockwise to increase.

Fill the vessel to Full level and turn the SPAN adjustment anticlockwise until a reading of 20.0 mA is obtained – clockwise rotation to increase.

7.0 Programming the System.

7.1 ELECTRICAL CONNECTIONS



For Mains Powered Unit

Connect the **L** terminal to the live of the mains supply.
Connect the **N** terminal to the neutral of the mains supply.
Connect the **E** terminal to earth if available.

For DC Powered Unit

Connect the **+Vdc** terminal to the positive end of the DC power supply.
Connect the **-Vdc** terminal to the negative end of the DC power supply.
Connect the **E** terminal to earth if available.

RYx corresponds to relay **x**. Eg. **RY2** is Relay 2
NO corresponds to the normally open contact on relay.
NC corresponds to the normally closed contact on relay.
C corresponds to common contact on relay.
Terminals 1 and **2** are for voltage re-transmission (1 - 5V or 0 - 10V).

Terminals 3 and **4** are for current re-transmission (4 - 20mA).
Terminals 5 is internally linked to the E terminal (Earth). This gives the option to earth a screened cable attached to the Flexicap

For connection to a Flexicap attach the +V (Positive) of the Flexicap to **terminal number 8** on the HCDL/4RL, and the -V (Negative) of the Flexicap to **terminal number 6** on the HCDL/4RL.

7.2 PROGRAMMING THE UNIT

(i) Signal Input Parameters (Factory pre-set such that a 4 to 20mA input displays *0.00* to *100.00* respectively)

The following menu item (*I-INP*) will scale the input (current or voltage) as required in order to be displayed.
Five parameters will need to be set:

(a) *INP1* parameter - the input value for scaling point 1.

(b) *dSP 1* parameter - the display value for scaling point 1.

(c) *INP 2* parameter - the input value for scaling point 2.

(d) *dSP 2* parameter - the display value for scaling point 2.

(e) *dECPt* parameter - decimal point precision.

All other parameters should be left with the values shown in the factory pre-set example below

The unit is factory pre-set programmed to display *0.00* (*dSP 1* parameter) for a 4mA input (*INP1* parameter), and to display *100.00* (*dSP 2* parameter) for a 20mA input (*INP 2* parameter). Two decimal places are shown (*dECPt* parameter). Display scaling will be linear between these two points. The programming procedure for this is as follows:

- Press **PAR**, *Pro*, *NO* alternates on display and then slowly keep pressing **F1** until *I-INP* displays then press **PAR**.
- *rAN9E* will display, use the arrow keys to set *0.02A* then press **PAR**.
- *dECPt* will display and use the arrow keys to set *0.00* (sets display to 2 decimal places) , press **PAR**.

  Note, setting this to *0.0* will display to 1 decimal place, whilst *0* will display no decimal places.
- *round* will display, use arrow keys to set *0.01*, press **PAR**.
- *Filtr* will display, use arrow keys to set *1.0*, press **PAR**.
- *bANd* will display, use arrow keys to set *0.10*, press **PAR**.
- *Pt5* will display, use arrow keys to set *2*, press **PAR**.
- *StyLE* will display, use arrow keys to set *mEY*, press **PAR**.
- *INP1* will display, use arrow keys to set *4.000*, press **PAR**.
- *dSP 1* will display, use arrow keys to set *0.00*, press **PAR**.
- *INP 2* will display, use arrow keys to set *20.000*, press **PAR**.
- *dSP 2* will display, use arrow keys to set *100.00*, press **PAR**.
- *Pro*, *NO* alternates on display, then press **PAR**
- *End* will display momentarily then the unit will revert back to standard display mode.

(ii) <u>Configuring The Action of The 4 Relays</u> (Factory pre-set as below)

There are four form C relays fitted to this unit that are programed using menu item (*6-SPt*). NOTE, each relay is contact rated at 3amps; total current with all four relays energised is not to exceed 4amps.
Before setting the relays, the **Setpoint Value, Hysteresis Value** and the **Output Logic** needs to be calculated for each relay required.

The **Setpoint Value** *SP-** is the mid-point between the relay energise and relay de-energise display values corresponding to relay number *.

The **Hysteresis Value** *Hys-** is the difference between the relay energise value and the relay de-energise value corresponding to relay number *.
If the relay energise value minus the relay de-energise value is positive, the **Output Logic** *out-** setting (corresponding to relay number *) will need to be set as *nor* (ie, normal). If the relay energise value minus the relay de-energise value is negative, the **Output Logic** *out-** setting (corresponding to relay number *) will need to be set as *rEu* (ie, reverse).

The four relays within the HCDL/4RL are factory pre-set to activate in the following manner:

- **Relay 1***:* Energise at 20.00 (and above) on the display, and de-energise at 19.00 (and below) on the display (Setpoint Value = 19.50, Hysteresis Value = 1.00, Output Logic = *nor*)
- **Relay 2***:* Energise at 40.00 (and above) on the display, and de-energise at 39.00 (and below) on the display (Setpoint Value = 39.50, Hysteresis Value = 1.00, Output Logic = *nor*)
- **Relay 3***:* Energise at 60.00 (and above) on the display, and de-energise at 59.00 (and below) on the display (Setpoint Value = 59.50, Hysteresis Value = 1.00, Output Logic = *nor*)
- **Relay 4***:* Energise at 80.00 (and above) on the display, and de-energise at 79.00 (and below) on the display (Setpoint Value = 79.50, Hysteresis Value = 1.00, Output Logic = *nor*)

<u>Note</u>: the setpoint annunciators (SP1, SP2, SP3 or SP4) will light up on the front display when the corresponding programmed relay for that setpoint is energised (Eg, SP2 will light up when Relay 2 is energised).

<u>7.3 The Relays are programmed as follows:</u>

* **= Relay Number (1 - 4)**	**????= Setpoint Value (*sp-**)**
?? **= Hysteresis Value (*hys-**)**	*nor* or *rEu* **= Output Logic (*out-**)**

- Press **PAR**, *Pro, NO* alternates on display then slowly keep pressing **F1** until *6-SPt, PRo*, alternates on display, press **PAR**

- *spsEl, NO* will alternate on display and using **F1** and **F2** keys select *SP-**, press **PAR**
- *AcT-** will display and using **F1** and **F2** keys select *Ab-HI*, press **PAR**
- *SP-** will display and using **F1** and **F2** keys select **????**, Press **PAR**
- *Src-** will display and using **F1** and **F2** keys select *Abs*, press **PAR**
- *Hys-** will display and using **F1** and **F2** keys select **??**, Press **PAR**
- *tON-** will display and using **F1** and **F2** keys select *0.0* press **PAR**
- *tOF-** will display and using **F1** and **F2** keys select *0.0* press **PAR**
- *out-** will display and using **F1** and **F2** keys select either *nor* or *rEu,* Press **PAR**
- *rSt-** will display and using **F1** and **F2** keys select *AUTo* , Press **PAR**
- *Stb-** will display and using **F1** and **F2** keys select *NO* , Press **PAR**
- *Lit-** will display and using **F1** and **F2** keys select *nor*, Press **PAR**
- *spsEl, NO* alternates on display. Press **DSP**, *End* will display momentarily

The unit will now go back to standard display mode and the programming process repeated for each relay needed.

<u>The following two Relay set-up examples are provided</u>

<u>Example 1</u> - Relay 2 will energise when the display reads *50.00* (and above) and de-energise at *40.00* (and below).

Relay Set Instructions:

sp-2 **= Relay Number 2** *45.00* **= Setpoint Value (***sp-2***)**

10.00 **= Hysteresis Value (***hys-2***)** *nor* **= Output Logic (***out-2***)**

- Press **PAR**, *Pro, NO* alternates on display then slowly keep pressing **F1** until *6-SPt, PRo*, alternates on display, press **PAR**
- *spsEl, NO* alternates on display and using **F1** and **F2** keys select *SP-2,* press **PAR**
- *Act-2* will display and using **F1** and **F2** keys select *Ab-HI*, press **PAR**
- *SP-2* will display and using **F1** and **F2** keys select *45.00*, Press **PAR**
- *Src-2* will display and using **F1** and **F2** keys select *Abs*, press **PAR**
- *Hys-2* will display and using **F1** and **F2** keys select *10.00*, Press **PAR**
- *tON-2* will display and using **F1** and **F2** keys select *0.0* press **PAR**

- *tOF-2* will display and using **F1** and **F2** keys select *0.0* press **PAR**
- *out-2* will display and using **F1** and **F2** keys select *nor,* Press **PAR**
- *rSt-2* will display and using **F1** and **F2** keys select *AUTo* , Press **PAR**
- *Stb-2* will display and using **F1** and **F2** keys select *NO* , Press **PAR**
- *LIt-2* will display and using **F1** and **F2** keys select *nor*, Press **PAR**
- *spsEl, NO* alternates on display. Press **DSP**, *End* will display momentarily

The unit will now go back to standard display mode.

Example 2 - Relay 4 will energise when the display reads *25.00* (and below) and de-energise at *30.00* (and above).

Relay Set Instructions:

sp-4 **= Relay Number 4** *27.50* **= Setpoint Value (***sp-4***)**

5.00 **= Hysteresis Value (***hys-4***)** *rEu* **= Output Logic (***out-4***)**

- Press **PAR**, *Pro, NO* alternates on display then slowly keep pressing **F1** until *6-SPt, PRo*, alternates on display, press **PAR**
- *spsEl, NO* alternates on display and using **F1** and **F2** keys select *SP-4*,press **PAR**
- *Act-4* will display and using **F1** and **F2** keys select *Ab-HI*, press **PAR**
- *SP-4* will display and using **F1** and **F2** keys select *27.50*, Press **PAR**
- *Src-4* will display and using **F1** and **F2** keys select *Abs*, press **PAR**
- *Hys-4* will display and using **F1** and **F2** keys select *5.00*, Press **PAR**
- *tON-4* will display and using **F1** and **F2** keys select *0.0* press **PAR**
- *tOF-4* will display and using **F1** and **F2** keys select *0.0* press **PAR**
- *out-4* will display and using **F1** and **F2** keys select *rEu,* Press **PAR**
- *rSt-4* will display and using **F1** and **F2** keys select *AUTo* , Press **PAR**
- *Stb-4* will display and using **F1** and **F2** keys select *NO* , Press **PAR**
- *LIt-4* will display and using **F1** and **F2** keys select *nor*, Press **PAR**
- *spsEl, NO* alternates on display. Press **DSP**, *End* will display momentarily

The unit will now go back to standard display mode.

(i) Configuring The Analogue Retransmission Output (Factory pre-set as below)

The following menu item (*8-OUT*) will configure whether a 4-20mA current or a 0-10V / 1-5V voltage (see note#) will be selected for retransmission, and how the high and low display values are scaled to correspond to the maximum and minimum retransmission output.
Three parameters will need to be set (other parameters as shown in the factory pre-set example below are left unchanged):

(a) *typE* parameter - a *4-20* selection will configure a 4-20mA output, whilst a *0-10* selection will configure a 0-10V/1-5V# output

(b) *AN-LO* parameter - the display value corresponding to 4mA (4-20mA), or 1V (1-5V) / 0V (0-10V) retransmission

(c) *AN-HI* parameter - the display value corresponding to 20mA (4-20mA), or 5V (1-5V) / 10V (0-10V) retransmission

#See Analogue Output Calibration section (3i) on how to calibrate the voltage retransmission for either a 0-10V or a 1-5V range.

The unit is factory pre-programmed to retransmit 4mA for a display value of *0.00*, and to retransmit 20mA for a display value of *100.00* as follows:

- Press **PAR**, *Pro, NO* alternates on display, then slowly press **F1** until *8-Out* displays, press **PAR**
- *typE* will display and using arrow keys select *4-20* (for a 4-20mA output)
- *ASIN* will display and using the arrow keys select *InP*, press **PAR**
- *AN-LO* (analog low scale value) will display and using the arrow keys select *0.00*, press **PAR**
- *AN-HI* (analog high scale value) will display and using the arrow keys select *100.00*, press **PAR**
- *udt* will display and using the arrow keys select *0.0*, press **DSP**, *End* will display momentarily

The unit will now go back to standard display mode

Note, only either a 4-20mA current, or a 1-5V / 0-10V voltage can be selected as the analogue retransmission output, not both current and voltage simultaneously.

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Note:
If at any time you are lost or confused while programming, press the **DSP** key which will take you back to the standard display mode.
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