Mud Pit Level Sensor (Dolphin) User Manual

hohner

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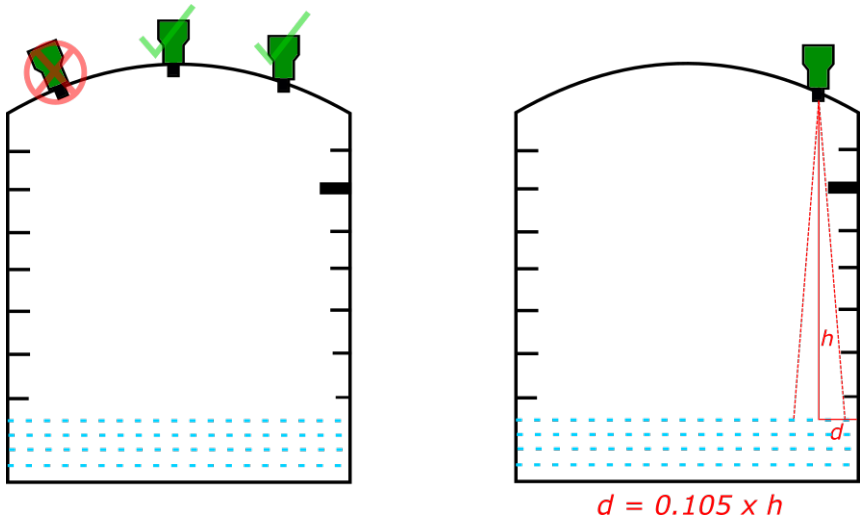
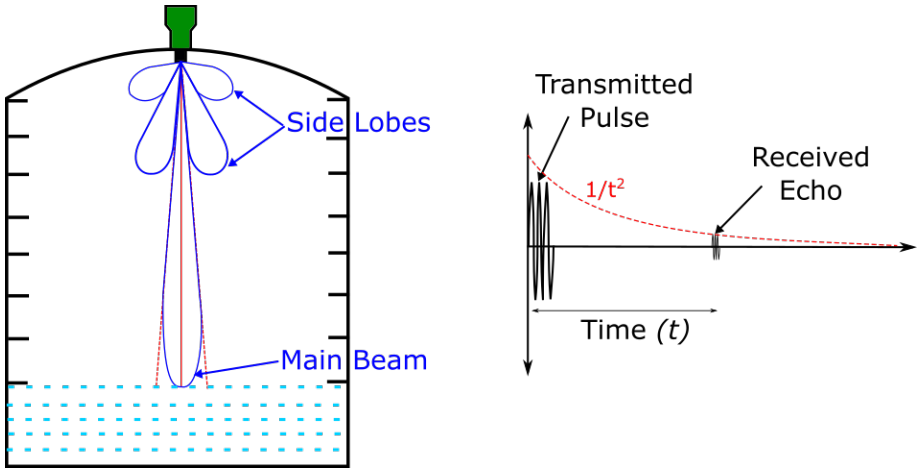
Mud Pit Level Sensor Installation

The mud-pit level sensor works by utilizing principles of sound to offer continuous level measurement of both liquid and solid media. The top-mounted sensor emits a high-frequency (50kHz) ultrasonic sound pulse of very short duration, then measures the time it takes for the echo to return. If the sensor is mounted closer to the sidewall of the mud-pit, multiple stray reflections can occur from maintenance rungs and the objects alike and hence for best performance it is highly recommended to install the sensor at a distance*(d)* away from any unwanted objects with respect to their depth*(h)* satisfying the formula *d = 0.105 x h*.



Intelligent adaptive echo detection technology

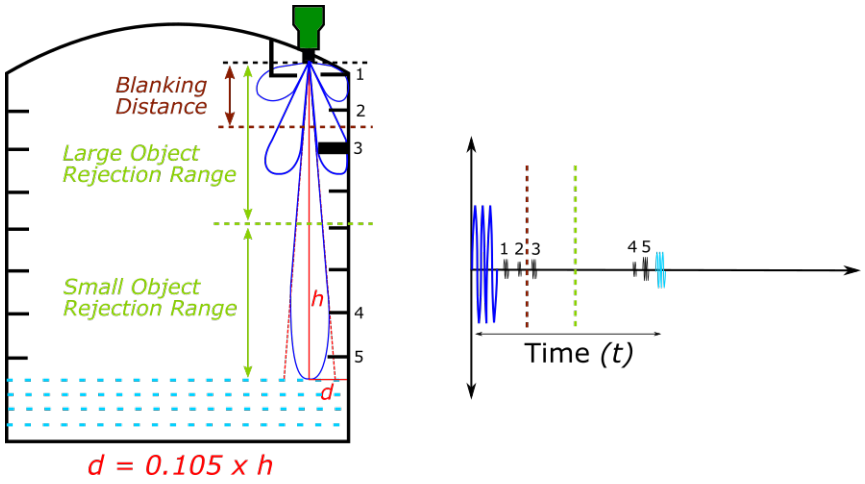
The Mud-pit level sensor work by utilizing principles of sound to offer continuous level measurement of both liquid and solid media.



The top-mounted sensor emits a high-frequency (50kHz) ultrasonic sound pulse of very short duration, then records the time it takes for the echo to return. Based on the speed of sound for the ambient temperature evaluated by the sensor, the distance from the sensor to the top of the liquid media can be calculated by

dividing the time between the initial pulse and its echo by two. [The principle is similar to the echolocation used by bats and dolphins.] The amplitude of the received echo diminishes with a profile that is inversely proportional to the square of time (distance) as per the property of sound waves. A typical radiation power pattern for the transmitted pulse and received echo from the sensor for the main ultrasonic beam and residual side lobes are depicted above.

If the sensor is mounted closer to the side wall of the mud-pit, multiple stray reflections can occur from maintenance rungs and the objects alike as shown below.

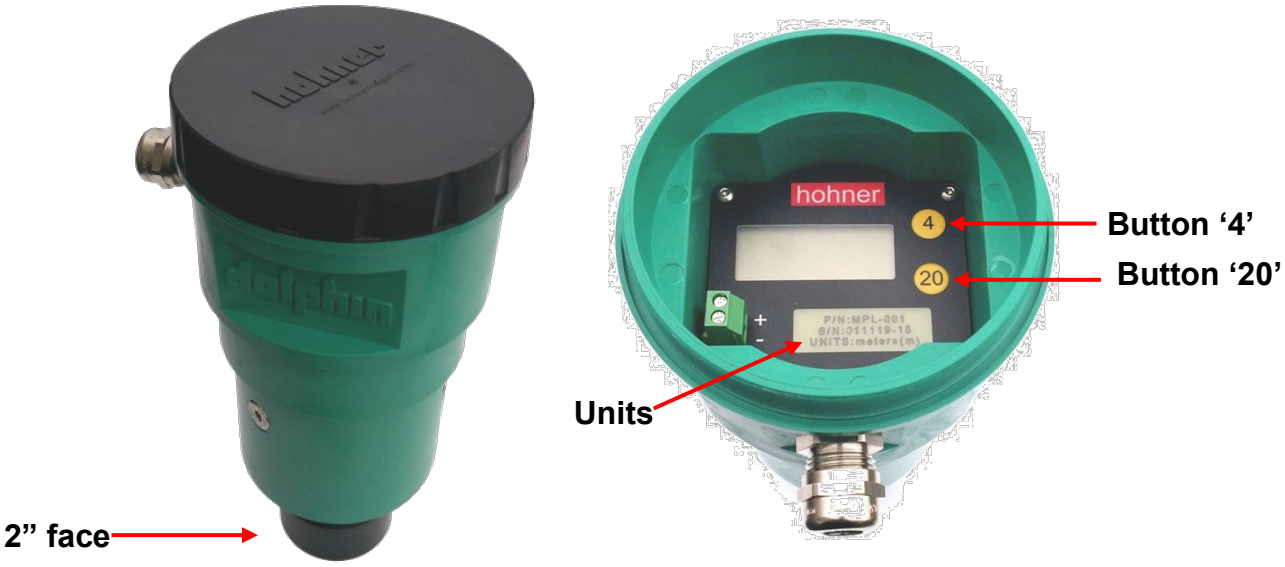


Hence, for best performance it is highly recommended to install the sensor at a distance*(d)* away from any unwanted objects with respect to their depth*(h)* satisfying the formula *d = 0.105 x h*, though the sensor has an *'intelligent adaptive echo detection technology'* to avoid any such stray reflection echoes as much as possible with respect to the selected '*mud-pit size*' or range.

Mud-pit size	Range	Sampling Time	Large object rejection range	Small object rejection range	Maximum Fill Rate
0	5m – 6m	0.450s	0.4m – 2.9m	2.9m – 6.0m	6.0m/min
1	7m – 8m	0.750s	0.4m – 4.7m	4.7m – 8.5m	5.0m/min
2	9m – 10m	1.000s	0.4m – 5.4m	5.4m – 9.5m	5.3m/min
3	11m – 12m	1.125s	0.4m – 6.4m	6.4m – 10.5m	5.4m/min

Echoes from objects 1 & 2 can be rejected by the '*blanking-distance*' selection and the echoes from large object 3 and small objects 4 & 5 can possibly be rejected by the selection of '*mud-pit size*'.

Quick Start Guide



1. **Start up**

   On power up the device starts with displaying the scrolling text *‘Hohner Auto Ltd’* appended with firmware revision as a decimal number *‘n.nn’* until initialised and ready for level measurements, at which point the device defaults to *‘Level mode’*.

2. **Level Mode**

   While in the *‘Level mode’,* upon successful reception of an echo for the emitted ultrasonic burst pulse, the device will display the level (distance from the 2” face of the sensor to the liquid level or any surface that will reflect sonic waves) measured in the *‘units’* stated below the serial number of the device. If no echo is received the device will display ‘- - - -’. The display may alternate in between the measured level and ‘- - - -’, depending on the echo reception.

3. **Calibration Mode**

   Calibration of the ‘mA’ output can be performed either proportional or inversely proportional to the span of measured level. While in the *‘Level mode’,* for a ‘single click’ of either of buttons ‘4’ or ‘20’, the device will display the current stored level for the respective ‘mA’ output – a ‘click’ means press and release of the button. A second ‘single click’ within 5 seconds of the same button will enter calibration mode for the respective ‘mA’ output level by displaying either *‘CA 4’* or *‘CA20’* and register the current displayed level for the respective 4mA or 20mA output. Device will correctly assign ‘proportional’ or ‘inversely proportional’ span for the ‘mA’ output regardless of the order at which the levels are registered to the 4mA and 20mA output. If the calibration cannot be completed an error code *‘Err.n’* will be displayed and the previous value for the corresponding button will be retained.

   Err.1 – No echo being received consistently

   Err.2 – Level is less than ‘Blanking Level’

   Err.3 – Level span for 4 – 20mA is less than 0.4m

4. Parameter Mode

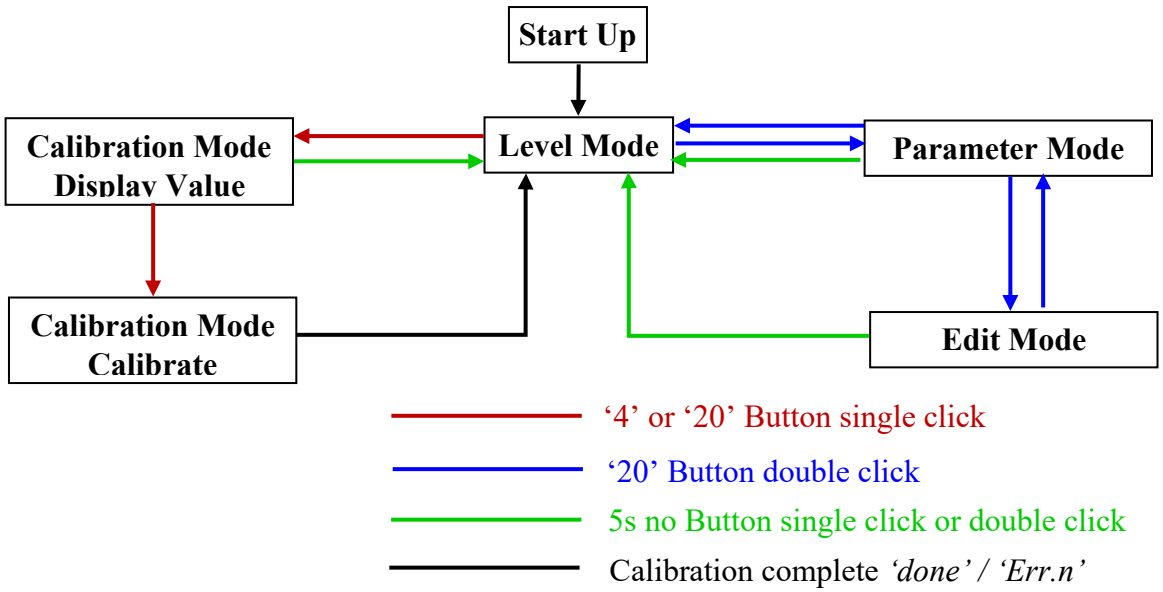
While in the *'Level mode'*, for a 'double click' of the button '20', the device will enter *'Parameter mode'* by displaying *'P-nn'* where *'nn'* is the parameter number that was last accessed or parameter 01 at first entry into *'Parameter mode'* after power up. While in *'Parameter mode'*, a 'single click' of button '20' will increment the parameter number and a 'single click' of button '4' will decrement the parameter number. If no key 'clicks' detected for 5 seconds, the device will default back to *'Level mode'*.

➢ **Note:** A 'double click' will be detected by the device when two consecutive 'clicks' occur within 0.25s (250ms), like the double click on a PC mouse.

5. Edit Mode

A 'double click' of the button '20' in *'Parameter mode'* will enter the device into *'Edit mode'* for the selected and displayed parameter number by displaying a flashing value of it. In this mode, a 'single click' of button '20' will increment the parameter value and a 'single click of button '4' will decrement the parameter value. If no key 'clicks' detected for 5 seconds, the device will default back to *'Parameter mode'*.

➢ **Note:** A 'double click' of the button '4' in 'Edit mode' will shift the cursor position by a digit for faster editing. 'Continuous press' of button '4' ('20') will decrement (increment) the value at a faster rate.



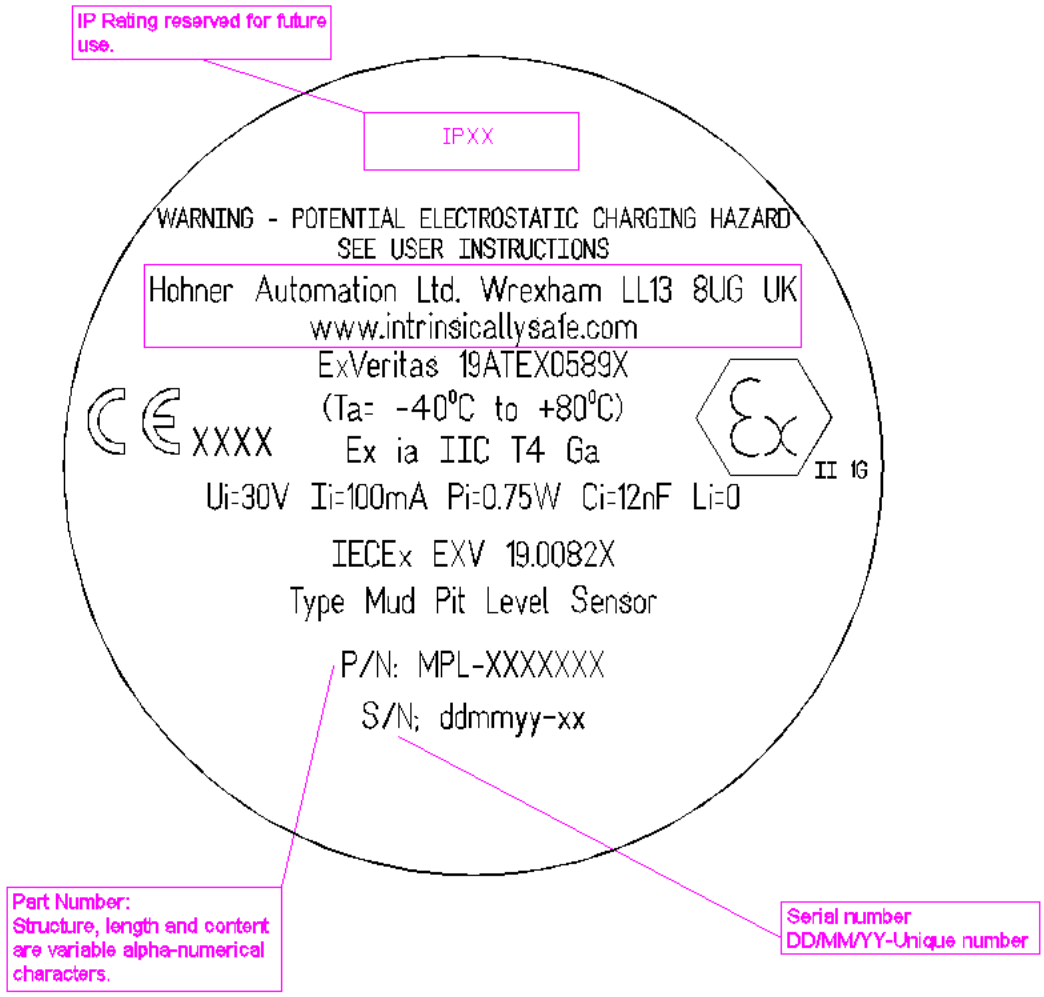
Parameter (P-nn)	Description	Default	Units
01	Level / Distance for 4mA output current	0.5m	m or ft
02	Level / Distance for 20mA output current	*	m or ft
03	Blanking Level / Distance	0.4m	m or ft
04	Fail safe mode: **0 –** span **1 –** minimum **2 –** last level / distance	0	–
05	Fail Safe Timer (FST): 1 - 900	**	seconds (s)
06	Mud Pit Depth Range: **0 –** Optimised (Maximum) 5m (6m), Sample Rate 2.22Hz, P-05 ** Default 15s, P-02 * Default 5m **1 –** 7m (8m), 1.33Hz, 25s, 7m **2 –** 9m (10m), 1.00Hz, 35s, 9m **3 –** 11m (12m), 1.13Hz, 40s, 11m	0	–

Note: Specifications and tolerances when operated over the full temperature range (-40°C to +80°C) are only guaranteed when measuring distances greater than 0.5m.

User Instructions MPL-XXX

The following instructions apply to the equipment covered by the following certificate numbers ExVeritas 19ATEX0589X and IECEx EXV 19.0082X.

Amalgamated Markings (ATEX & IECEx)



Please note that the entiy parametres shown above, do not include any termination parameters (refer to termination parameter section). Part number and temperture rating are variable.

Instructions for safe selection, installation, use, maintenance and repair

The equipment may be used in zones 0, 1, and 2 with flammable gases and vapours

For Gas, the equipment may be used in the presence of flammable gases and vapours with apparatus groups IIC or IIB or IIA, with the enclosure having a maximum surface temperature of T4.

The equipment is certified for use in ambient temperatures in the range of -40°C to +80°C and should not be used outside this range.

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.

The equipment does not require assembly or dismantling. With regards to safety it is not necessary to check for functional operation. The openable lid allows access to the user interface for programming, wiring and display viewing. An optional cable screen connection is accessible internally and externally for EMC purposes to allow grounding to earth. The equipment contains no other customer-replaceable parts.

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

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 certificates stated have an 'X' suffix which indicates that special conditions of installation and use apply. Those installing or inspecting this equipment must have access to the contents of the certificates or these instructions. The conditions listed in the certificates are reproduced below:

> The equipment is manufactured with an enclosure made from plastic materials. Under certain extreme conditions, such parts may generate an ignition-capable level of electrostatic charge. Therefore, for applications on areas classified as category 1G / EPL Ga, it shall not be installed where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment may only be cleaned with a damp cloth.

Installation 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 coil excess cable.
Do not make the cable longer than actually required.
Do not short outputs together.
Do not shock the equipment.
Do not subject the equipment.to excessive vibration.
Do not dismantle the equipment.
Do not tool the equipment.
Do not subject the equipment to excessive radial or axial stresses.
Do observe EMC precautions.
Do tighten down the lid fully (hand tight) to ensure the IP rating is maintained.
Do ensure that any connection type fitted is suitable for the environment, temperature range and IP rating.
Cable screen connection to earth is optional.

Maintenance Instructions

It is recommended that inspection of the equipment is carried out periodically which should be performed by suitably trained personnel in accordance with the applicable code of practice to ensure it is maintained in a satisfactory condition. Cleaning of the equipment should only be carried out with a damp cloth.

Termination Parameters

The equipment termination varies with part number and can include connectors or cable which can be fitted by the manufacturer or end-user. If fitted by the manufacturer, the parameters for each option are below and the end user should ensure that when added together with the equipment's entity parameters + any associated equipment + any additional cabling that the total sum does not exceed the amount allowed as per the applicable standards for the required group / zone / gas group where it is installed. For further details please contact Hohner Automation Ltd.

Any termination less than 1m in length

Ci = <200pF
Li = <1uH

Any termination greater than 1m in length

Cc = <200pF/m
Lc = <1uH/m

Ci = cable length/m x Cc/m
Li = cable length/m x Lc/m

*m = Meter

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Website: www.intrinsicallysafe.com

EU Declaration of Conformity

Hohner Automation Limited declares under sole responsibility that the product listed below conforms to the following EU directives:

EU directive 2014/34/EU (ATEX)
EU directive 2014/30/EU (EMC)

Product Description: Ultrasonic Level Sensor (Intrinsically Safe Gas)

Product Type: Mud Pit Level Sensor (MPL)

Part Number: MPL-XXXXXXX

Where: X = Variable Length Alphanumeric Characters

Notified Body: ExVeritas Limited,
Units 16-18, Abenbury Way, Wrexham Industrial Estate,
Wrexham, United Kingdom, LL13 9UZ.
Notified Body number: 2585

Product Conformity has been demonstrated with reference to the following documentation:

EU type-examination certificate ExVeritas 19ATEX0589X dated 5th February 2020
EMC Test Report Element TRA-047296-35-00A dated 11th September 2019

Compliance with the Essential Health and Safety Requirements has been assessed by reference to the following standards:

BS EN IEC 60079-0:2018
BS EN 60079-11:2012
BS EN 61326-2-3: 2013
BS EN 61000-6-4:2007+A1:2011

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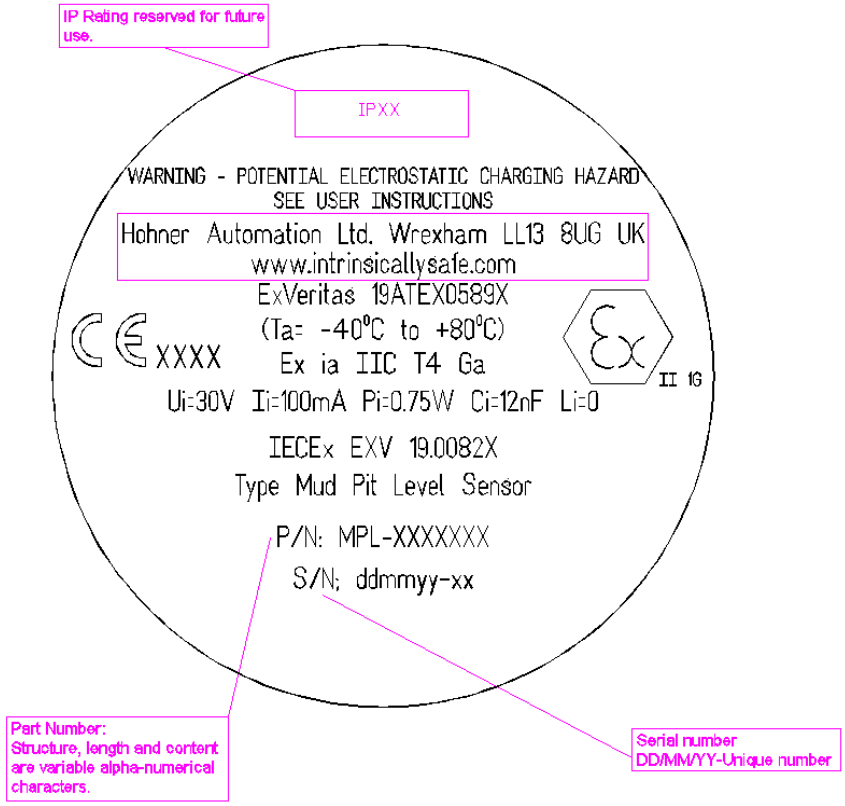
Website: www.intrinsicallysafe.com

EU Declaration of Conformity

Markings:

The following markings have been reproduced from the ATEX certificate & associated report (Amalgamated with IECEx). Please refer to the user manual for details of any special conditions for safe use, essential health and safety requirements of Annex II, together with instructions for safe use, installation and maintenance requirements (if relevant).



Quality Conformity has been demonstrated with reference to the following documentation:

Quality Assurance Notification Sira 98 ATEX M035 (Notified Body number: 2813) dated 15th October 2019

The products detailed in this certificate were manufactured in the United Kingdom

Carl Collinge
Technical Development and Certification Manager
Wrexham, UK
5th February 2020

Version 1 **Valid from Serial Number: 190220-XX** **Valid to Serial Number: XXXXXX-**