



Type 4-20mA Absolute Shaft Encoder & Optional Dragon Flow Sensor DLS-00X User Manual

hohner

OPTICAL ENCODERS



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Table of Contents

	<i>Page</i>
SECTION 1 – Terms & Definitions	3
SECTION 2 – ATEX & IECEx User Manual	
2.0 Equipment Overview	4
2.1 Safety Markings, Warnings and Special Conditions for safe use	5
2.2 Encoder Only Installation Instructions	9
2.3 Flow Sensor DLS-00x Installation Instructions	11
2.4 Maintenance	23
SECTION 3 – cCSAus User Manual	
3.0 Equipment Overview	24
3.1 Safety Markings, Warnings and Special Conditions for safe use	25
3.2 Encoder Only Installation Instructions	27
3.3 Flow Sensor DLS-00x Installation Instructions	29
3.4 Installation Drawing	41
3.5 Maintenance	42

Section 1

Terms and Definitions

For the purpose of this manual, any reference to 'Encoder' refers to: Type 4-20mA Absolute Shaft Encoder, and any reference to 'Flow Sensor' or 'Dragon Flow Sensor' or 'Mud Flow Return Sensor' or 'Flow Line Sensor' refers to: Flow Sensor DLS-00x.

Section 2 – ATEX & IECEx User Manual

2.0 Equipment Overview

This manual covers two distinct pieces of equipment – an optical encoder and a flow sensor which are manufactured by Hohner Automation Ltd, Wrexham, LL13 8UG, UK. The encoder has been certified against electrical standards (SIRA 01ATEX2189X & SIR 10.0105X), whilst the flow sensor has been certified against mechanical standards (SIRA 11ATEX6274X & SIR16.0022X).

The encoder is designed to provide an absolute 4-20 mA current loop output relative to the angular movement of a shaft. Movement is detected optically by shining light produced by LEDs through a graduated disc that rotates with the shaft.

Optionally, this encoder can also be fitted to a flow sensor. The flow sensor is a sensing device that has the function of producing an electrical signal directly proportional to the height of a liquid (usually drilling fluid or mud) flowing through a closed or open trough pipe or conduit. As the mud level increases beyond the lowest point of the paddle plate component of the flow line sensor, the entire arm (wherein the plate is connected) is deflected upwards. As the arm is pivoted on a main shaft, the deflection causes an angular movement of the shaft. Finally, with the encoder mounted on this shaft, this angular displacement (or partial rotation) is translated into an electronic signal. The arm and shaft has a maximum angular displacement of 90 degrees and thus the encoder is specified to have its full span (20 mA) equivalent to a full 90 degree turn. Please refer to product datasheets for further information.

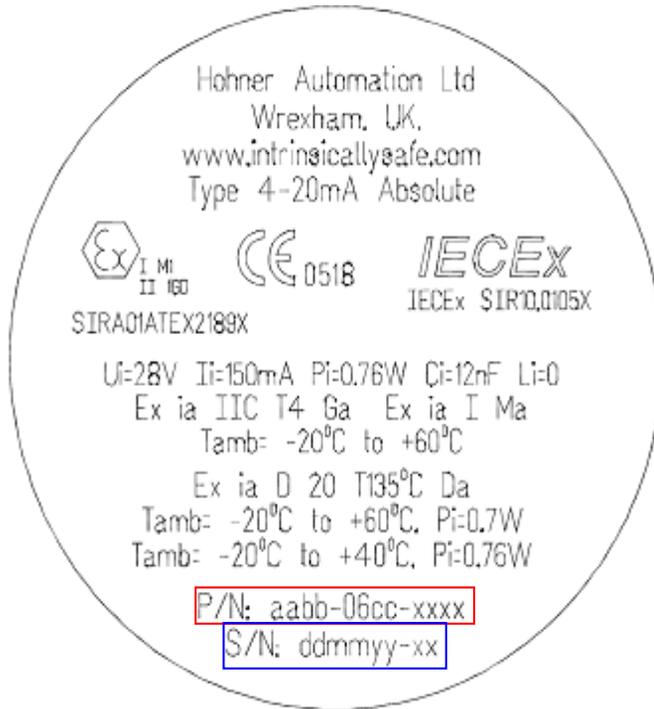
The physical dimensions and part number for the encoder can vary (encoder series) and can be deciphered by the specific part number stated. The encoder series includes hollow and solid shaft designs, which are made from either plastic or metallic materials (predominantly stainless steel or aluminum). The termination can vary, and allows any suitably rated cable or connector to be fitted. Please refer to product datasheets for further information.

The minimum IP rating for the encoder is IP54, and is certified for use in both Hazardous (Gas & Dust, Equipment group I & II) and non Hazardous locations. The flow sensor is fitted with a stainless steel encoder variant IP rated to IP66/67 and is certified for use in both Hazardous (Gas & Equipment group II) and non Hazardous locations.

The equipment shall be powered from a suitably rated and certified intrinsically safe source (Barrier or Isolator as per SIRA 01ATEX2189X).

2.1 Safety Markings, Warnings and Special Conditions for Safe Use

The following instructions specific to hazardous area installations are covered by certificate numbers SIRA 01ATEX2189X & SIR 10.0105X & SIRA 11ATEX6274X & SIR 16.0022X. For **stand alone encoder only** applications, the 'full' ATEX and IECEx certification marking, together with any warnings or special conditions for safe use are as follows:



Part Code Breakdown

aa - Encoder Series (minimum IP54)
bb - Shaft Diameter
06 - Electronic Circuit
cc - Connection type
XXXX - Current Ramp in Degrees

Serial Number Breakdown

dd - Day of Manufacture
bb - Month of Manufacture
yy - Year of Manufacture
XX - Unique Identifier

The markings above will be situated in a clear visible location on the outside of the encoder.

Some versions of the equipment are manufactured with an enclosure made from plastic materials. Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. This is particularly important if the equipment is installed in a zone 0 location. In addition, the equipment shall only be cleaned with a damp cloth.

The equipment may be used in zones 0, 1, and 2 with flammable gases and vapours and zones 20, 21 and 22 for dust.

For Mining, the equipment may be used in the presence of flammable gases and vapours with apparatus Group I.

The equipment may be used in the presence of flammable gases and vapours with gas groups IIC or IIB or IIA and with a temperature class of T1, T2, T3 or T4.

The equipment may be used in the presence of conductive dusts with dust groups IIIC or IIIB or IIIA and with a surface temperature of 135 °C.

For Gas the equipment is certified for use in ambient temperatures in the range of -20 °C to +60 °C and should not be used outside this range.

For Dust there are two ambient temperature ranges, depending on the power drawn by the system (determined by the barrier's Po value). The equipment should not be used outside this range.

For a Po of 0.76W or less = Tamb - 20 °C to + 40 °C

For a Po of 0.70W or less = Tamb - 20 °C to + 60 °C

The equipment is to be installed by suitably trained personnel in accordance with the applicable code of practice (typically IEC EN60079-14)

The equipment does not require assembly or dismantling. With regard to safety it is not necessary to check for correct operation. There is no permitted user adjustment. Regular periodic inspection of the equipment should be performed by suitably trained personnel in accordance with the applicable code of practice to ensure it is maintained in a satisfactory condition – see installation and maintenance section for further details.

The equipment is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approved agents, in accordance with the applicable code of practice. The equipment contains no other customer-replaceable parts.

As aluminium may be used at the accessible surface of this equipment, ignition sources due to impact and friction could occur, this shall be taken into account during installation of the equipment.

If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

It is the users responsibility to ensure that the shaft encoder certification is complied with and that it is supplied from an intrinsically safe source in accordance with Sira 01ATEX2189X.

For **flow sensor** applications, additional ATEX and IECEx certification markings are also required which cover the mechanical aspects of the equipment, including any warnings or special conditions for safe use. Also included are any encoder relevant warnings or special conditions for safe use as it is recognised that the flow sensor also incorporates the encoder.

Hohner Automation Ltd
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Ex ia IIC T4 Ga Ta=-20°C to +60°C
Ex h IIC T4 Ga Ta=-20°C to +60°C
SIRA 11ATEX6274X

 0518 **IECEX** IECEx SIR 16.0022X  II 1G

P/N: DLS-00x
S/N: ddmmyy-xxx

Customer options that do not affect the EX ia status including cable gland size and paddle size

Serial Number including unique identifier

The markings above will be situated in a clear visible location on the outside of the flow sensor. If the markings are situated on the 'removable' electrical connection box cover, it is safety critical to ensure that after user connection has been completed (cover has been opened to gain access to the Ex terminals), that the cover is screwed back down onto the flow sensor. If the cover is lost or damaged for some reason, then the user must obtain a replacement cover from Hohner.

The flow sensor is only fitted with a stainless steel encoder variant rated to IP66/67.

The flow sensor is certified for use in Equipment group II (Surface) and may be used in zones 0, 1, and 2 with flammable gases and vapours.

The equipment is certified for use in ambient temperatures in the range of -20°C to +60°C and should not be used outside this range.

With regard to safety it is not necessary to check for correct operation. Functionally, the equipment does require some user assembly and there is permitted user adjustment. Regular periodic inspection of the equipment should be performed by suitably trained personnel in accordance with the applicable code of practice to ensure it is maintained in a satisfactory condition – see installation and maintenance section for further details.

The equipment is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approved agents, in accordance with the applicable code of practice.

The equipment is to be installed by suitably trained personnel in accordance with the applicable code of practice (typically IEC EN60079-14)

If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

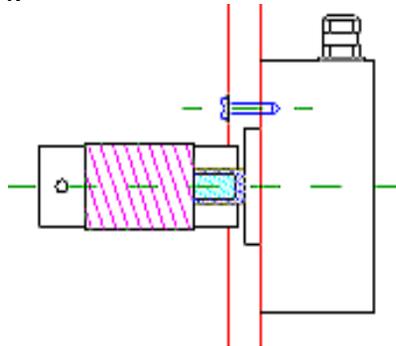
It is the users responsibility to ensure that the equipment is connected to earth appropriately.

It is the users responsibility to ensure that the shaft encoder certification is complied with and that it is supplied from an intrinsically safe source in accordance with Sira 01ATEX2189X.

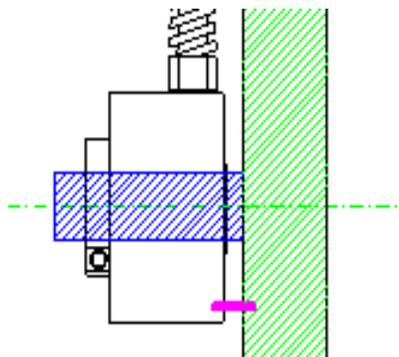
Refer to the maintenance section for further details regarding any required inspection / cleaning of the sensor.

2.2 Encoder Only Installation Instructions

The encoder can be manufactured as a hollow or solid shaft design. The dimensions of the encoder vary with the series. For solid shaft versions, the encoder is designed to be fixed (screwed onto, using one or more of the available mounting holes) onto the machine frame or a suitable mounting bracket. It is recommended that a flexible coupling is installed in-between the encoder shaft and the drive shaft, which will reduce any axial or radial stress that could be transmitted by possible misalignment or eccentricity between the two shafts. A representative illustration can be seen below demonstrating a solid shaft installation.



For hollow shaft versions, the encoder bore is directly connected onto the drive shaft and tightened with either a locking collar or set-screws. To keep the encoder from rotating, several methods can be used depending on the series. The recommendations include fitting a pin (into one of the available mounting holes or slots) between the encoder and the machine frame, or a bracket bolted onto the mounting holes, or use a flexible tether. Whichever method is used, it is recommended that the installation is not rigid, and a little play exists - to account for possible misalignment or eccentricity between the two shafts. A representative illustration can be seen below demonstrating a hollow shaft installation.



All Hohner products have been designed to be 'fit for purpose' as per the parameters and specifications stated on the product datasheets, however some precautions are to be taken into account to ensure functionality and safe use is maintained. These are listed overleaf

Functional User Instructions

- Do not leave any unused in/out wires without protective insulation.
- Do not apply more supply voltage than the specified maximum.
- Do not exceed the maximum power dissipation specified.
- Do not leave any unused in/out wires without protective insulation.
- Do not apply more supply voltage than the specified maximum.
- Do not exceed the maximum power dissipation specified.
- Do not coil excess cable.
- Do not make the cable longer than actually required.
- Do not short outputs together.
- Do not connect the cable screen from the cable with the encoder housing.
- Do not mount the encoder rigidly.
- Do not shock the encoder.
- Do not subject the encoder to excessive vibration.
- Do not dismantle the encoder.
- Do not tool the encoder or its shaft.
- Do not subject the encoder to excessive radial or axial stresses.
- Do not run the encoder faster than that specified.
- Do connect the cable screen to earth.
- Do earth (4mm² Cable) the encoder if the facility is available.
- Do observe EMC precautions – see below:

EMC – Best Practices

Although Hohner has designed a great deal of noise immunity into the product it is still important to use good Electro Magnetic Compatibility measures on installation of this and associated electronic equipment, to ensure reliable operation both short and long term.

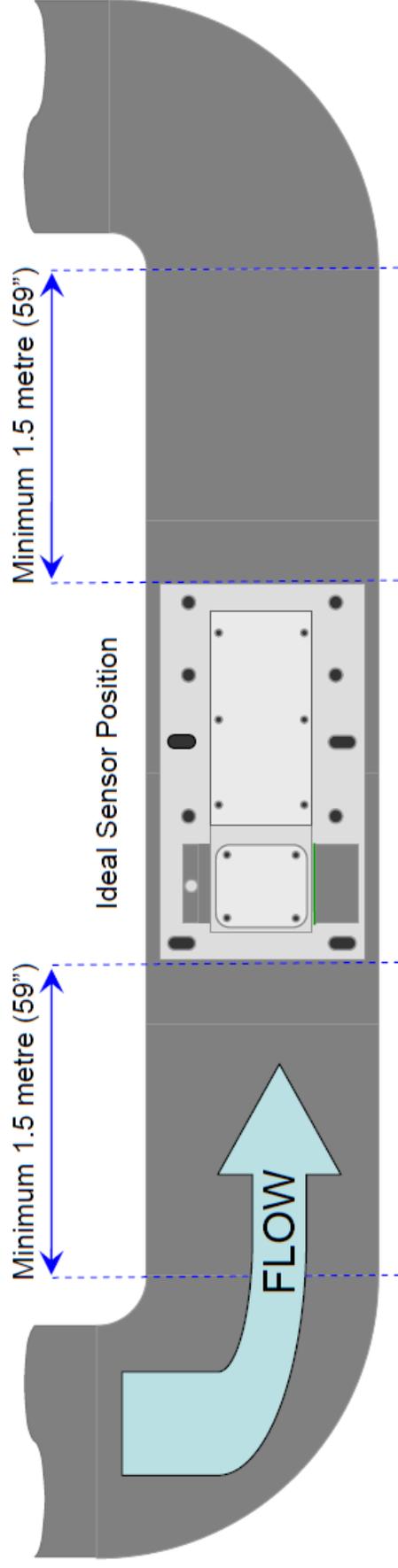
Encoder cable should be routed to avoid close proximity to cables carrying high levels of current or rapid switching transients. It is also recommended that those power cables be suppressed using ferrites or similar noise suppressing components. For improved noise immunity twisted pair and screened cable should be used and each output should be driven in differential mode (i.e. with compliments). It is further suggested that the cable screen is connected all around the circumference of the cable to earth, instead of twisting it to one side. With this method a more effective level of shielding will be achieved. Do not connect the screen from the cable with the encoder housing.

2.3 Flow Sensor Installation Instructions

Kit Contents

- 1 x Dragon Flow Line Sensor
- 1 x Dragon Flow Line Sensor Saddle (optional)
- 1 x Small Paddle
- 1 x Medium Paddle
- 1 x Large Paddle
- 1 x Tension Spring (factory fitted)
- 1 x Spare Tension Spring
- 2 x 10mm Spanners
- 1 x 17mm Spanner
- 1 x 4mm Allen Key
- 1 x Arm Handle
- 1 x Base Plate Gasket
- 1 x Spare Base Plate Gasket
- 2 x Spare Adjustment Bolt O-Rings
- 1 x Tube of Anti Seize Paste

Positioning of Sensor (i)

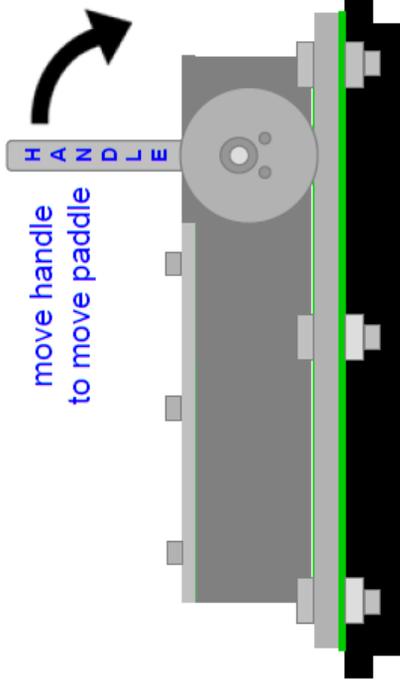


IMPORTANT

DO NOT install Flow Sensor near bends or turns in the return line.

Ideally the flow sensor should be at least 1.5 metres (59") away for the nearest bend or turn this should ensure a consistent flow of drilling fluid reaches the paddle of the sensor with minimum turbulence

Positioning of Sensor (ii)

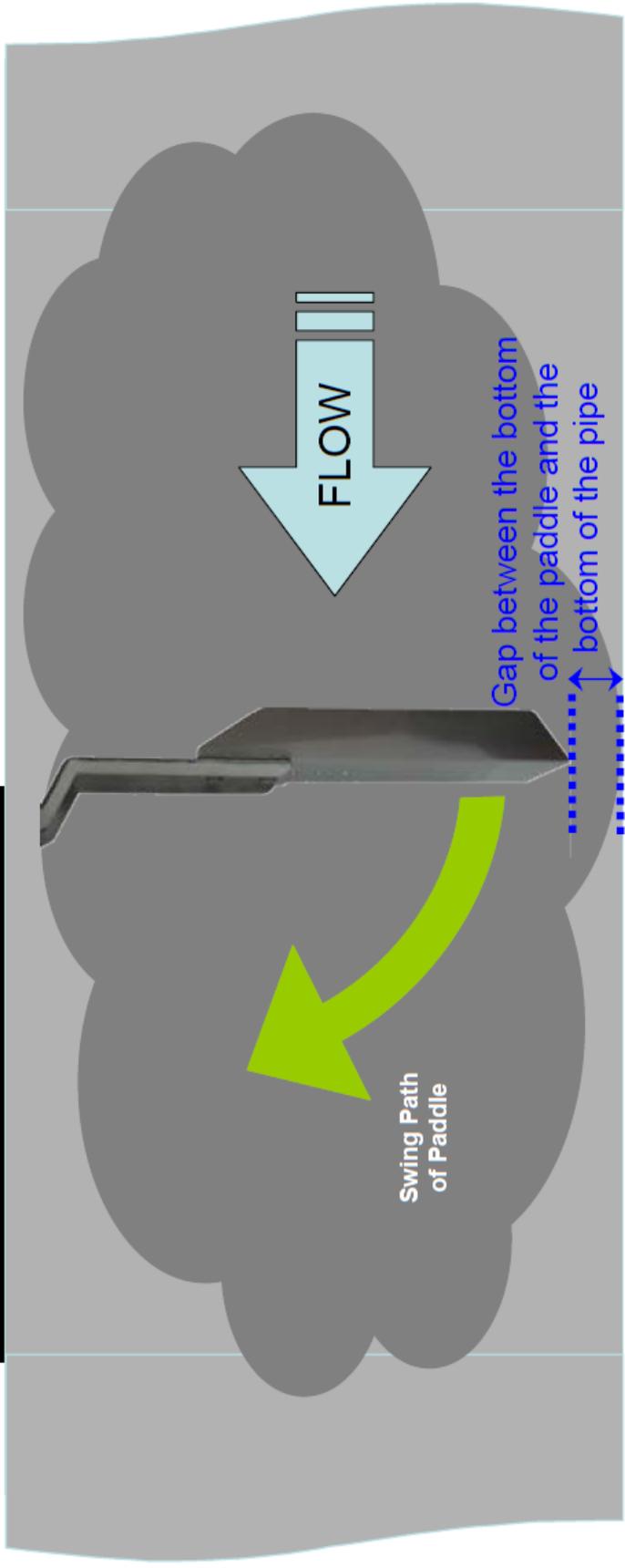


****Important****

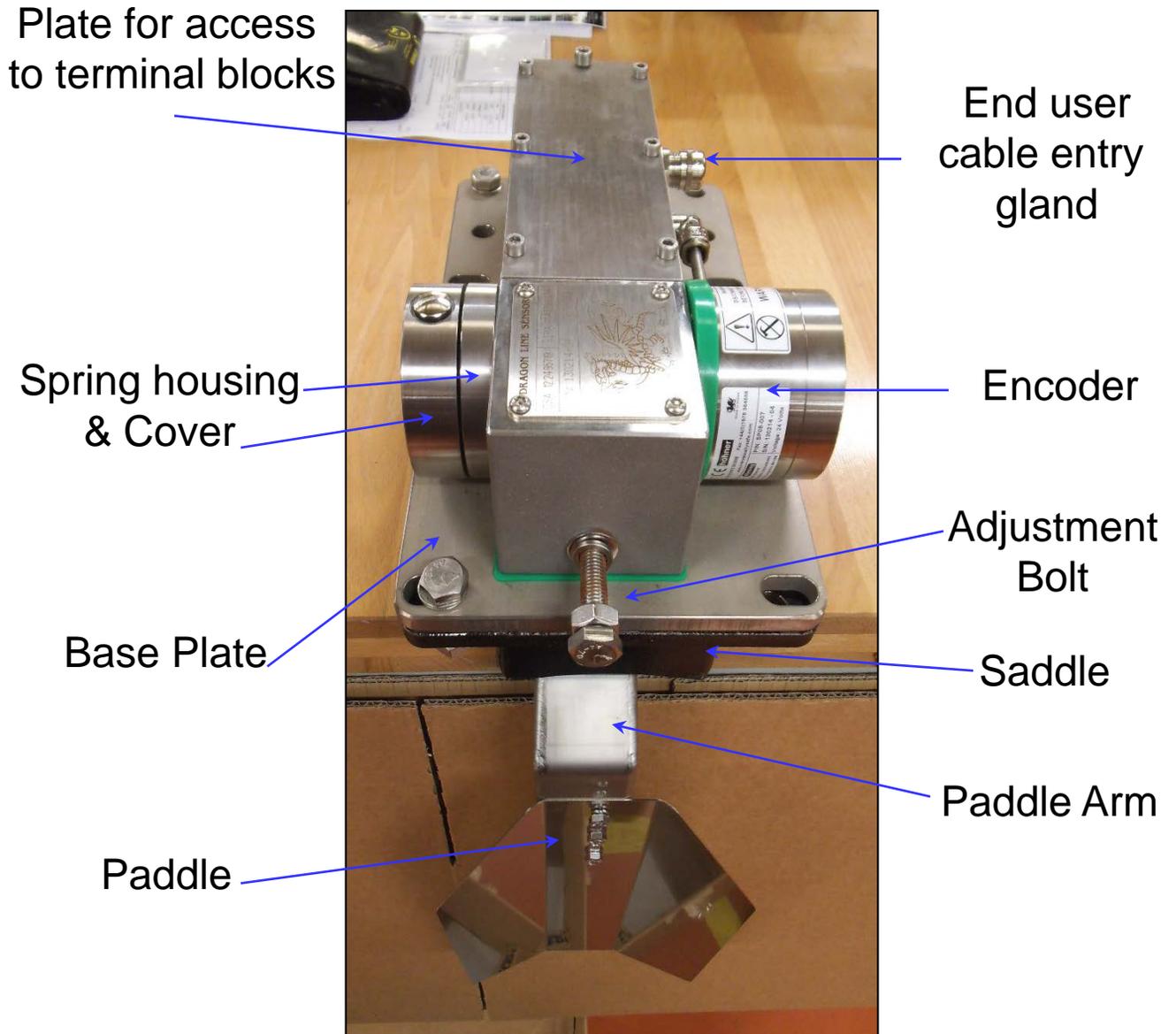
Ensure that is a sufficient gap between the bottom of the selected paddle and the bottom of the pipe; this can be checked by screwing the Supplied handle into the spring housing

And moving the paddle back and forth to ensure it moves freely

Any residue stuck to the paddle can also be removed by gently tapping the paddle back and forth against the housing when the handle is attached



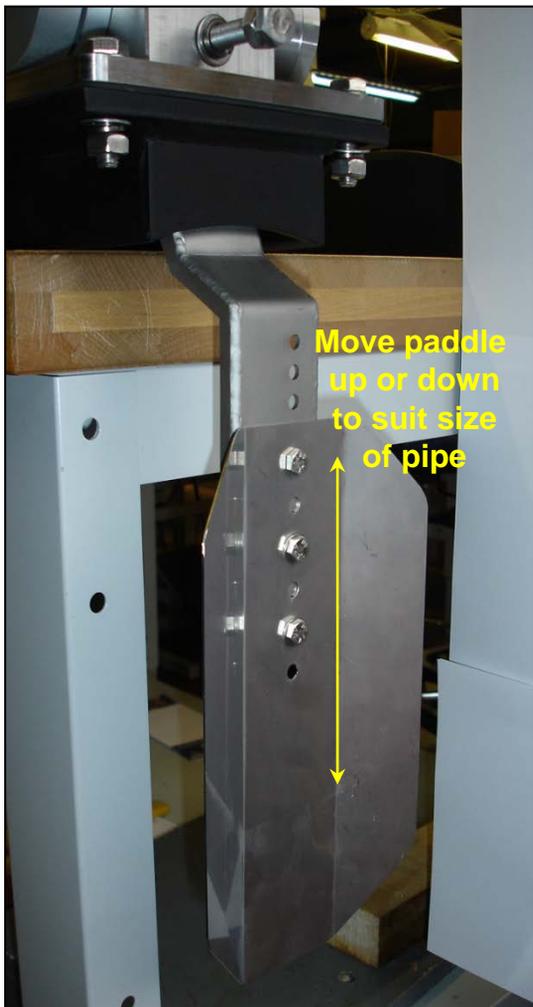
Overview of Dragon Flow Line Sensor



Fitting the Paddle



- Select the paddle to suite the size of pipe that the sensor is being fitted to.

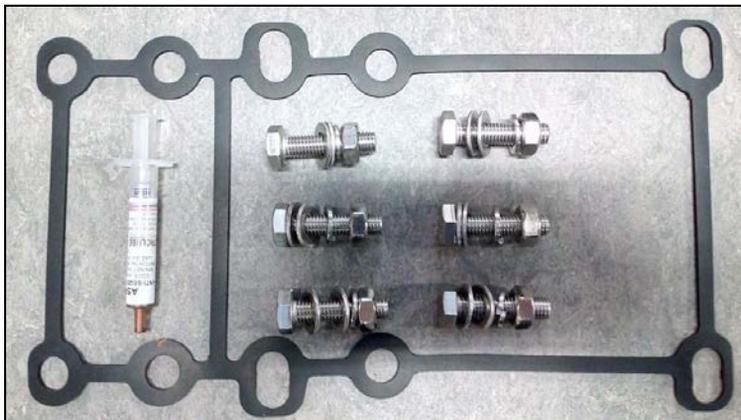


- Fit the required paddle to the arm of the sensor as shown in photo, the paddle can be fitted higher or lower on the arm to suit the size of pipe. Secure the paddle in place with the supplied nuts, bolts and washers using 10mm spanners.
- The procedure is the same for changing the paddle size from one to another

Fitting Sensor to Saddle

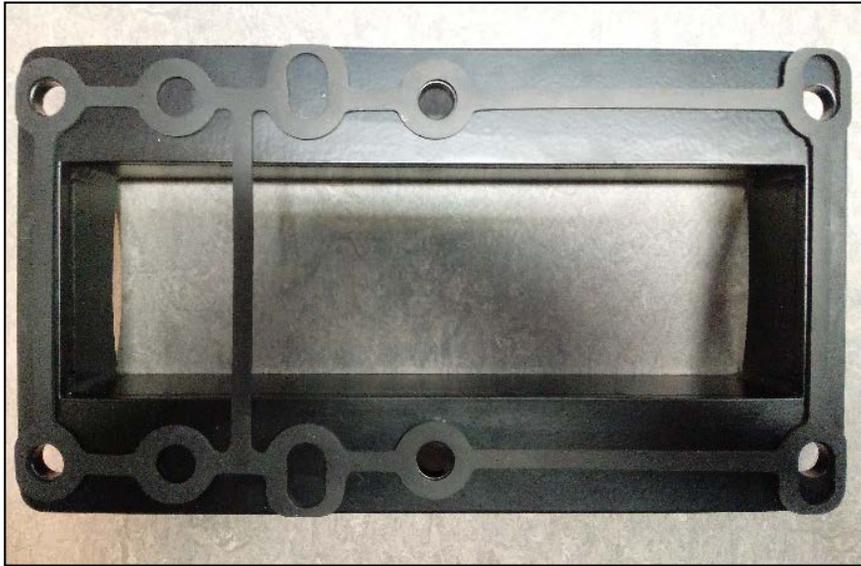


- Saddle should be welded to required pipe before Dragon Flow Line Sensor is fitted

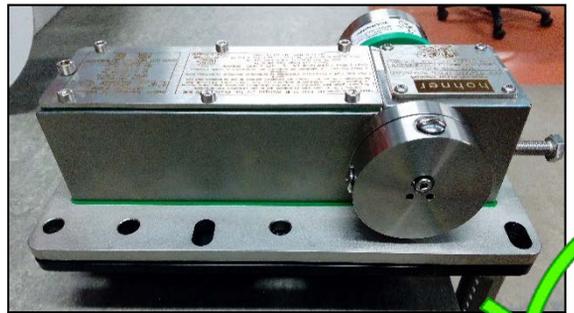


- Remove the nuts and washers and apply anti seize paste to the threads as shown above.

Fitting Sensor to Saddle

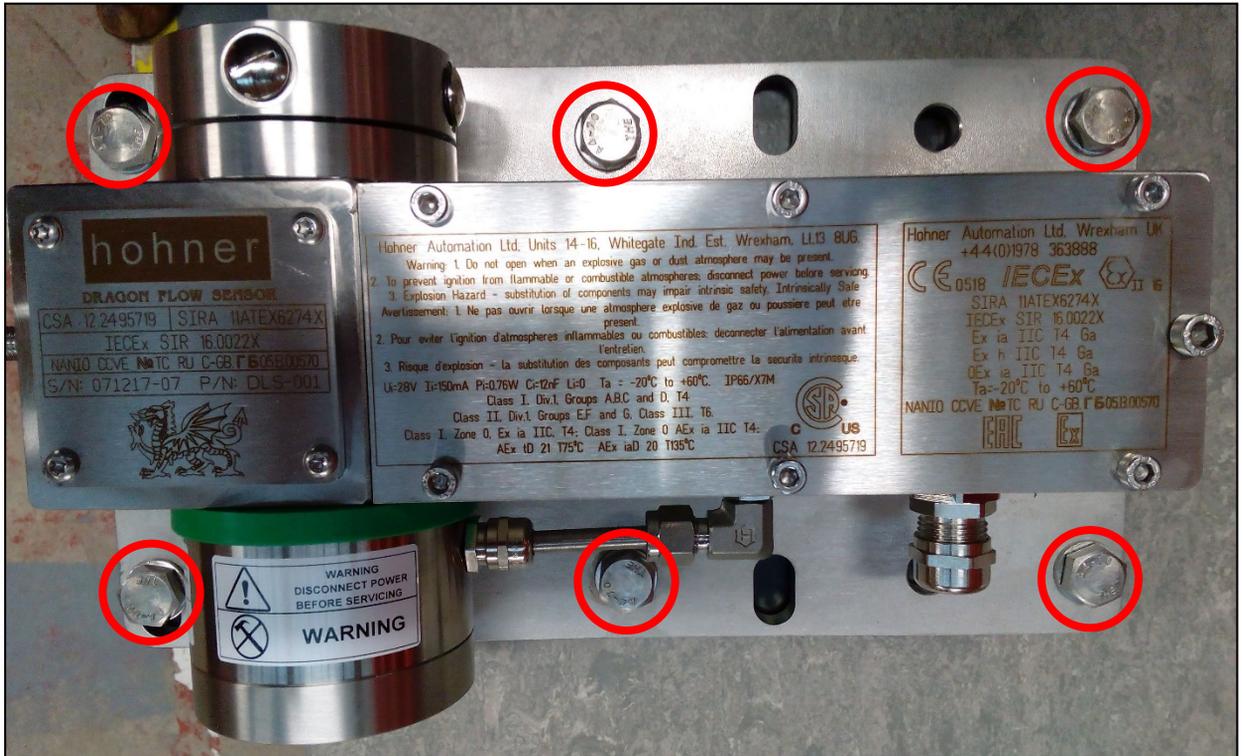


Align the gasket perfectly over the mounting holes as shown above



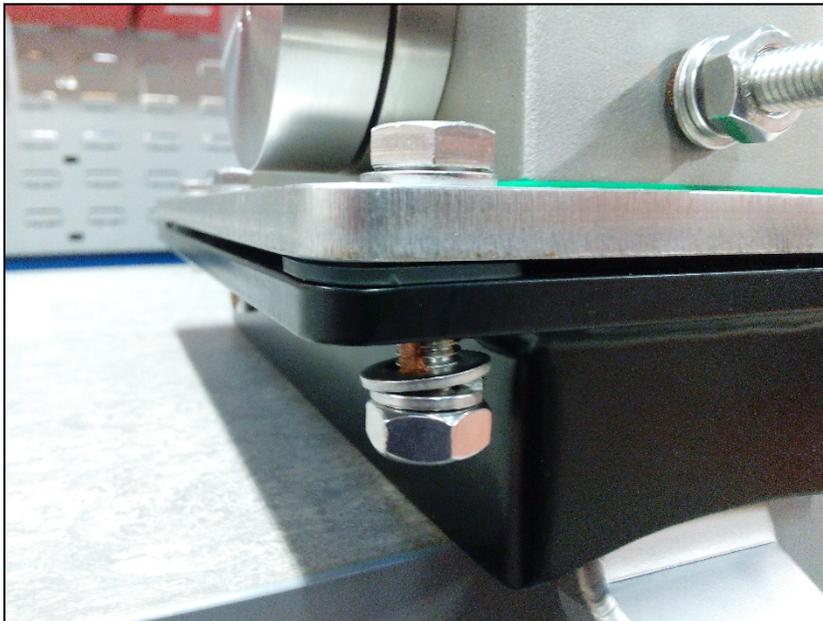
Align the sensor on the saddle so that the base plate, gasket and saddle are all perfectly centered

Fitting Sensor to Saddle



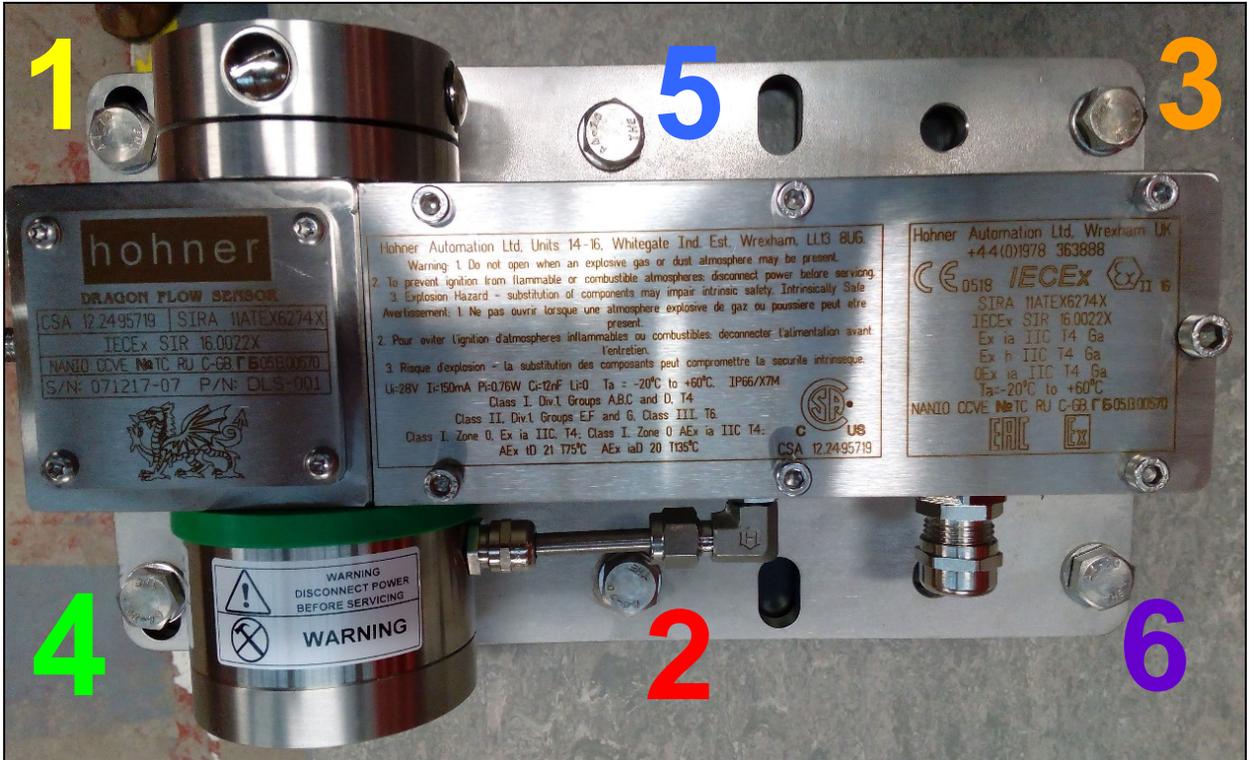
Fit all six bolts, plain washers, spring washers and nuts as shown

Bolts should only be hand tightened at this point



Tightening Sensor to Saddle

The Flow Sensor is pressure rated to 5 Bar minimum and to ensure this pressure rating is not compromised it is important that the bolts are tightened in the correct sequence which is detailed below



Bolt Sequence	1	2	3	4	5	6
Torque Value 0%	0Nm	0Nm	0Nm	0Nm	0Nm	0Nm
Torque Value 30%	15Nm	15Nm	15Nm	15Nm	15Nm	15Nm
Torque Value 60%	30Nm	30Nm	30Nm	30Nm	30Nm	30Nm
Torque Value 90%	45Nm	45Nm	45Nm	45Nm	45Nm	45Nm
Torque Value 100%	50Nm	50Nm	50Nm	50Nm	50Nm	50Nm
Repeat Value 100%	50Nm	50Nm	50Nm	50Nm	50Nm	50Nm

WARNING

Failure to follow the above sequence could compromise the sealing arrangement and pressure rating.

Adjustment Bolt

The adjustment bolt is used to regulate the full movement of the paddle arm and is fitted with an o ring, washers and nut.

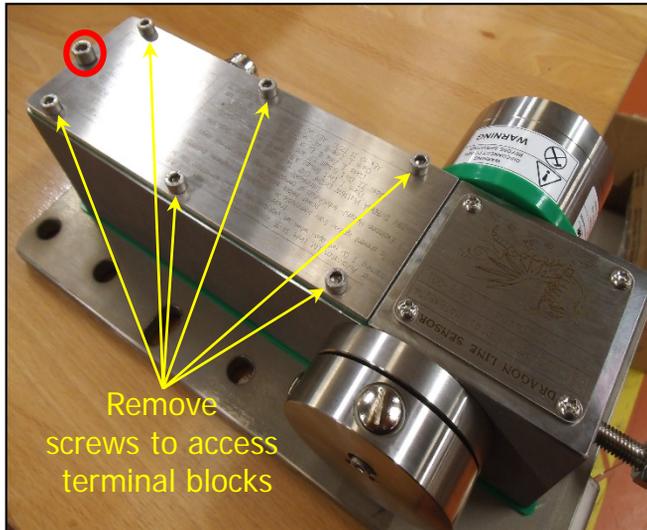
Adjust the bolt to the desired position and then fully tighten the nut to 30Nm carefully making sure that the O-Ring is compressed evenly.



WARNING

Failure to follow the above sequence could compromise the sealing arrangement and pressure rating.

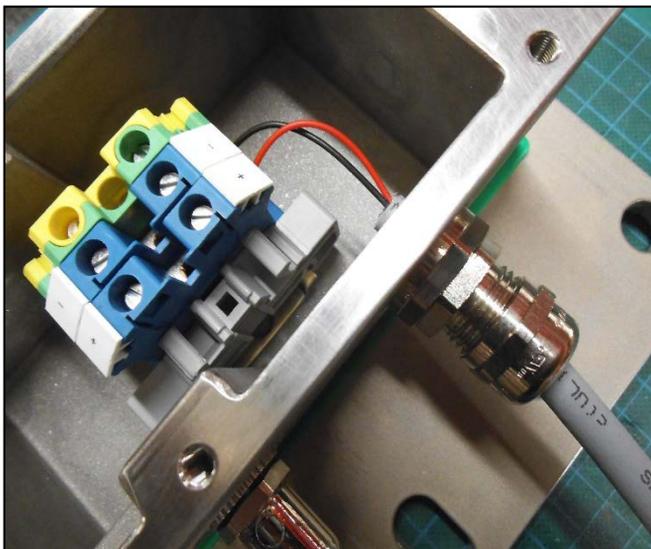
Access to Terminal Blocks



- Remove the six screws from the top plate using a 4mm Allen key

DO NOT REMOVE THE 6MM SCREW (CIRCLED IN RED)

- The plate and gasket can now be raised and rotated away to reveal the connector blocks



- Thread cable through gland and tighten gland with:
20mm spanner for M16 Gland.
22mm spanner for M20 Gland.
**Note* spanners not included in kit*

- Terminate cable + (red) & - (black) to corresponding terminals

- Plate is now replaced and the six screws are re-fitted and tightened using a 4mm allen key

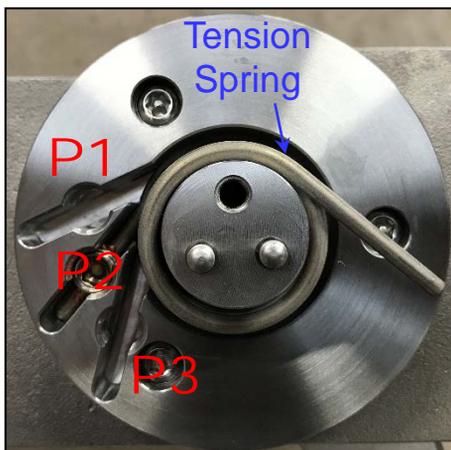
***Please Note... cable in photograph is for example only
Cable is not supplied as part of the Dragon Flow Line Sensor kit***

Changing The Tension Spring

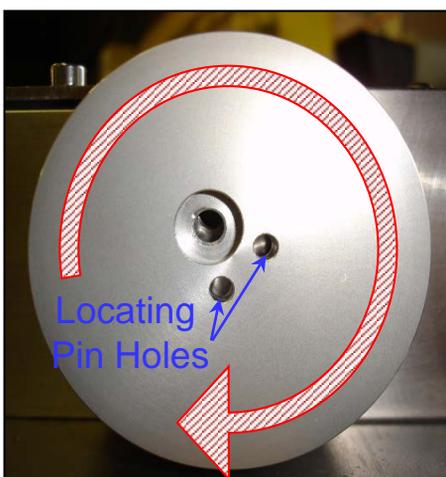
****It Is important that the tension spring is only changed with the Paddle arm in the fully downward position****



- Remove the spring housing cover by removing retaining screw & washer using a 4mm allen key



- Remove the exposed spring and re-fit spring in the slot of the desired tension
P1 = 15% Weaker
P2 = Neutral (default position)
P3 = 15% Stronger



- Ensuring that spring is in recesses of both spring housing and spring housing cover, twist the spring housing cover clockwise until it locates on the two pins. Refit retaining screw & washer using 4mm allen key

2.4 Maintenance

With proper installation and ensuring the encoder's specifications and parameters are adhered to will ensure numerous trouble free years of operation. The lifespan of the encoder varies with these operating and environmental conditions; however as a guide under optimum conditions (Temperature, Minimal Stress - Axial/Radial, Correct Installation etc) at 2000rpm (constant use) the encoder's bearings would have a rated life of 9.8 years.

The rigidity of the mounting arrangement and the stress on the encoder are the most significant contributors in determining the encoder's lifespan. Once installed, the encoder requires very little maintenance. It is suggested that periodically the encoder is checked for signs of deterioration. This would include the following:

- Checking the cable for any damage.
- Checking signs for ingress (removing any dirt/oil/grease with a damp cloth)
- Checking the bearings (shaft should rotate without any 'notches' or 'grinding')
- Checking the seals (making sure that the seals are intact without damage)
- Checking the shaft for 'play' (no play should be present in the encoder)

The flow sensor is ruggedly designed for use in harsh environments and is manufactured from stainless steel. Once installed, very little maintenance is required, as the equipment is predominantly mechanical with very few slow moving low frictional parts due to the nature of the application (measuring the level of mud via a paddle pivoted onto a shaft). The rated life of the DLS-00x is a minimum of 10 years. It is suggested that the user periodically checks and removes any signs of mud built up on the equipment.

The equipment incorporates bushings, and it is recommended that they should be periodically checked for wear and tear and that excessive play is not present. Please contact Hohner if replacements are required.

SECTION 3 – cCSAus User Manual

3.0 Equipment Overview

This manual covers two distinct pieces of equipment – an optical encoder and a flow sensor which are manufactured by Hohner Automation Ltd, Wrexham, LL13 8UG, UK. The encoder has been certified against electrical standards, whilst the flow sensor has been certified against mechanical standards. One certificate covers both pieces of equipment (CSA 12.2495719).

The encoder is designed to provide an absolute 4-20 mA current loop output relative to the angular movement of a shaft. Movement is detected optically by shining light produced by LEDs through a graduated disc that rotates with the shaft.

Optionally, this encoder can also be fitted to a flow sensor. The flow sensor is a sensing device that has the function of producing an electrical signal directly proportional to the height of a liquid (usually drilling fluid or mud) flowing through a closed or open trough pipe or conduit. As the mud level increases beyond the lowest point of the paddle plate component of the flow line sensor, the entire arm (wherein the plate is connected) is deflected upwards. As the arm is pivoted on a main shaft, the deflection causes an angular movement of the shaft. Finally, with the encoder mounted on this shaft, this angular displacement (or partial rotation) is translated into an electronic signal. The arm and shaft has a maximum angular displacement of 90 degrees and thus the encoder is specified to have its full span (20 mA) equivalent to a full 90 degree turn. Please refer to product datasheets for further information.

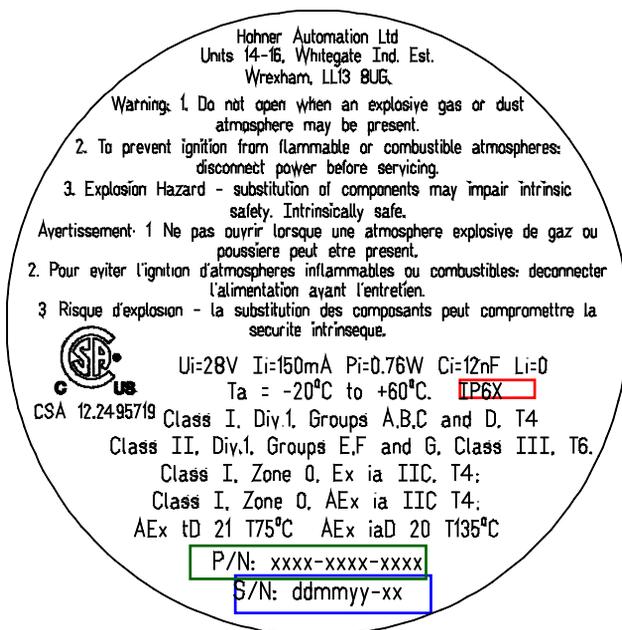
The physical dimensions and part number for the encoder can vary (encoder series) and can be deciphered by the specific part number stated. The encoder series includes hollow and solid shaft designs, which are made from metallic materials (predominantly stainless steel or aluminum). The termination can vary, and allows any suitably rated cable or connector to be fitted. Please refer to product datasheets for further information.

The minimum IP rating for the encoder is IP65 (for stand alone applications), and is certified for use in both Hazardous (Gas, Dust and Fibers & Flyings) and non Hazardous locations. The flow sensor is fitted with a stainless steel encoder variant IP rated to IP66/67.

The equipment shall be powered from a suitably rated and certified intrinsically safe source (Barrier or Isolator as per installation drawing EX-INS-DLS-01).

3.1 Safety Markings, Warnings and Special Conditions for Safe Use

The following instructions specific to hazardous area installations are covered by certificate number CSA 12.2495719. The ‘full’ CSA certification marking, together with any warnings or special conditions for safe use are given below and are universal (unless otherwise stated) for both **stand alone encoder only** applications and **flow sensor applications**.



IP Rating
 IP 6X = Minimum of IP65
 This is a variable

Part Number
 There are three types of part code structures that may be used for encoders, referenced in the report
 X = Variable
 * = Optional
 Numbers and Letters = Constant

- 1) 16 digits with the last 4 being optional
 XXXX-06XX-XXXX-****
- 2) 20 digits with the last 4 being optional
 SUBXWD-XX-06XX-XXXX-****
- 3) Special Part Numbers (SP's)
 SPXX-XXX-****

And one type of part code structure for the flow sensor:

- 1) 6 digits
 DLS-00X

Serial Number
 dd/mm/yy – Unique Number

The markings above will be situated in a clear visible location on the outside of the encoder or flow sensor. If the markings are situated on the ‘removable’ electrical connection box cover, it is safety critical to ensure that after user connection has been completed (cover has been opened to gain access to the Ex terminals), that the cover is screwed back down onto the flow sensor. If the cover is lost or damaged for some reason, then the user must obtain a replacement cover from Hohner.

The encoder shall be powered by a suitably certified Class 2 power supply or barrier unless installed per control drawing EX-INS-DLS-01.

The equipment may be used in Zones 0, 1, and 2 and Division 1 in groups A,B,C and D with flammable gases and vapours (Class I). The equipment may be used in Division 1, groups E,F and G with a dust atmosphere (Class II). The equipment may be used in an environment with fibres and flyings (Class III).

For Gas (Zones 0,1 and 2), the equipment may be used in the presence of flammable gases and vapours with apparatus groups IIC or IIB or IIA and with temperature class T4.

For Dust (Zones 0,1 and 2), the equipment may be used in the presence of conductive dusts with apparatus groups 20 or 21 or 22, with the enclosure having a maximum surface temperature of 135°C.

For Fibres and Flyings (Class III), the equipment may be used in the presence of fibres and flyings with the enclosure with temperature class T6.

The equipment is certified for use in ambient temperatures in the range of -20°C to +60°C and should not be used outside this range.

The equipment is to be installed by suitably trained personnel in accordance with the applicable code of practice (typically IEC EN60079-14).

With regard to safety it is not necessary to check for correct operation. Regular periodic inspection of the equipment should be performed by suitably trained personnel in accordance with the applicable code of practice to ensure it is maintained in a satisfactory condition – see installation and maintenance section for further details.

The equipment is not intended to be repaired by the user. Repair of the equipment is to be carried out by the manufacturer, or their approved agents, in accordance with the applicable code of practice.

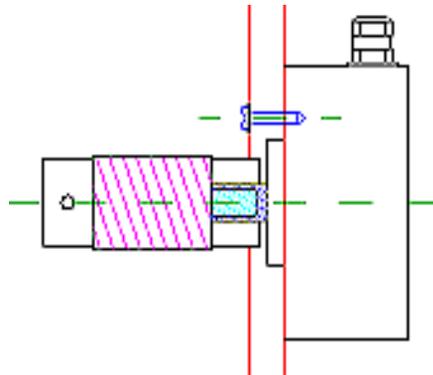
If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

Functionally, the equipment does require some user assembly and there is some permitted user adjustment - see installation and maintenance section for further details. **(FLOW SENSOR ONLY)**

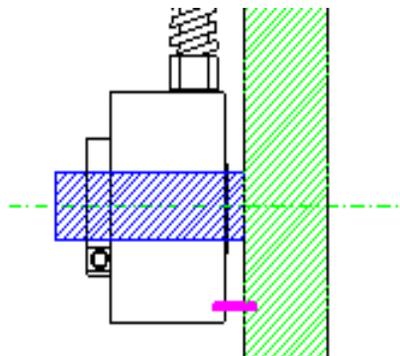
Please see installation drawing Ex-INS-DLS-01 for further information regarding installation.

2.2 Encoder Only Installation Instructions

The encoder can be manufactured as a hollow or solid shaft design. The dimensions of the encoder vary with the series. For solid shaft versions, the encoder is designed to be fixed (screwed onto, using one or more of the available mounting holes) onto the machine frame or a suitable mounting bracket. It is recommended that a flexible coupling is installed in-between the encoder shaft and the drive shaft, which will reduce any axial or radial stress that could be transmitted by possible misalignment or eccentricity between the two shafts. A representative illustration can be seen below demonstrating a solid shaft installation.



For hollow shaft versions, the encoder bore is directly connected onto the drive shaft and tightened with either a locking collar or set-screws. To keep the encoder from rotating, several methods can be used depending on the series. The recommendations include fitting a pin (into one of the available mounting holes or slots) between the encoder and the machine frame, or a bracket bolted onto the mounting holes, or use a flexible tether. Whichever method is used, it is recommended that the installation is not rigid, and a little play exists - to account for possible misalignment or eccentricity between the two shafts. A representative illustration can be seen below demonstrating a hollow shaft installation.



All Hohner products have been designed to be 'fit for purpose' as per the parameters and specifications stated on the product datasheets, however some precautions are to be taken into account to ensure functionality and safe use is maintained. These are listed overleaf

Functional User Instructions

- Do not leave any unused in/out wires without protective insulation.
- Do not apply more supply voltage than the specified maximum.
- Do not exceed the maximum power dissipation specified.
- Do not leave any unused in/out wires without protective insulation.
- Do not apply more supply voltage than the specified maximum.
- Do not exceed the maximum power dissipation specified.
- Do not coil excess cable.
- Do not make the cable longer than actually required.
- Do not short outputs together.
- Do not connect the cable screen from the cable with the encoder housing.
- Do not mount the encoder rigidly.
- Do not shock the encoder.
- Do not subject the encoder to excessive vibration.
- Do not dismantle the encoder.
- Do not tool the encoder or its shaft.
- Do not subject the encoder to excessive radial or axial stresses.
- Do not run the encoder faster than that specified.
- Do connect the cable screen to earth.
- Do earth (4mm² Cable) the encoder if the facility is available.
- Do observe EMC precautions – see below:

EMC – Best Practices

Although Hohner has designed a great deal of noise immunity into the product, it is still important to use good Electro Magnetic Compatibility measures on installation of this and associated electronic equipment, to ensure reliable operation both short and long term.

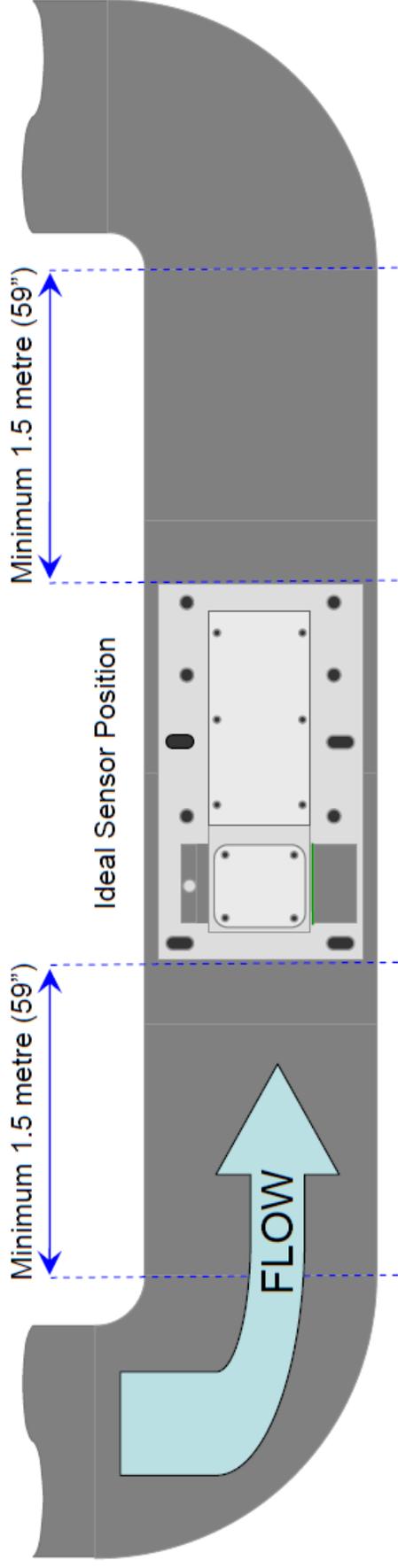
Encoder cable should be routed to avoid close proximity to cables carrying high levels of current or rapid switching transients. It is also recommended that those power cables be suppressed using ferrites or similar noise suppressing components. For improved noise immunity twisted pair and screened cable should be used and each output should be driven in differential mode (i.e. with compliments). It is further suggested that the cable screen is connected all around the circumference of the cable to earth, instead of twisting it to one side. With this method a more effective level of shielding will be achieved. Do not connect the screen from the cable with the encoder housing.

3.3 Flow Sensor Installation Instructions

Kit Contents

- 1 x Dragon Flow Line Sensor
- 1 x Dragon Flow Line Sensor Saddle (optional)
- 1 x Small Paddle
- 1 x Medium Paddle
- 1 x Large Paddle
- 1 x Grey Tension Spring (factory fitted)
- 1 x Yellow Tension Spring
(15% Weaker than grey Spring)
- 1 x Blue Tension Spring
(15% Stronger than grey Spring)
- 2 x 10mm Spanners
- 1 x 17mm Spanner
- 1 x 4mm Allen Key
- 1 x Arm Handle
- 1 x Base Plate Gasket
- 1 x Spare Base Plate Gasket
- 2 x Spare Adjustment Bolt O-Rings
- 1 x Tube of Copper Slip

Positioning of Sensor (i)

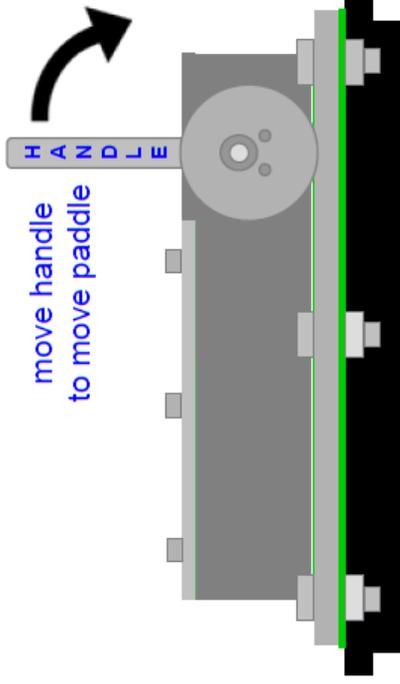


IMPORTANT

DO NOT install Flow Sensor near bends or turns in the return line.

Ideally the flow sensor should be at least 1.5 metres (59") away for the nearest bend or turn this should ensure a consistent flow of drilling fluid reaches the paddle of the sensor with minimum turbulence

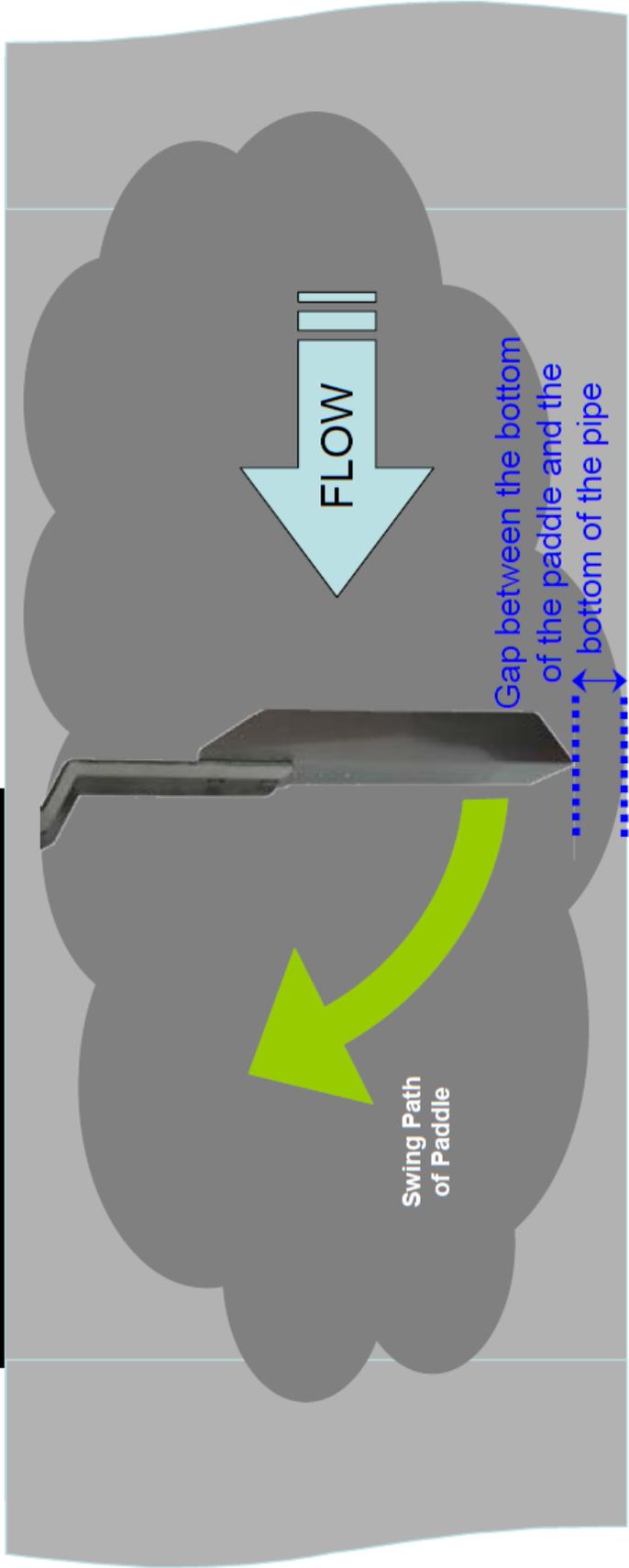
Positioning of Sensor (ii)



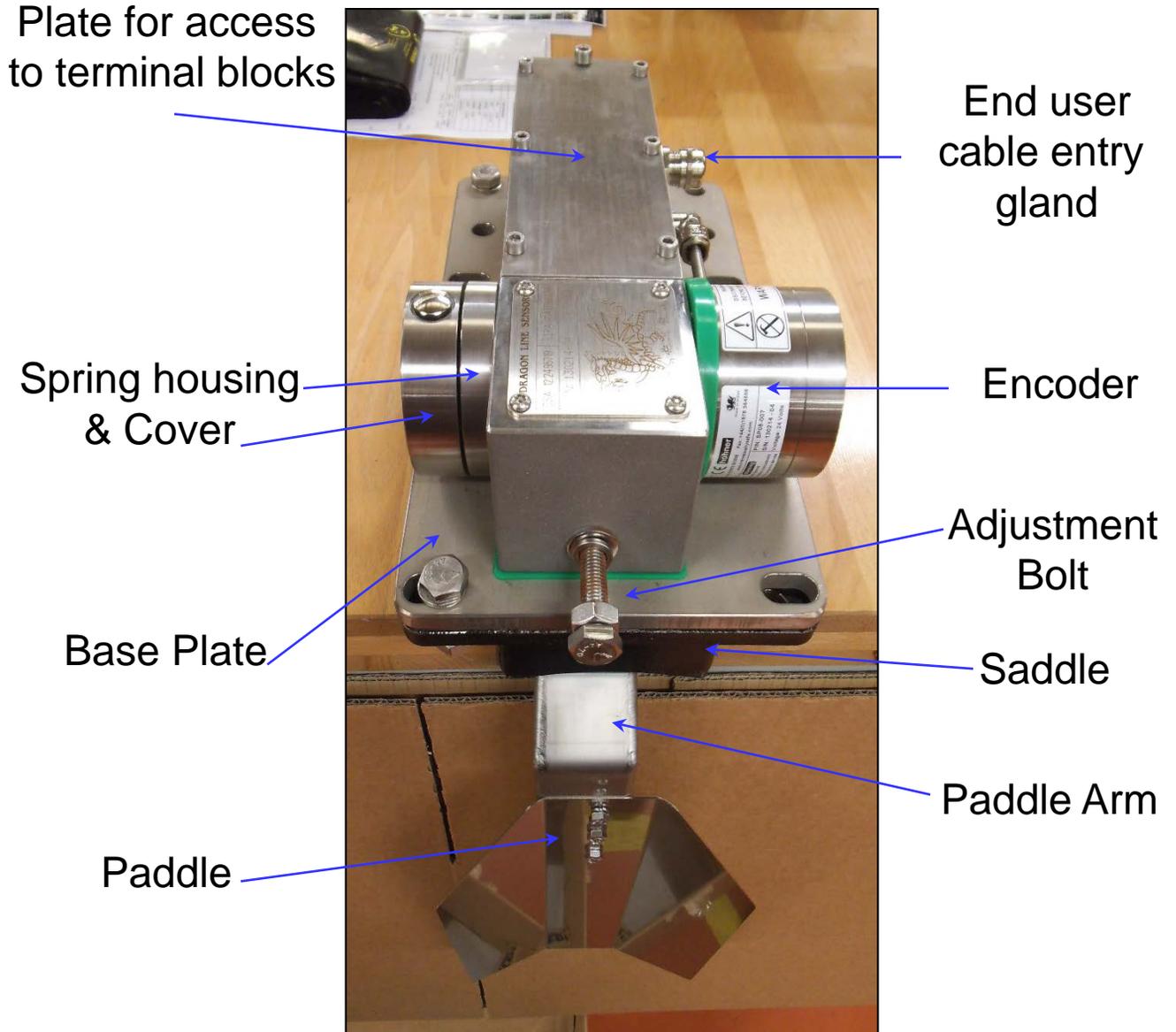
move handle to move paddle

****Important****

- Ensure that is a sufficient gap between the bottom of the selected paddle and the bottom of the pipe; this can be checked by screwing the Supplied handle into the spring housing
- And moving the paddle back and forth to ensure it moves freely
- Any residue stuck to the paddle can also be removed by gently tapping the paddle back and forth against the housing when the handle is attached



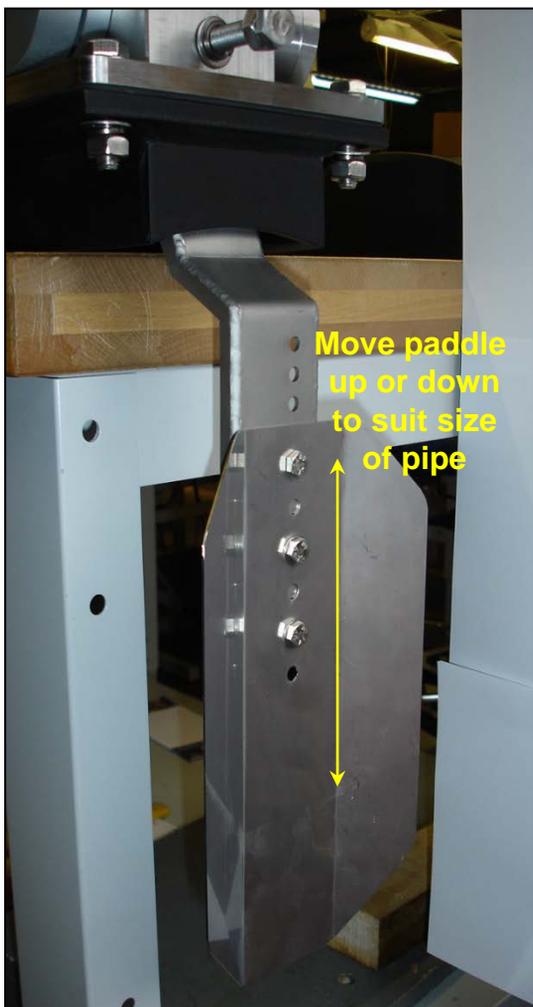
Overview of Dragon Flow Line Sensor



Fitting the Paddle



- Select the paddle to suite the size of pipe that the sensor is being fitted to.

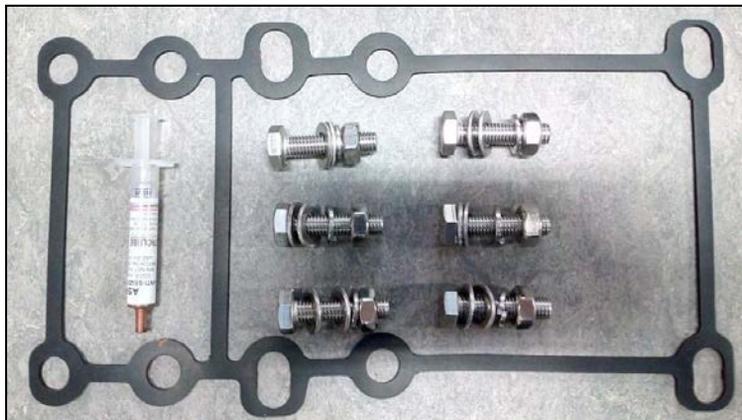


- Fit the required paddle to the arm of the sensor as shown in photo, the paddle can be fitted higher or lower on the arm to suit the size of pipe. Secure the paddle in place with the supplied nuts, bolts and washers using 10mm spanners.
- The procedure is the same for changing the paddle size from one to another

Fitting Sensor to Saddle

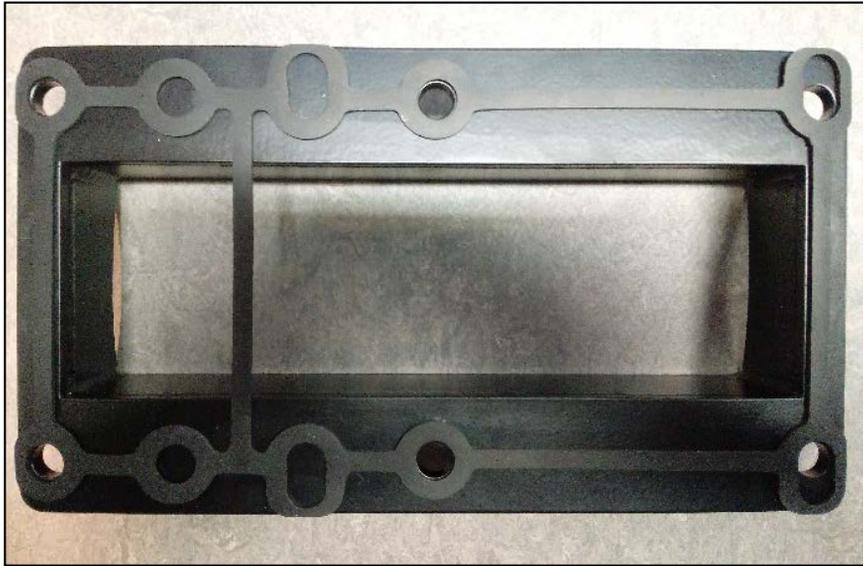


- Saddle should be welded to required pipe before Dragon Flow Line Sensor is fitted

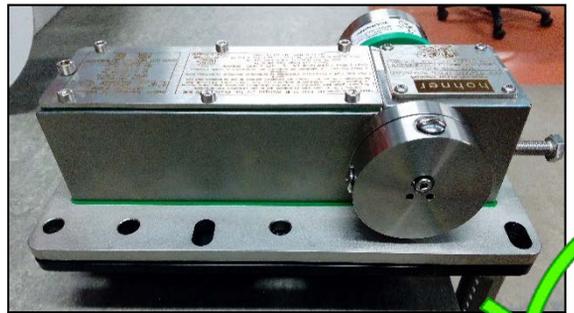


- Remove the nuts and washers and apply anti seize paste to the threads as shown above.

Fitting Sensor to Saddle

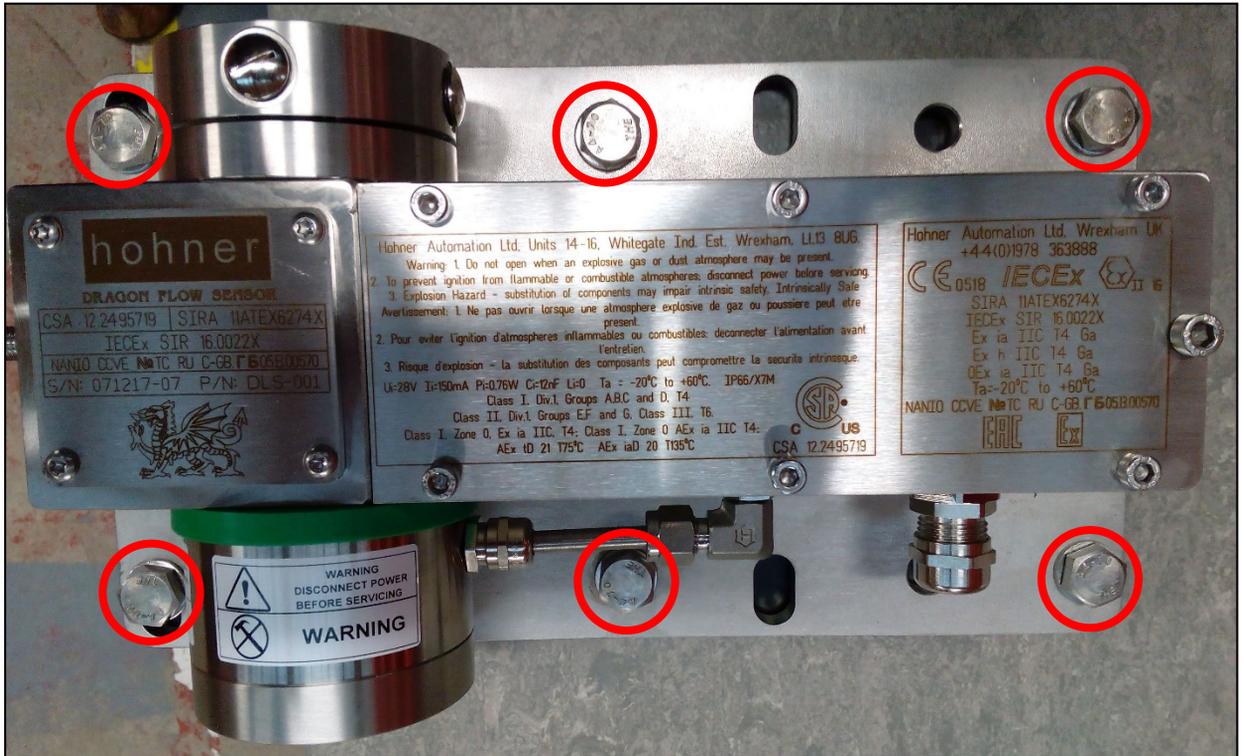


Align the gasket perfectly over the mounting holes as shown above



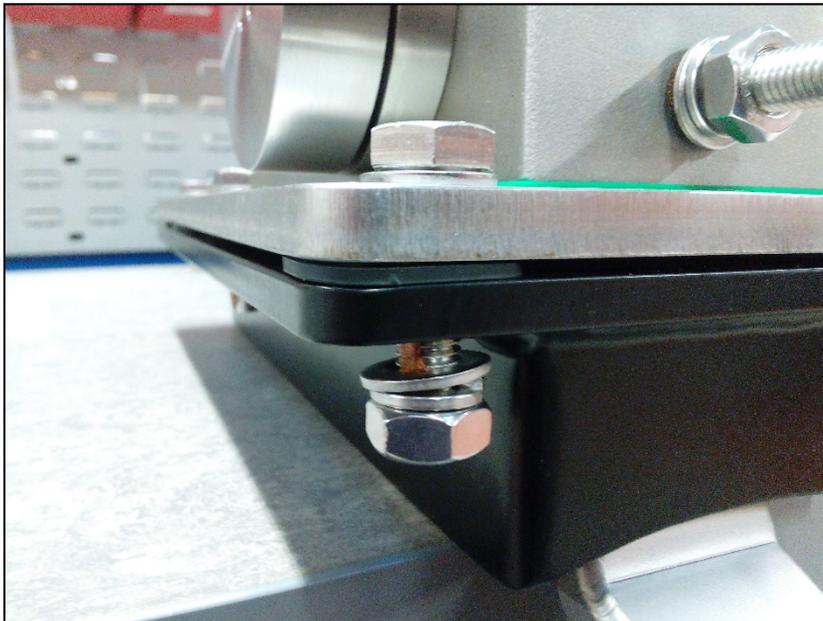
Align the sensor on the saddle so that the base plate, gasket and saddle are all perfectly centered

Fitting Sensor to Saddle



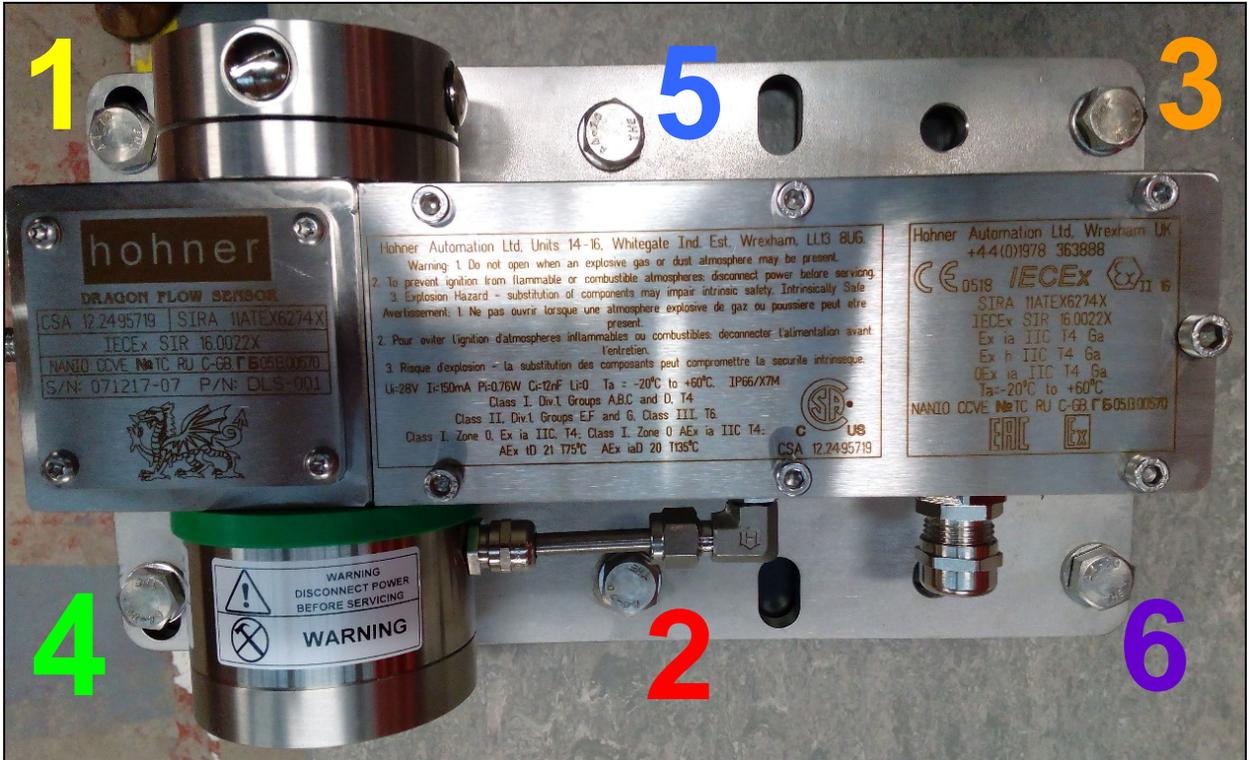
Fit all six bolts, plain washers, spring washers and nuts as shown

Bolts should only be hand tightened at this point



Tightening Sensor to Saddle

The Flow Sensor is pressure rated to 5 Bar minimum and to ensure this pressure rating is not compromised it is important that the bolts are tightened in the correct sequence which is detailed below



Bolt Sequence	1	2	3	4	5	6
Torque Value 0%	0Nm	0Nm	0Nm	0Nm	0Nm	0Nm
Torque Value 30%	15Nm	15Nm	15Nm	15Nm	15Nm	15Nm
Torque Value 60%	30Nm	30Nm	30Nm	30Nm	30Nm	30Nm
Torque Value 90%	45Nm	45Nm	45Nm	45Nm	45Nm	45Nm
Torque Value 100%	50Nm	50Nm	50Nm	50Nm	50Nm	50Nm
Repeat Value 100%	50Nm	50Nm	50Nm	50Nm	50Nm	50Nm

WARNING

Failure to follow the above sequence could compromise the sealing arrangement and pressure rating.

Adjustment Bolt

The adjustment bolt is used to regulate the full movement of the paddle arm and is fitted with an o ring, washers and nut.

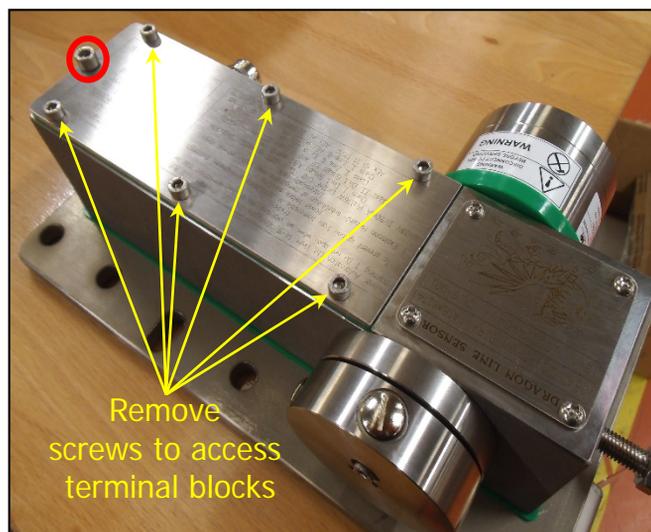
Adjust the bolt to the desired position and then fully tighten the nut to 30Nm carefully making sure that the O-Ring is compressed evenly.



WARNING

Failure to follow the above sequence could compromise the sealing arrangement and pressure rating.

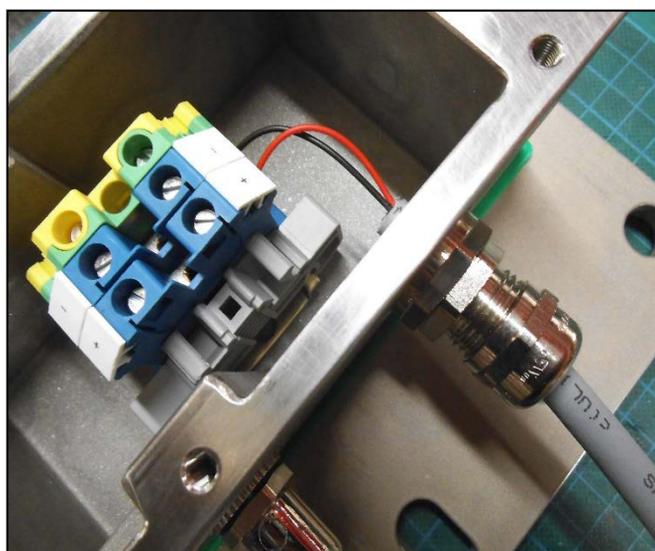
Access to Terminal Blocks



- Remove the six screws from the top plate using a 4mm Allen key

DO NOT REMOVE THE 6MM SCREW (CIRCLED IN RED)

- The plate and gasket can now be raised and rotated away to reveal the connector blocks



- Thread cable through gland and tighten gland with:
20mm spanner for M16 Gland.
22mm spanner for M20 Gland.
**Note* spanners not included in kit*
- Terminate cable + (red) & - (black) to corresponding terminals

- Plate is now replaced and the six screws are re-fitted and tightened using a 4mm allen key

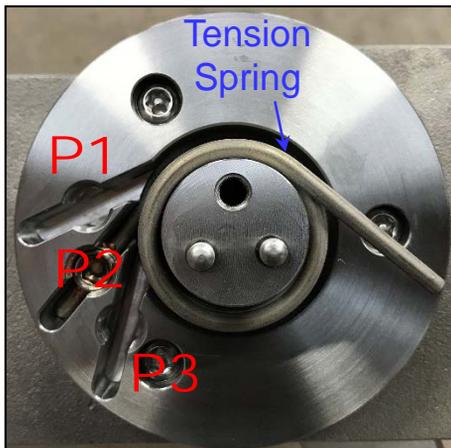
***Please Note... cable in photograph is for example only
Cable is not supplied as part of the Dragon Flow Line Sensor kit***

Changing The Tension Spring

****It Is important that the tension spring is only changed with the Paddle arm in the fully downward position****



- Remove the spring housing cover by removing retaining screw & washer using a 4mm allen key



- Remove the exposed spring and re-fit spring in the slot of the desired tension
P1 = 15% Weaker
P2 = Neutral (default position)
P3 = 15% Stronger



- Ensuring that spring is in recesses of both spring housing and spring housing cover, twist the spring housing cover clockwise until it locates on the two pins. Refit retaining screw & washer using 4mm allen key

NON HAZARDOUS

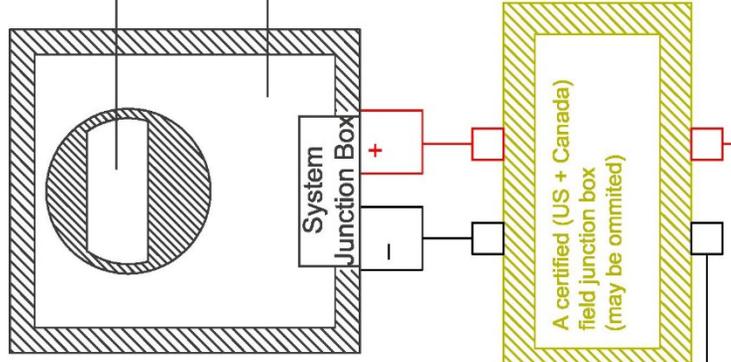
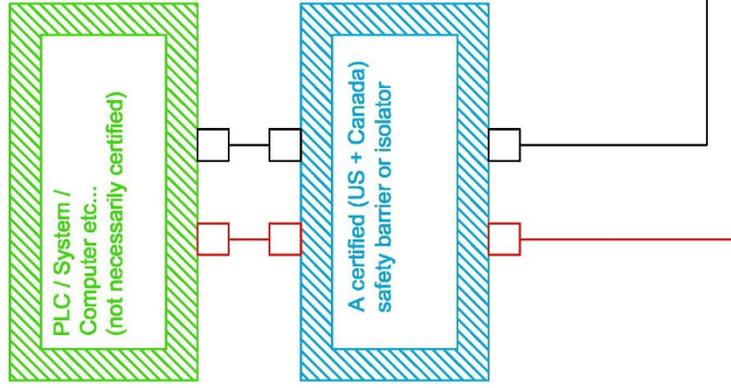
HAZARDOUS

Third Angle Projection

ALL DIMENSIONS ARE IN (mm) UNLESS OTHERWISE STATED.
TOLERANCES ARE ± 0.1 (mm) UNLESS OTHERWISE STATED.
ALL CHAMFERS TO BE 0.25(mm) UNLESS OTHERWISE STATED.

The system comprises of an encoder (mandatory) together with an optional flowline sensor assembly (this can be omitted or incorporated)

4...20 mA Absolute Encoder / FlowLine System



Encoder ———— $U_i = 28 \text{ V}$
 $I_i = 150 \text{ mA}$
 $P_i = 0.76 \text{ W}$
 $C_i = 12 \text{ nF}$
 $L_i = 0 \text{ H}$
 FlowLine System

Hohner
Schedule drawing
No modifications
permitted without
reference to the
Notified Body

Notes:

1) Cable capacitance and inductance plus the IS apparatus unprotected capacitance (Ci) and inductance (Li) must not exceed the allowed capacitance (Ca) and inductance (La) indicated on the associated apparatus

2) Suitable for installation in:

- Class I Div 1, Groups A, B, C and D
- Class II, Div 1, Groups E, F and G
- Class I, Zone 0 Ex Ia, IIC
- Class I, Zone 0, AEX Ia, IIC
- AEX tD 21
- AEX IaD 20

3) Barrier / Isolator Notes:

- For obvious reasons the barrier / Isolator and field junction box indicated shall be a certified safety barrier / Isolator and field junction box for Canada and the US
- a) When installed per control drawing EX-IN-DLS-01, the IS circuit shall comply with Article 304.30 (A) of NFPA 70 and clause F.6.1 of CSA C22.1
- b) The wiring between the ABS Absolute shaft encoder to field junction box to safety barrier / Isolator shall have a minimum insulation thickness of 0.5mm

Hohner Automation Ltd. own the copyright in this drawing which must not be reproduced or utilised other than for the purpose intended by them without prior approval	MATERIAL	CHECKED BY	AUTHORISED / DRAWN BY	DATE
		Carl Collinge	Patrick Blochle	24 May 2012
TITLE: CSA Installation Drawing for 4...20 mA Absolute Encoder / FlowLine				SHEET 1 OF 1
DWG #: EX-INS-DLS-01				

3.5 Maintenance

With proper installation and ensuring the encoder's specifications and parameters are adhered to will ensure numerous trouble free years of operation. The lifespan of the encoder varies with these operating and environmental conditions; however as a guide under optimum conditions (Temperature, Minimal Stress - Axial/Radial, Correct Installation etc) at 2000rpm (constant use) the encoder's bearings would have a rated life of 9.8 years.

The rigidity of the mounting arrangement and the stress on the encoder are the most significant contributors in determining the encoder's lifespan. Once installed, the encoder requires very little maintenance. It is suggested that periodically the encoder is checked for signs of deterioration. This would include the following:

- Checking the cable for any damage.
- Checking signs for ingress (removing any dirt/oil/grease with a damp cloth)
- Checking the Bearings (shaft should rotate without any 'notches' or 'grinding')
- Checking the seals (making sure that the seals are intact without damage)
- Checking the shaft for 'play' (no play should be present in the encoder)

The flow sensor is ruggedly designed for use in harsh environments and is manufactured from stainless steel. Once installed, very little maintenance is required, as the equipment is predominantly mechanical with very few slow moving low frictional parts due to the nature of the application (measuring the level of mud via a paddle pivoted onto a shaft). The rated life of the DLS-00x is a minimum of 10 years. It is suggested that the user periodically checks and removes any signs of mud built up on the equipment.

The equipment incorporates bushings, and it is recommended that they should be periodically checked for wear and tear and that excessive play is not present. Please contact Hohner if replacements are required.

