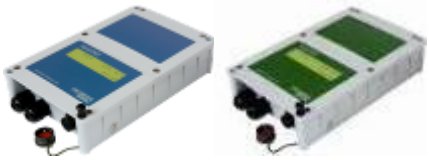
HydrINS 2 and HydrINS 2 Mini Electromagnetic Insertion Flow Meters

Installation Manual



Revision	Date	Author	Modifications	Signature
01	15/02/11	GSE	Approval	GSE
00	15/12/10	MRE	Updated	

CONTENTS

This document is the user manual for the following electromagnetic insertion flow meter: **HydrINS 2/HydrINS 2 Mini in the configuration with Displays A and C**

For acquisition programming, refer to the **HydrINS 2 / HydrINS 2 Mini flow meter programming manual, the programming manual for the data logger used, and the programming manual for an internal pressure channel**

For additional information, please contact us:

HYDREKA

34, route de Saint Romain – 69450 ST CYR AU MONT D'OR – France

Tel.: +33 (0)4 72 53 11 53 – Fax: +33 (0)4 78 83 44 37

E-mail: hydreka@hydreka.fr or accueil@hydreka.fr

Customer Service: services@hydreka.fr

Rentals: rent@hydreka.fr

Sales: sales@hydreka.fr

Export: export@hydreka.fr

1 Introduction

The HydrINS 2/ HydrINS 2 Mini electromagnetic insertion flow meter is intended to measure flow in pipes carrying drinking water or raw water. The probe performs a velocity measurement and calculates the flow rate by integrating the velocity over the flow cross-section.

The measurement scale is from 2 cm/s to 5 cm/s and the relative measurement accuracy is +/-2% or +/-2 mm/s, where the error applied is the larger of the two.

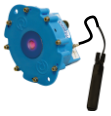
The HYDREKA range of electromagnetic insertion flow meters comprises the HydrINS 2, which comes in five standard lengths (300, 500, 700, and 1000 mm) and the HydrINS2 Mini, covering diameters from 70 mm to more than 2000 mm.

Flow meters are installed using a 1" BSP or NPT insert collar equipped with a ball valve (also possible using a 3/4" BSP or NPT collar, but only for the HydrINS 2 Mini).

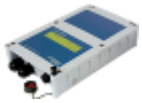
HydrINS 2 and HydrINS 2 Mini electromagnetic insertion flow meters can operate in several different configurations:

- Connected to a **standalone data logger** with a **digital input channel** (records data on site): Lolog, Vista +

- Connected to a **standalone data logger** with a **digital input channel with communications capability** (records data remotely): Octopus LX



- Connected to a **Display A**, **blue** (possibility of a **Pulse** output to a remote management system)



- Connected to a **Display C**, **green** (possibility of a **Pulse** or 4-20 mA output to a remote management system)

Two measurement positions are used for continuous flow measurement:

- The position at the centre of the pipe, position representing the maximum speed
- The position at one eighth of the diameter, a position representing the average speed

The velocity sensor of the HydrINS 2/HydrINS 2 Mini flow meter can be inserted in different positions across the cross-section of the pipe. This allows a flow velocity profile to be created in order to refine the mean speed calculation and therefore also the flow measurement. A set of default parameters is available in the Winfluid software (refer to the **HydrINS 2 / HydrINS 2 Mini Flow Meter Programming Manual**).

All Catalogue Numbers for the products presented in this manual are listed in **Appendix 3**.

1.1 Measurement Principle

The velocity measurement principle is based on the application of Faraday's Law, which states that a voltage is generated by the movement of a conductor through a magnetic field.

In the case of HydrINS 2/HydrINS 2 Mini, the magnetic field is generated by a coil at the end of the probe, and the water passing through the pipe, whose conductivity must be at least **20 µS/cm**, represents the conductor.

The electromotive force generated by the passage of the water through the magnetic field, comparable to a voltage, is measured by the two electrodes, which are visible on both sides of the stem. Because this electromotive force is proportional to the velocity, the HydrINS 2/ HydrINS 2 Mini probe carries out a velocity measurement derived from the electromotive force of the water. The flow rate is then deduced from this velocity measurement.

The electromagnetic sensor is located at the tip of the insertion rod. It has an exciter coil and two electrodes, seen on the side of the sensor.

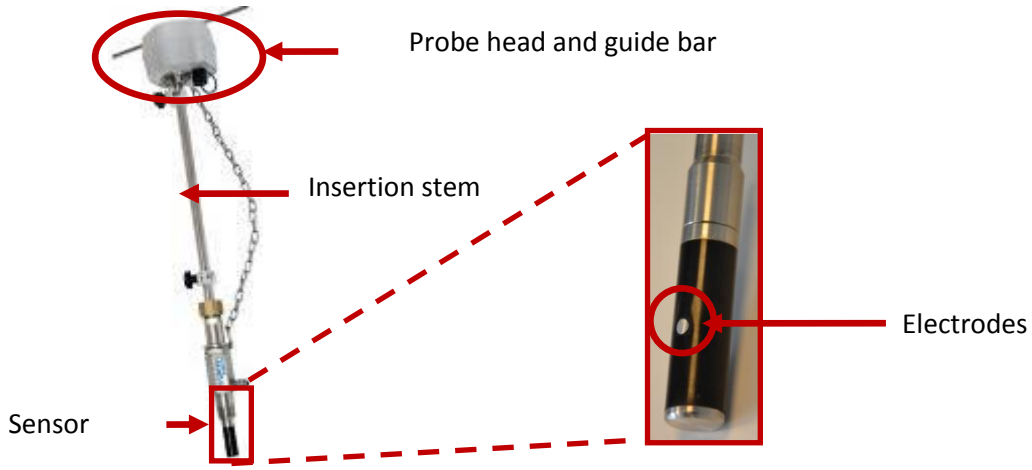


Figure 1: Location of sensor on the HydrINS2/HydrINS 2 Mini flow meter

The flow value is obtained via the following processing chain:

= A × Fi × Fp × Vm

Where:

- **Q: flow rate**
- **A: internal cross-section (calculated by Winfluid software from the inside diameter, ID)**
- **Fi: insertion factor (calculated by the Winfluid software)**
- **Fp: profile factor (calculated by the Winfluid software)**

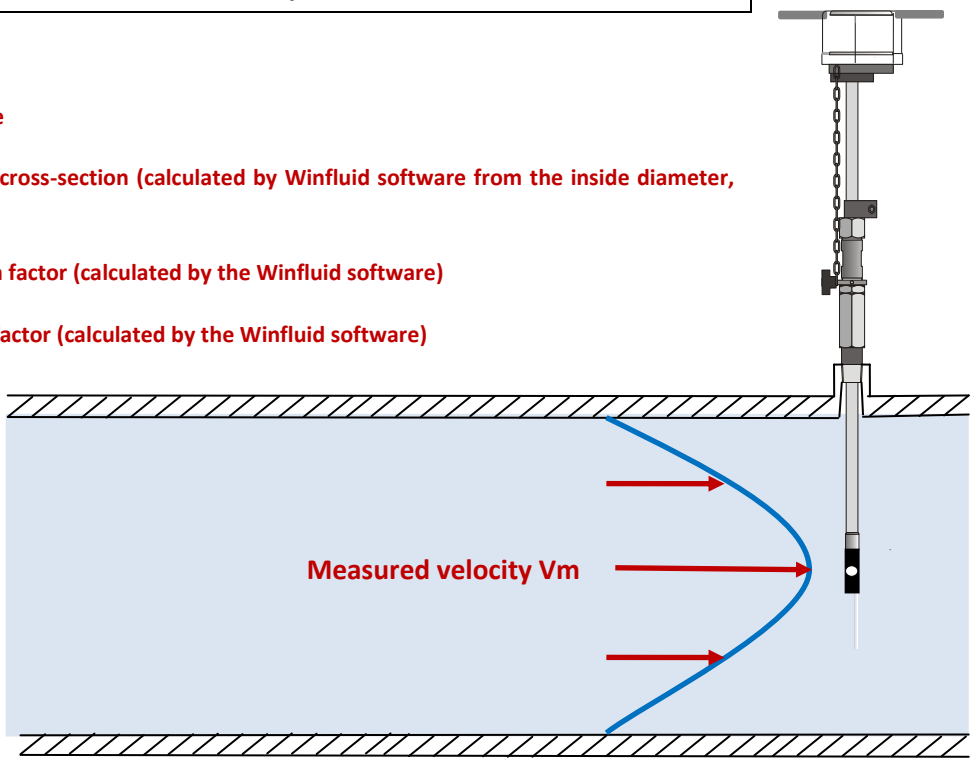


Figure 2: HydrINS 2/HydrINS 2 Mini data processing system

1.2 Environmental and safety conditions

Optimum use of the HydrINS 2 flow meter requires a suitable measurement environment in order to avoid as far as possible any environmental disturbances that could affect the measurement.

Hydreka shall not be held liable for the quality of the measurements performed using the HydrINS 2/HydrINS 2 Mini flow meter if the recommendations given below are not observed.

1.3 Conditions in the measurement environment

- Protection: **IP 68 (NEMA 6):** resistance to submersion within the limits of the standard
- Operating temperature range**: -20°C to +60°C**
- Storage temperature range: **-20°C to +70°C**

WARNING: It is essential to avoid sites where the pipes vibrate. If the probe vibrates excessively after installation, the measurement will not be correct. In this case, remove the probe.

THE CONDUCTIVITY OF THE WATER PASSING THROUGH THE PIPE MUST BE GREATER THAN 20µS/cm.

1.4 Software environment

The HydrINS 2 and HydrINS 2 Mini and Displays A and C are configurable using Winfluid and Winfluid Mobile software, developed by Hydreka.

Minimum software version: Winfluid 2.98 or Winfluid Mobile 1.98

1.5 Safety

 : **The physical installation of the HydrINS 2/HydrINS 2 Mini probe is a potentially hazardous operation. Because of the intrusive nature of the procedure, the probe can be ejected if there is excessive pressure inside the pipe. The probe is supplied with a safety chain, which must be used. Ensure compliance with the installation conditions (pumps shut off, wait for night-time conditions before installing, etc.).**

ENSURE THAT THE CHAIN IS OPERATIONAL BEFORE OPENING THE INSERT VALVE

Figure 3: Safety chain

The safety chain is also used to ensure that the probe is fully raised when the flow meter is withdrawn. It is connected to a hook that can pivot around the probe.

1.6 Product transport

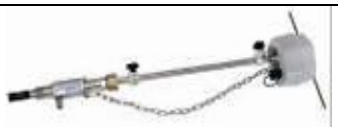
The HydrINS 2 / HydrINS 2 Mini flow meters are delivered in an appropriate box with polystyrene blocks to protect them during transport.

Figure 4: Typical packaging of the HydrINS2/HydrINS 2 Mini

Reinforced cases, called PELICASE, are also available for the transport of HydrINS 2/HydrINS 2 Mini 300 to 700 models and their accessories:

Figure 5: Pelicase transport case

Your package, whether a box or a case, must contain:

The HydrINS 2 / HydrINS 2 Mini flow meter with plug	
Guide bar, attached or bonded to the flow meter	
This installation manual	
The programming manual	

: **ENSURE THAT THE GUIDE BAR IS PRESENT IN THE PACKAGE. IT IS ESSENTIAL FOR THE OPERATION OF THE HYDRINS 2 / HYDRINS 2 MINI. IT IS CONNECTED TO THE FLOW METER**

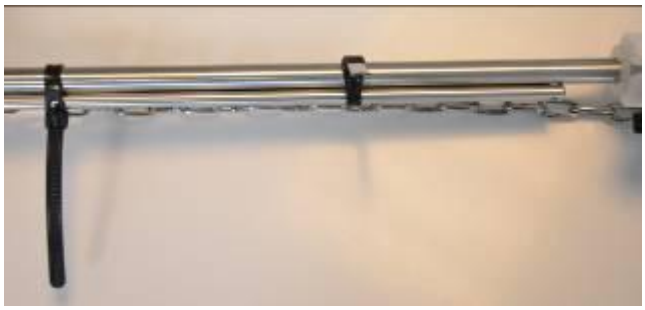


Figure 6: HydrINS 2 / HydrINS 2 Mini guide bar connected to the flow meter in the packaging

The HydrINS 2 / HydrINS 2 Mini flow meter is delivered with a protective plug. Please remove it before installing the HydrINS 2 in the pipe.

Figure 7: Flow meter protection plug

1.7 Product guarantee

The HydrINS 2 / HydrINS 2 Mini has a two-year guarantee when used in accordance with the conditions of use. Contact Hydreka Customer Service to invoke this guarantee if necessary.

1.8 Conditioning the product before use

The sensor of the HydrINS 2/HydrINS 2 Mini flow meter must be soaked for one day before use in order to obtain stable measurements.

2 Description of the HydrINS2/HydrINS 2 Mini product range

2.1 Mechanical description:

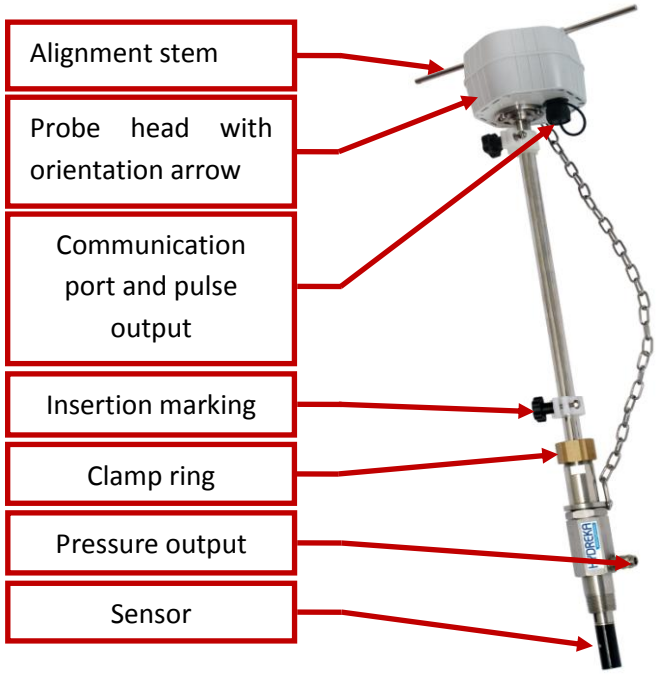
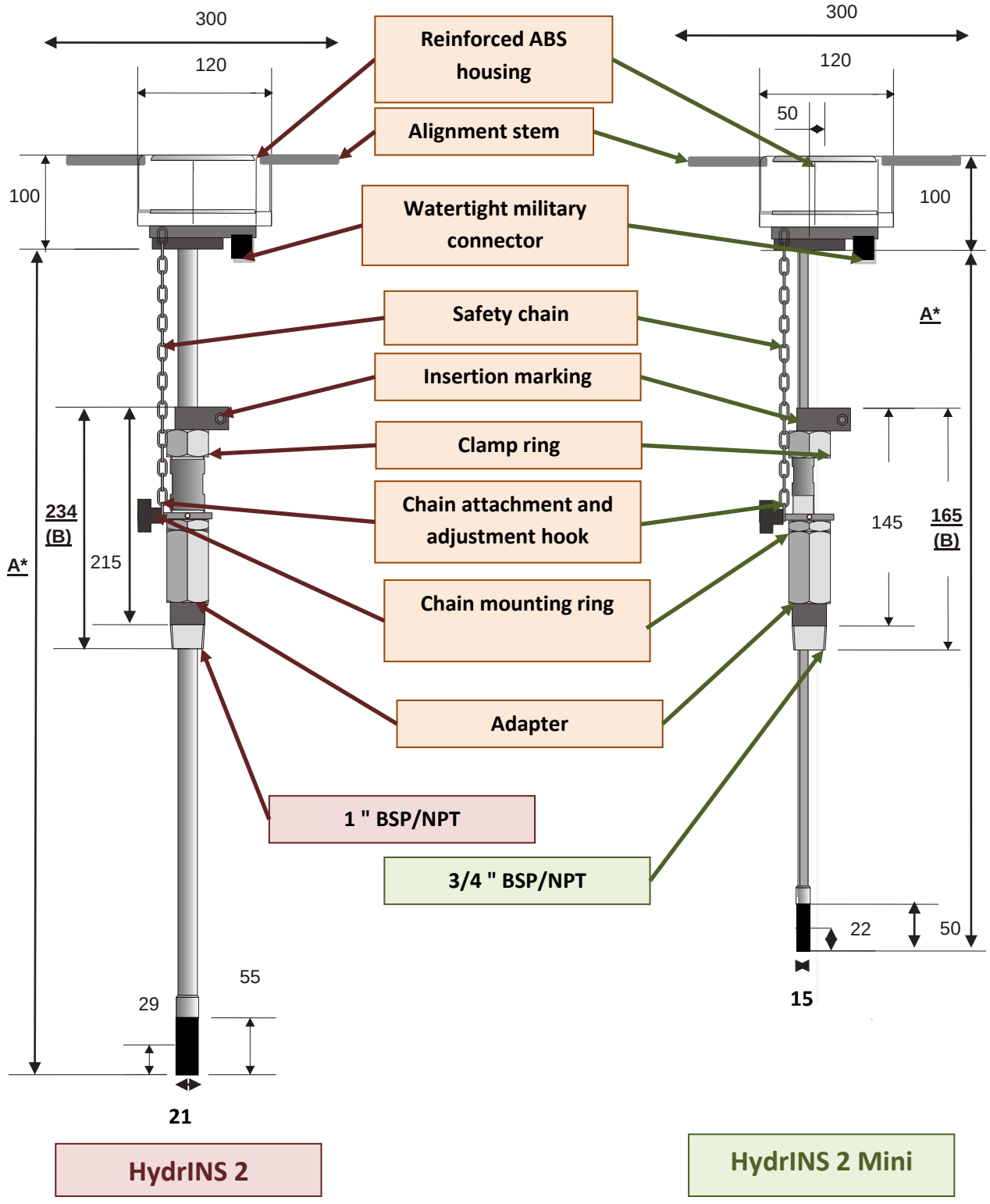


Figure 8: Mechanical description of the HydrINS 2 / HydrINS 2 Mini flow meter



**A: dimension A is 689 for Cat. No.:SI_HYDA2P-30 / 869 for Cat. No. SI_HYDA2P-50 / 1109 for SI_HYDA2P-70 / 1409 for SI_HYDA2P-100 / 500 for Cat. No. SI_HYDE2-15*

Figure 9: Drawing of the HydrINS 2 and HydrINS 2 Mini probes

2.2 Models in the HydrINS 2 / HydrINS 2 Mini flow meter range

The following table is a selection guide to identify the most appropriate HydrINS 2 model according to the pipe diameter and dimensions as shown in the diagram above:

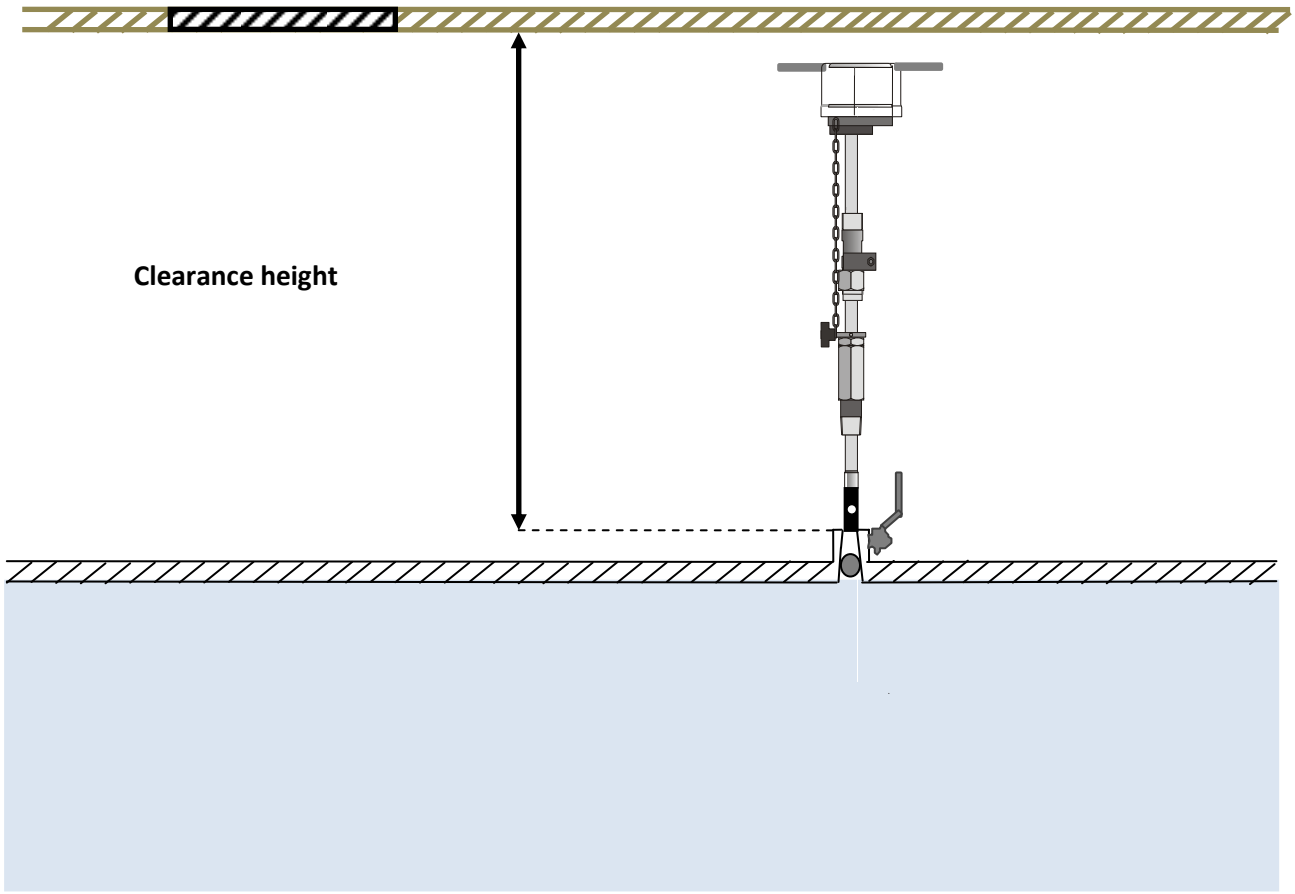
- A: Total stem length (see the above diagram)
- B: Stacking length of HydrINS 2/HydrINS 2 Mini accessories (see dimensions on the diagram above)
- C: Stacking height at insertion level (theoretical value, must be checked on site).

HYDREKA Catalogue Number	Model Hydrins	Dimension A	Dimension B	Dimension C*	Available insertion length = A-(B+C)	Usable on pipe diameters	
						Profile	***Centre***
SI_HYDA2P-30	300	689	234	*200*	*255*	*< 250 mm*	*< 500 mm*
SI_HYDA2P-50	500	869	234	*200*	*400*	*< 400 mm*	*< 800 mm*
SI_HYDA2P-70	700	1109	234	*200*	*675*	*< 650 mm*	*< 1300 mm*
SI_HYDA2P-100	1000	1409	234	*200*	*975*	*< 950 mm*	*< 1900 mm*
SI_HYDE2-15	Min (300)	500	165	*200*	*175*	*< 180 mm*	*< 300 mm*

Table 7: Flow meter selection table according to the flow range to be measured

Warning: This is a theoretical value. It is provided as an indication, but must be checked on site

The model is also chosen according to the space available in the port. Allow sufficient distance above the insertion point for installation in a port or valve chamber, known as the clearance height.



The clearance heights are presented in the table below:

Model	Clearance height (mm)
300	800
500	980
700	1220
1000	1520
Min.	610

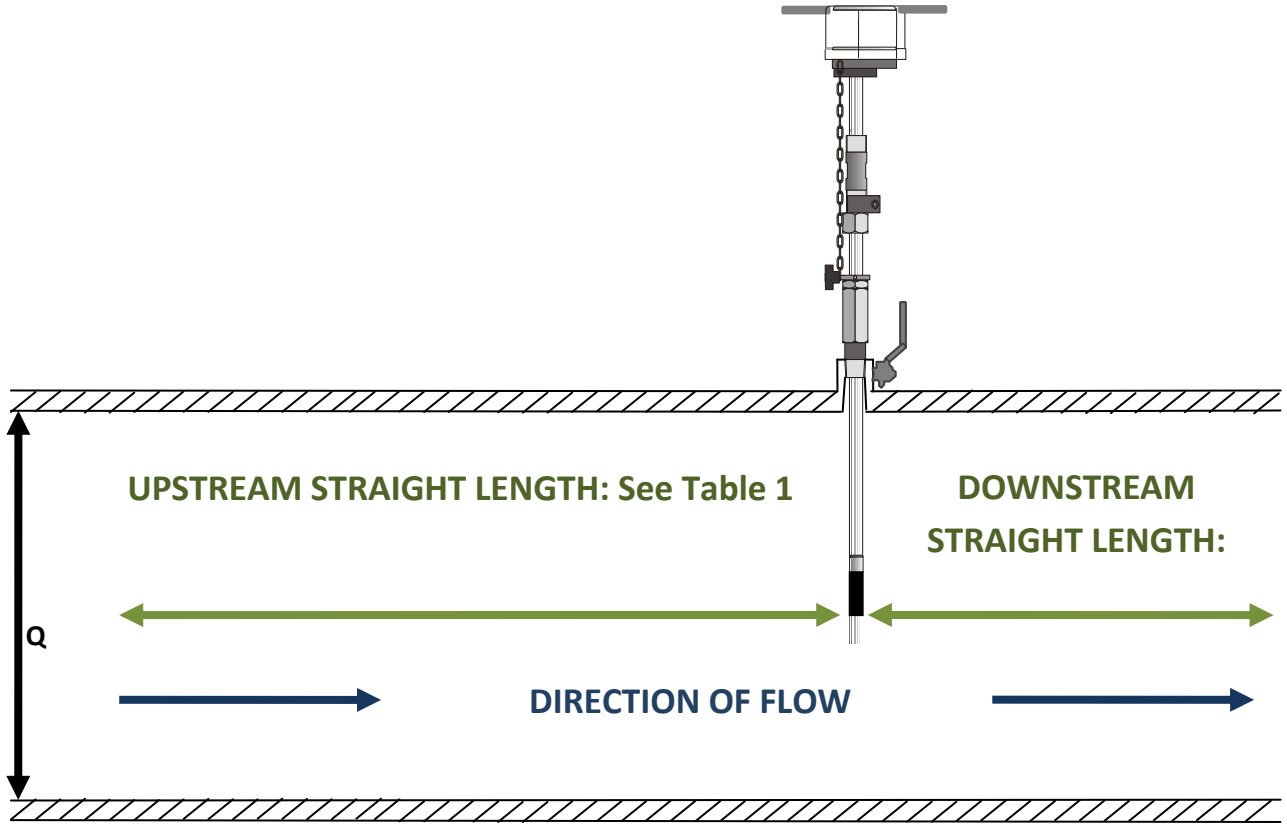
Table 7: Clearance heights above the insertion point required for installation of a HydrINS 2 / HydrINS 2 Mini flow meter.

Appendix 1 presents the HydrINS 2 / HydrINS 2 Mini flow meter models that can be used for several standardised diameters.

3 Installation location of the HydrINS 2 / HydrINS 2 Mini flow meter

3.1 Choice of installation location and installation and flow conditions

For accurate measurement of the flow, the pipe must be continuously carrying a flow, and disturbance-free upstream and downstream distances ('straight lengths') must be observed. The table below summarises the upstream distances to be observed according to the disturbing element



*ID: inside diameter of pipe

Figure 10: Flow conditions to be observed

Disturbances	Upstream straight length to be observed (multiple of the internal diameter ID)	
	Measurement to the centre	Measurement to 1/8th
90° connection or elbow	**25**	**50**
Convergent cone (18 to 36°)	**10**	**30**
Divergent cone (14 to 28°)	**25**	**55**
Open gate valve	**15**	**30**
Open butterfly valve	**25**	**45**

Table 1: Upstream disturbance-free straight lengths to be observed

3.2 Velocity limits for measurement

Maximum velocities must be observed in order to prevent irreversible damage to the sensor. The following charts show the maximum velocity applicable to the probe according to the chosen sensor diameter and position. These values are provided as an indication. They are used when programming the flow meter in Winfluid in the form of the **maximum flow rate tolerated by the probe** (refer to the **HydrINS 2/HydrINS 2 Mini flow meter acquisition programming manual**)

The flow rate is calculated based on a perfectly developed flow profile. Refer to the ISO 7145-1982 standard.

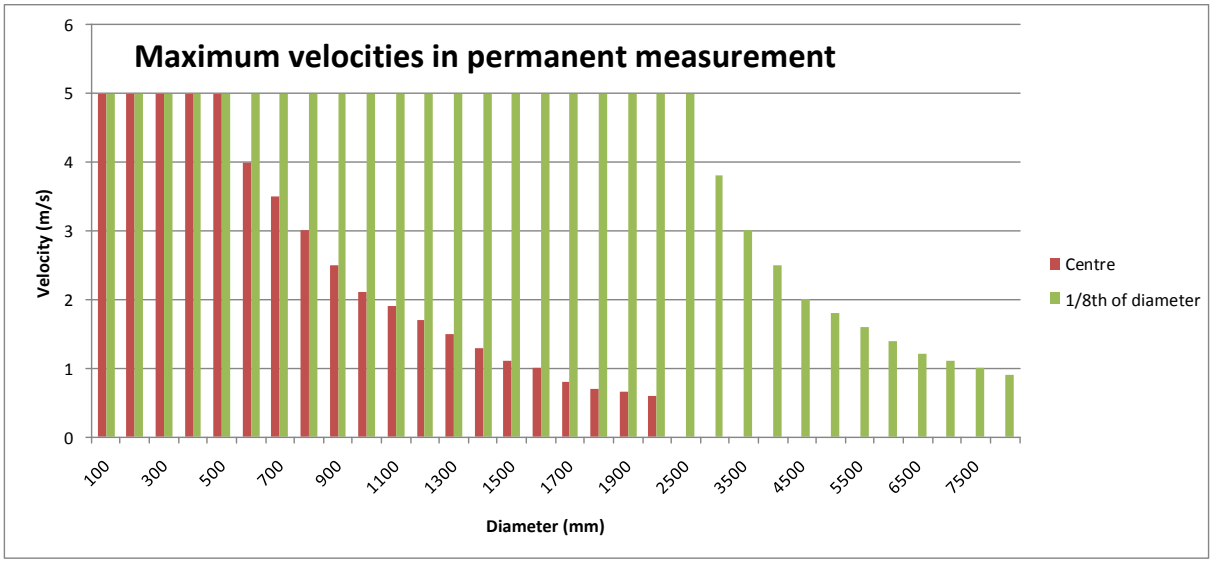


Figure 11: Maximum velocity for different pipe internal diameters

The creation of a velocity profile is used to refine the insertion factor and profile factor values (refer to the **HydrINS 2 / HydrINS 2 Mini flow meter acquisition programming manual**). The order of magnitude of the maximum velocities to be observed are indicated on the chart below.

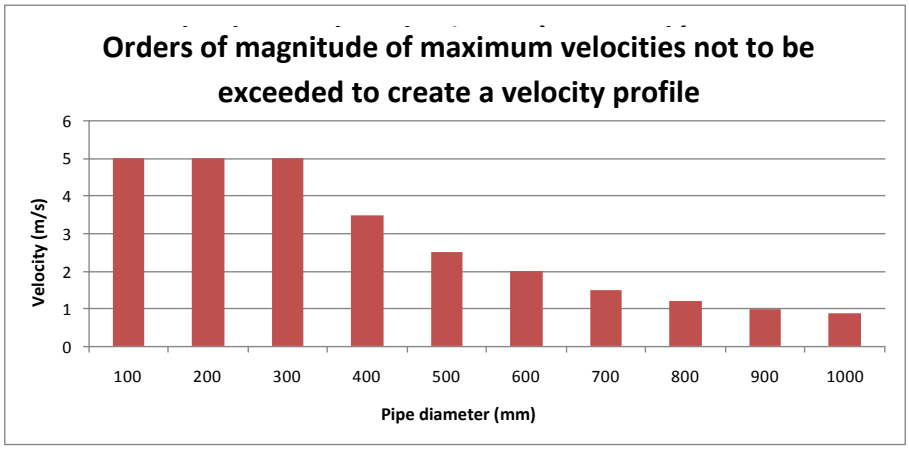


Figure 12: Orders of magnitude of maximum velocities not to be exceeded to create a velocity profile

3.3 Choice of position for the electromagnetic sensor

Two precise positions are chosen for the electrodes in order to take a flow measurement:

- At the centre of the pipe
- At 1/8th of the pipe diameter

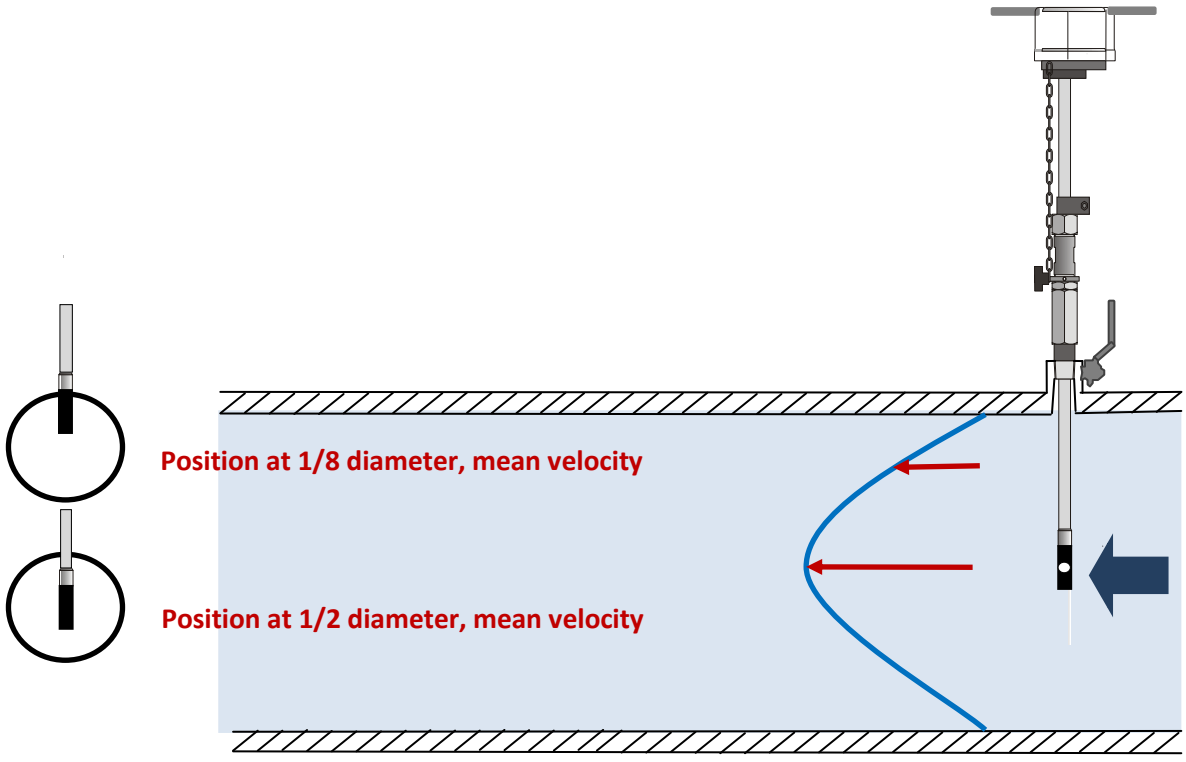


Figure 13: Valid positions of the HydrINS2/HydrINS 2 Mini flow meter sensor for flow measurement

3.4 Valve diagram for the installation of HydrINS 2 / HydrINS 2 Mini flow meters

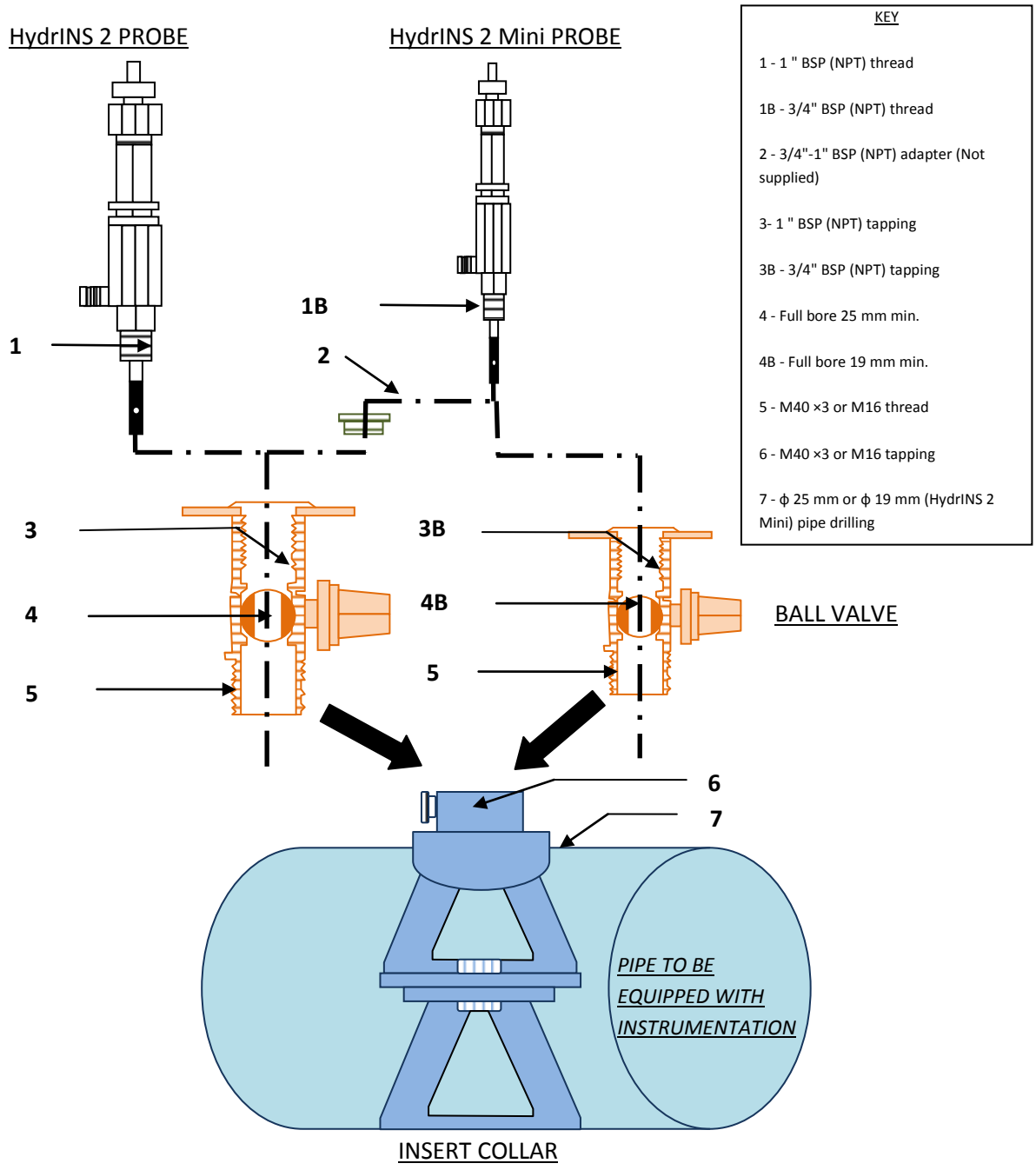


Figure 14: Diagram for the adaptation of different threads for the installation of the HydrINS 2/HydrINS 2 Mini flow meter

Typical installations are as follows:

- HydrINS 2**:** 1" insertion – drill 25 mm at least
- HydrINS 2 Mini**:** two possibilities:
    - Either 1" insert plus 1"-3/4" adapter – drill 25 mm at least: this can measure the inside diameter of pipes using diameter gauges marketed by HYDREKA and adaptable to 1" tappings**.**
    - or 3/4" insert – drill 19 mm at least**:** this does not require an adapter.

The preparation of an insertion point compatible with HydrINS 2 or HydrINS 2 Mini is exactly the same as for the preparation of a classic insertion point for the installation of a connection. No additional accessories are required. After drilling the pipe, tighten the HydrINS 2 /HydrINS 2 Mini probe to the ball valve. When installing the probe, it is recommended that you use Teflon to ensure that the probe/valve connection is perfectly watertight (if using a 1"-3/4" adapter, use Teflon for both sets of threading).

3.5 Inside diameter measurement gauges

Before the probe is installed, measurements may be performed using an adaptable diameter gauge on a 1" insertion thread. Their use requires the appropriate clearance above the pipe.

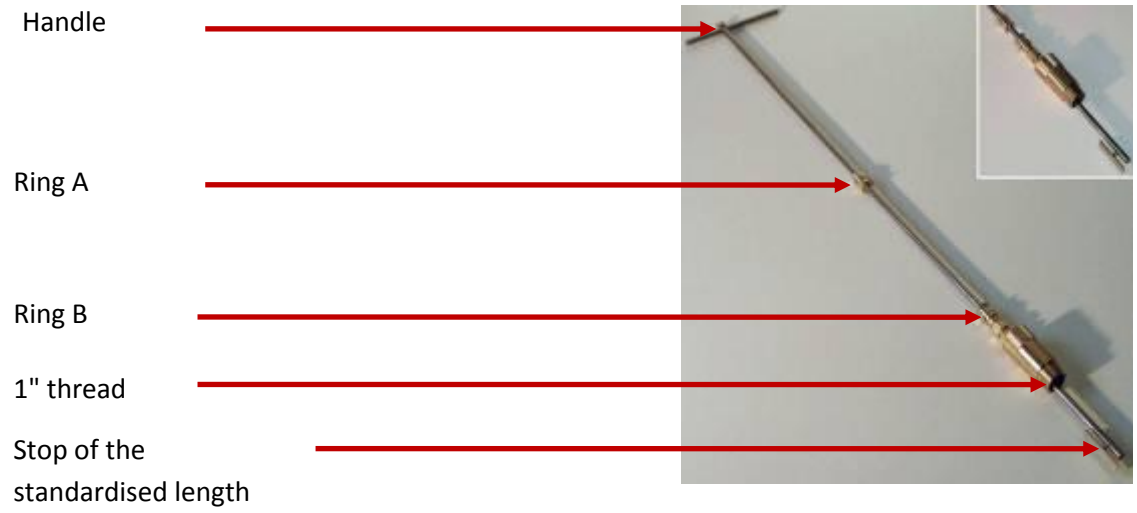


Figure 15: View of the different components of the diameter gauge

The diameter gauge has a bleed screw to evacuate the pressure. This is useful when excessive pressure prevents the user from bringing the gauge down to the bottom of the pipe.

Figure 16: Gauge pressure evacuator

Note that a gauge can be created with a personalised size and thread (please ask us). Available gauge models and their sizes are described in detail in **Appendix 2**

4 Installation of the HydrINS 2 / HydrINS 2 Mini flow meter

4.1 Method for installation at the centre:

The method for installing the probe at the centre, described below, includes three stages:

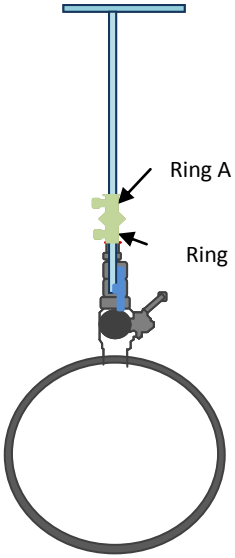
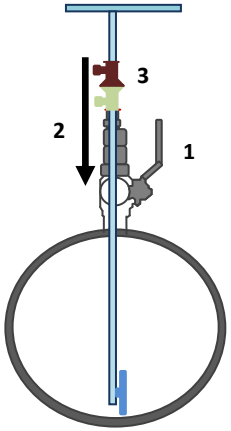
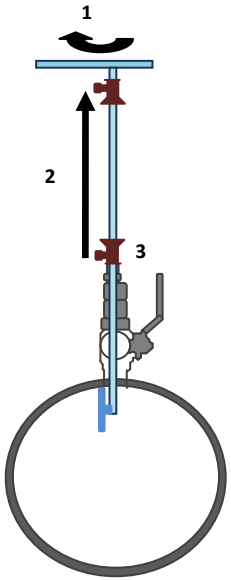
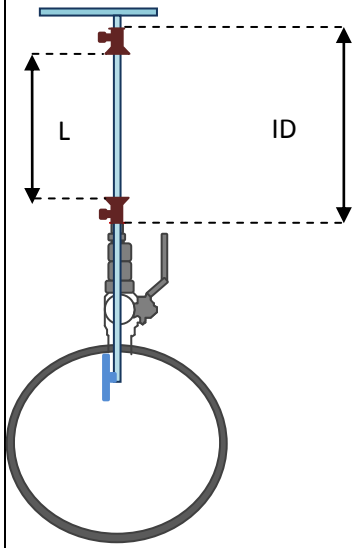
1. Measuring the inside diameter **ID** using the diameter gauge. If the inside diameter cannot be measured using the gauge, refer to the standardised characteristics of the pipes according to their nominal diameters and materials. See example in Appendix 1.

2. Measurement of insertion length $\mathbf{LI_{1/2}}$, as defined below

3. Installation of probes at the calculated insertion lengths

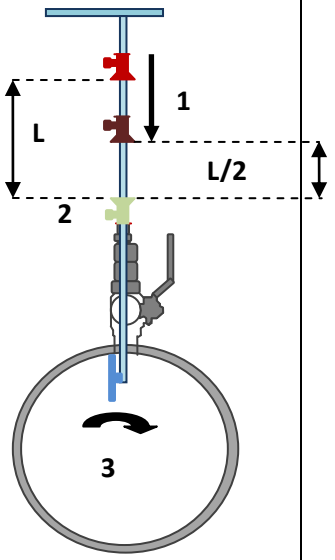
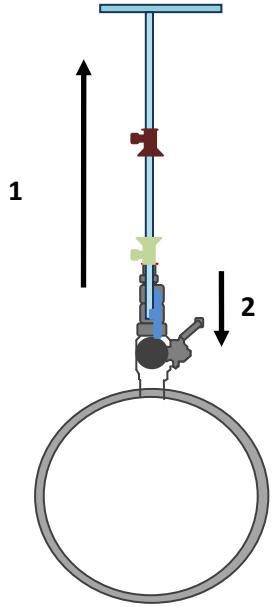
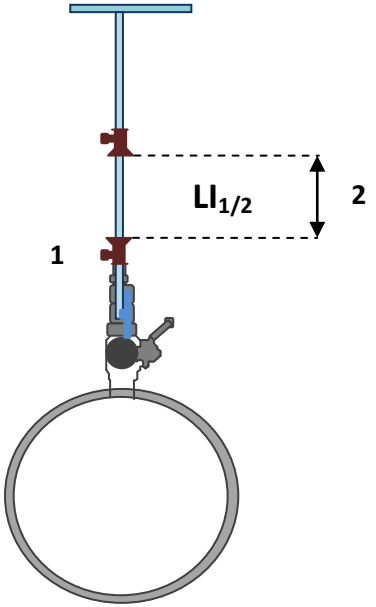
4.1.1 Step 1/3: Measuring the inside diameter ID using the gauge.

Freely rotating ring Immobilised ring

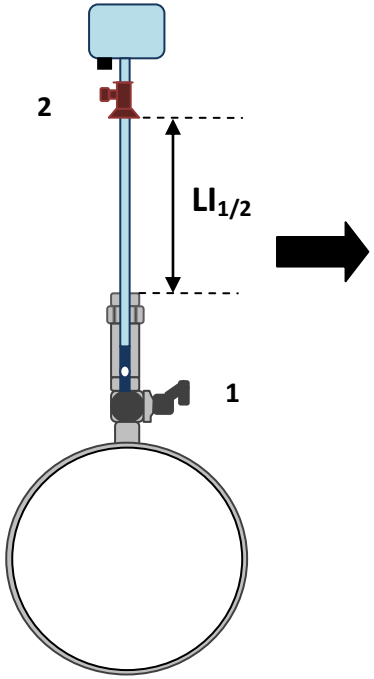
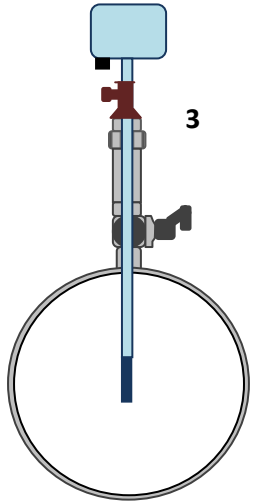
			
Tighten the diameter gauge, taking care to align the handle with the pipe axis.	1. Open the insert valve and lower the gauge until it stops against the bottom of the pipe. 2. Lower the two identification rings onto the gauge watertight fitting. 3. Lock Ring A in this position using the knurled screw.	1. Rotate the gauge through 180°. 2. Bring the gauge back up until it stops against the upper surface of the pipe. 3. Position Ring B where it stops against the watertight fitting of the gauge. Secure Ring B in this position using the knurled screw.	Measure the inside diameter ID between the external faces of the two rings.

It might not be possible to measure the ID (lack of space in the port or diameter too large). In that case, replace the ID value with an estimate (e.g., manufacturer data).

4.1.2 Step 2/3: Measurement of insertion length at the centre $LI_{1/2}$

		
1. From the last position, place Ring A half-way along the length L and lock Ring A in position. 2. Loosen Ring B. 3. Rotate the gauge through 180°.	1. Raise the gauge fully. 2. Close the insertion valve and place the tip of the gauge on the ball of the valve.	1. Tighten Ring B. 2. Measure the insertion length **$LI_{1/2}$** between the two internal faces of the rings.

4.1.3 Step 3/3: Insertion of the probe

		Installation at the centre
1. Close the insertion valve, tighten the probe, and lower the probe until it stops on the ball of the valve. 2. Place the insertion mark at the insertion length LI calculated above. 3. Open the insert valve and lower the probe until the insertion mark stops against the insert valve, and then slightly tighten the cable gland.		

4.2 Method for installation at 1/8

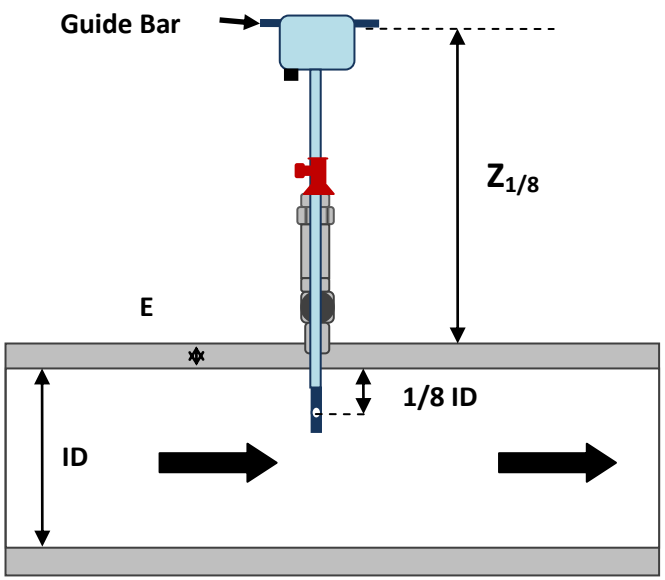


Figure 17: Diagram of installation at 1/8 diameter

For an installation at 1/8 diameter, the distance $Z_{1/8}$ after probe insertion must be equal to:

$$Z_{1/8} = L - E - 1/8\ ID$$

- **$Z_{1/8}$:** Distance between the lower edge of the guide bar and the top of the pipe (mm)
- E: Pipe thickness (mm)
- D: Inside diameter of pipe (mm)
- L: Length (mm) – value according to model, equal to the distance between the lower edge of the guide bar and the two measurement electrodes located on the sensor.

Model	L (mm)
300	760
500	935
700	1175
1000	1475
Min.	575

Table 2: Correspondence of lengths L with the HydrINS probe model for an installation at 1/8th diameter

4.3 Aligning the guide bar with the direction of flow

After adjusting the insertion distance and placing the flow meter in the desired position, gently press the cable gland to maintain the position. The orientation of the HydrINS 2 / HydrINS 2 Mini flow meter must now be adjusted. The head of the HydrINS 2 / HydrINS 2 Mini flow meter has a red arrow to orient the flow meter in the main direction of flow. Flow in this direction will count as positive, whilst flow in the reverse direction will count as negative.

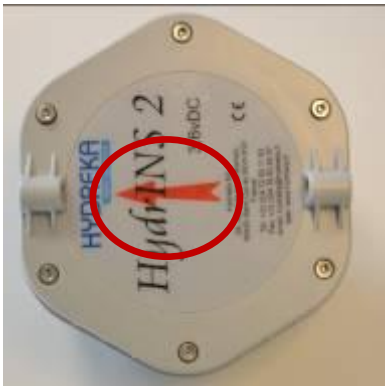


Figure 18: Position of the positive direction arrow on the probe head

The guide bar supplied with the flow meter allows the probe head containing the electrodes to be positioned in the direction of flow. Insert the bar in its lodging in the flow meter head, and then match the arrow with the positive direction using the guide bar by placing it in the direction of flow.

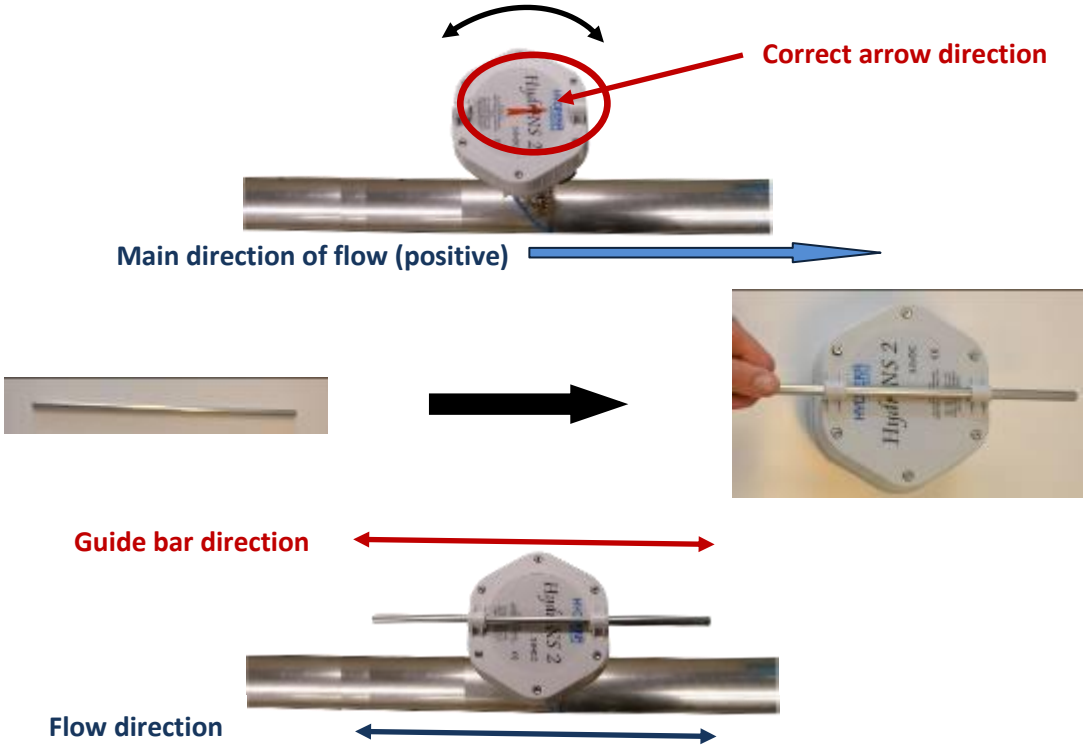


Figure 19: Aligning the flow meter in the direction of flow

Once the direction and alignment have been adjusted, tighten the cable gland more tightly to hold the flow meter firmly in its final measurement position.

5 Installing the pressure channel on a data logger

The HydrINS 2 / HydrINS 2 Mini insertion flow meter has a Quickfit connector to measure the pressure at the same point as the flow rate measurement.

This channel can be connected to a data logger with an **internal pressure channel (10 or 20 bars)**. This applies to data loggers such as **Lolog, Vista +, Octopus LX, etc.**

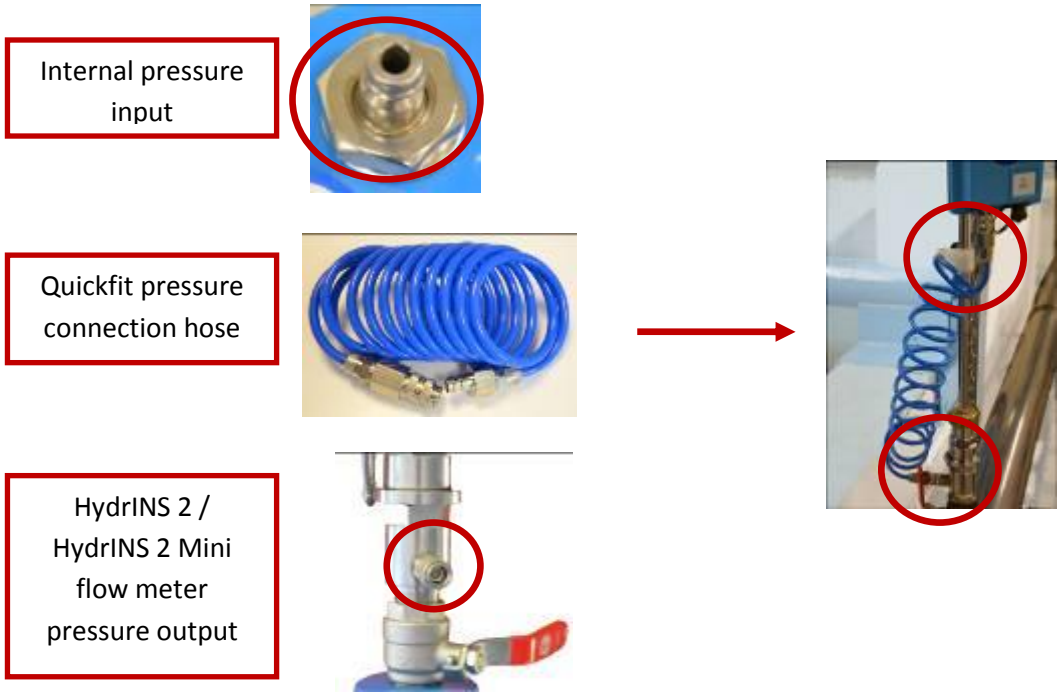


Figure 20: Quickfit connector for the pressure channel between data logger and probe

To program acquisition on this channel, refer to the manual on **Programming an internal pressure channel.**

6 Processing of data measured by display or recording

The flow data measured can be used in different ways:

- Archived by a data logger that supports a **digital channel** (Lolog, Vista +, Octopus LX, etc.) or by an external system (SCADA or remote management)
- Displayed on
    - a Type A display (Blue, Cat. No. AFFHYDA)
        - LCD measurement display (16 characters, two lines)
        - Two **pulse** outputs

- a Type C display (Green, Cat. No. AFFHYDC)
  - LCD measurement display (16 characters, two lines)
  - Two **4-20 mA** outputs
  - Four **pulse** outputs

- Displayed on a Display and archived by a standalone data logger

Displays A and C show:

- the flow rates (positive and negative)
- the mean speed
- the total volumes

There are some distinctive points between the two display units:

- With a Display A**:** the display unit can be equipped with batteries to obtain 10 years of operating life with one acquisition every minute. Two pulse outputs are available.
- With a Display C: External DC power supply (20-28 volts) with two 4-20 mA outputs (on terminal block) and four pulse outputs (two on terminal block, two on output connector).

The HydrINS 2/HydrINS 2 Mini flow meter operates in two separate modes:

- Mode 1 (without Display): the flow meter operates in standalone mode thanks to two batteries in the head of the flow meter.
- Mode 2 (with Display)**:** the flow meter operates thanks to the power supply from Display A or C. A back-up battery is kept in the head of the flow meter. In the event of an interruption of the electrical power supply from the display, this battery allows acquisition to continue until a normal electrical power supply is restored.

WARNING: This point is essential before putting the unit in operation. If an incorrect operating mode is selected, the probe board will suffer irreversible electrical damage.

			
Configuration with pulse output in bare wire to a SCADA system	Configuration with a standalone data logger	Configuration with blue Display A (standalone or supplied from outside)	Configuration with a green Display C (powered externally)
Mode 1	**Mode 1**	**Mode 2**	**Mode 2**

Figure 21: Installation configurations for HydrINS 2/HydrINS 2 Mini

It is essential to ensure that the HydrINS 2 / HydrINS 2 Mini flow meter is configured in the appropriate operating mode before placing it in operation; otherwise, the probe will suffer irreversible damage (see paragraph 7.2)

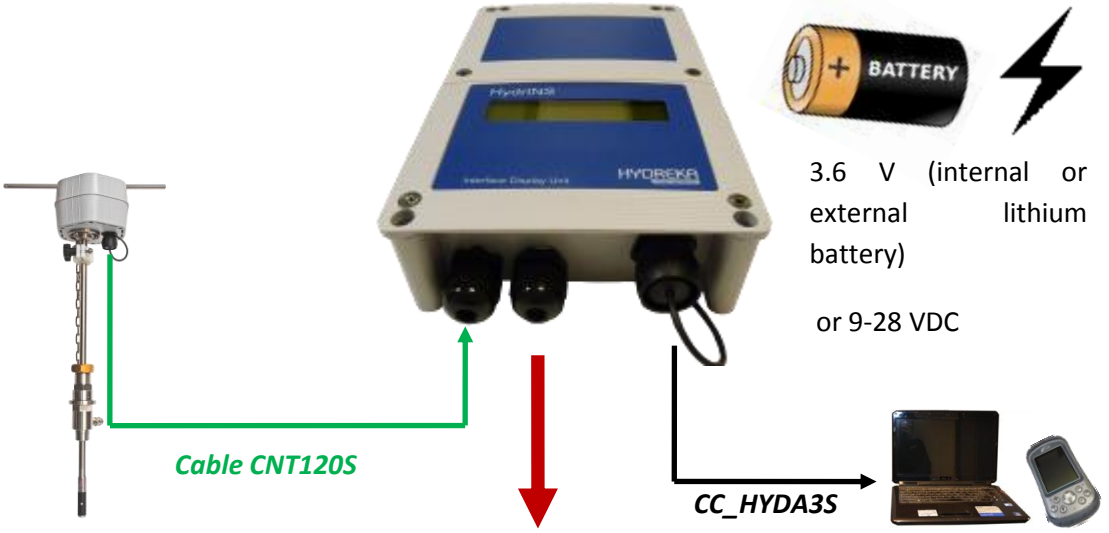
7 Installation of a Display A or a Display C

It is necessary to check in advance that the HydrINS 2/HydrINS 2 Mini flow meter is configured in **Mode 2** (See paragraph 7.2). It is important to specify that there is always the possibility of communicating with the flow meter from a computer to perform checks or acquisition reprogramming because the display is 'transparent' in communication between the computer and the HydrINS 2 / HydrINS 2 Mini flow meter.

7.1 Overview of Displays A and C

Displays A and C have cable gland fittings and a communication output.

DISPLAY A OUTPUTS (BLUE)



DISPLAY C OUTPUTS (GREEN)

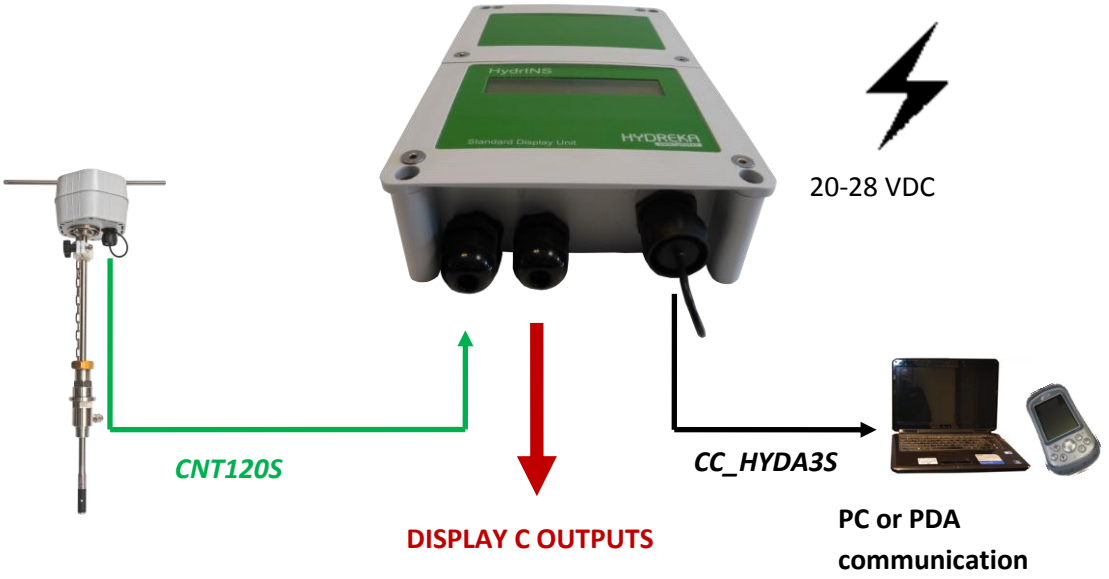


Figure 22: Inputs and outputs of Displays A and C

The applicable outputs for each of the displays are summarised in the table below:

DISPLAY A OUTPUTS	DISPLAY C OUTPUTS
• **Two pulse outputs**	• **Two 4-20 mA outputs** • Four pulse outputs

Table 3: Outputs of Displays A and C

To reduce energy consumption, the display is activated manually using a magnet included with the Display. This magnet must be applied to a magnetic zone on the side of the Display, the magnetic switch, in order to activate the Display. (The display time is adjustable when programming the probe).

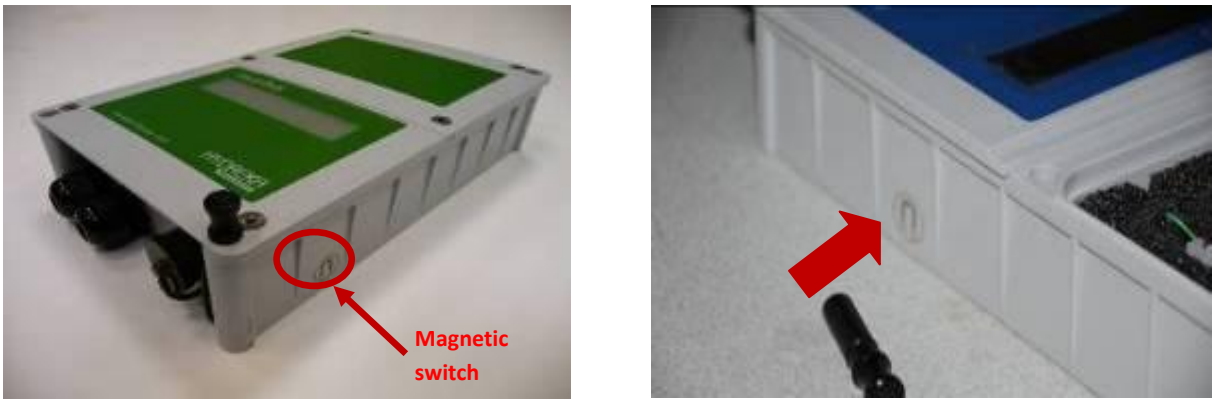


Figure 23: Application of the magnet to the magnetic switch to activate the Display

7.2 Wall mounting of Display A or Display C

Display A or Display C can be mounted on the wall according to the following layout diagram:

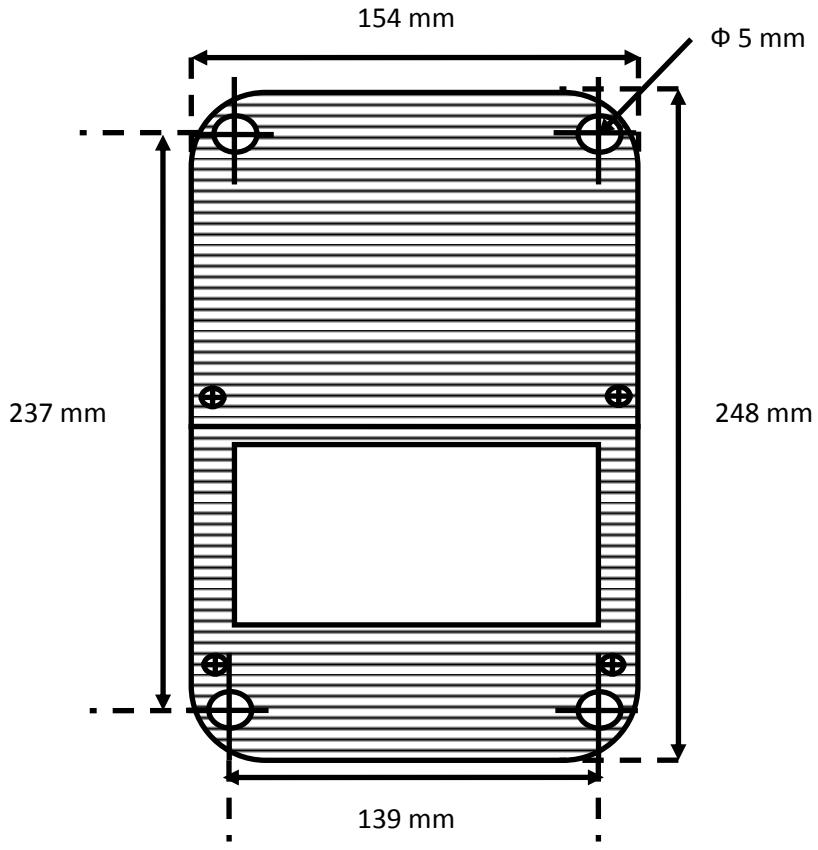


Figure 24: Layout diagram for the wall mounting of a Display A or C

7.3 Mode change of the HydrINS 2 and HydrINS 2 Mini probes

The change of the probe power supply mode must be performed with care. If not, there is a risk of causing severe electrical damage to the flow meter.

7.3.1 Equipment

The following equipment is required to remove the HydrINS 2/HydrINS 2 Mini probe head:

- Flat head screwdriver
- 4-mm Allen key

7.3.2 Removal

1 - Remove the six screws from the head of the flow meter:

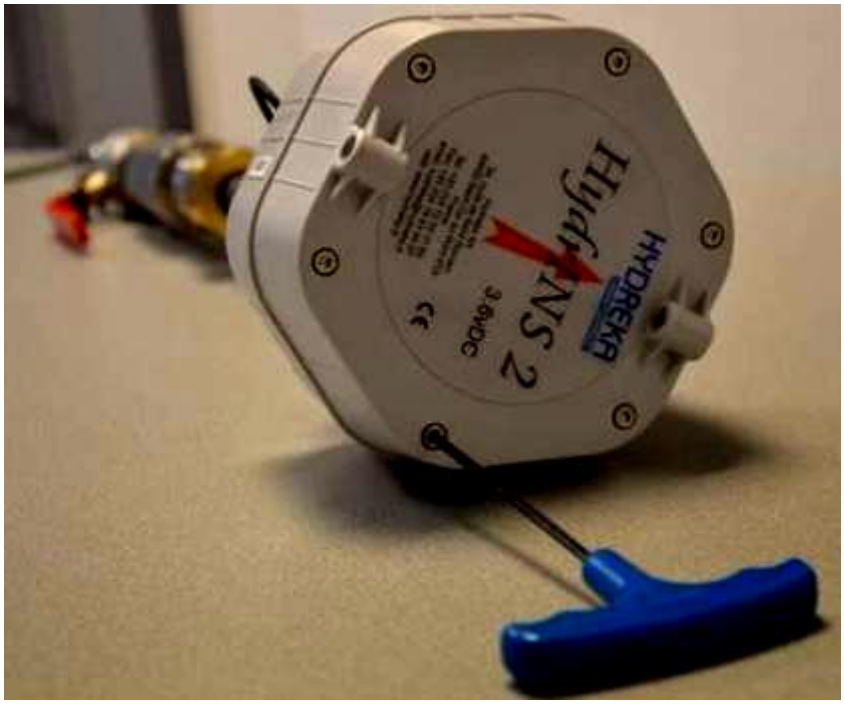


Figure 25: Remove the screws from the head of the HydrINS 2 flow meter

2 – Remove the reinforced ABS cover:

There are two possible cases:

- It is possible to switch the probe from one mode to the other thanks to the light that is present (see the indication below). In this case, after switching, immediately begin reinstalling the reinforced ABS cover as explained below.
- No light is present, and in this case, it is necessary to identify and then remove Battery 1 and/or Battery 2, taking care not to pull the wires off, and then to disassemble as explained below:

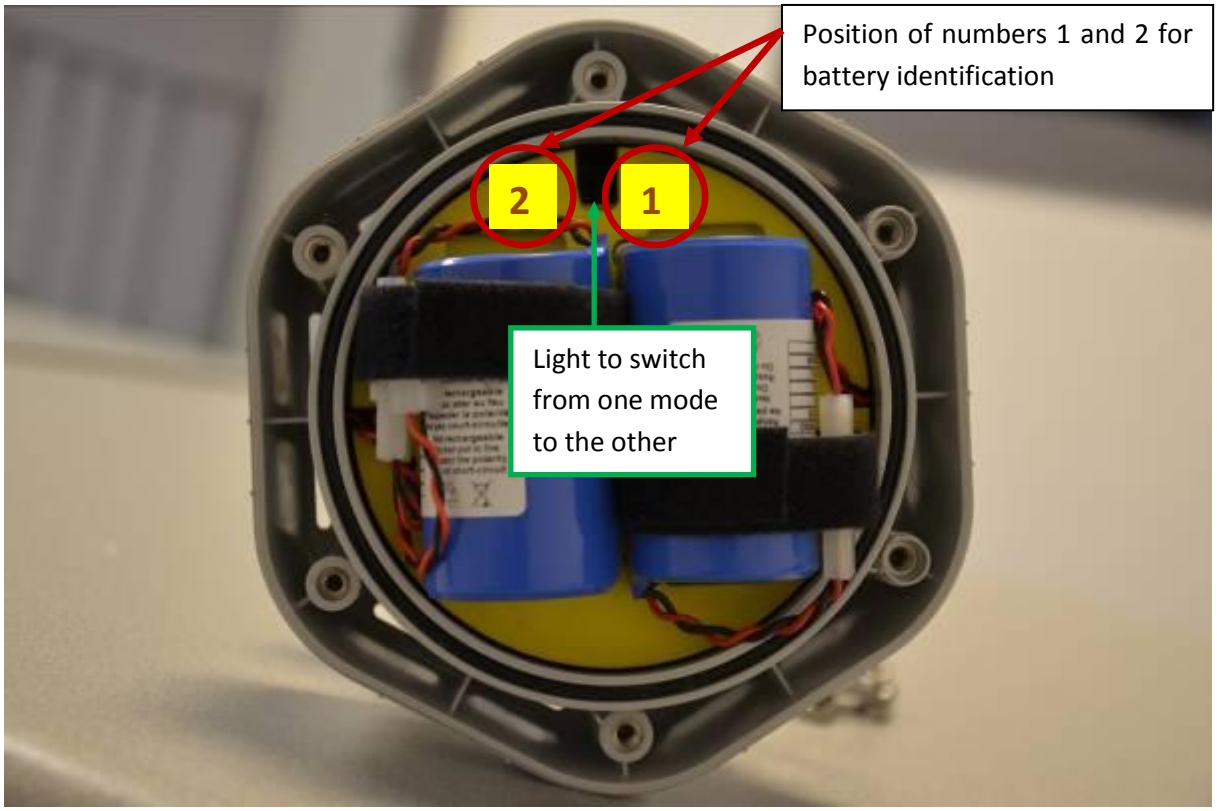


Figure 26: Overview of the inside of the HydrINS 2 flow meter head

Loosen the three flat-head screws securing the battery holder, and remove it.

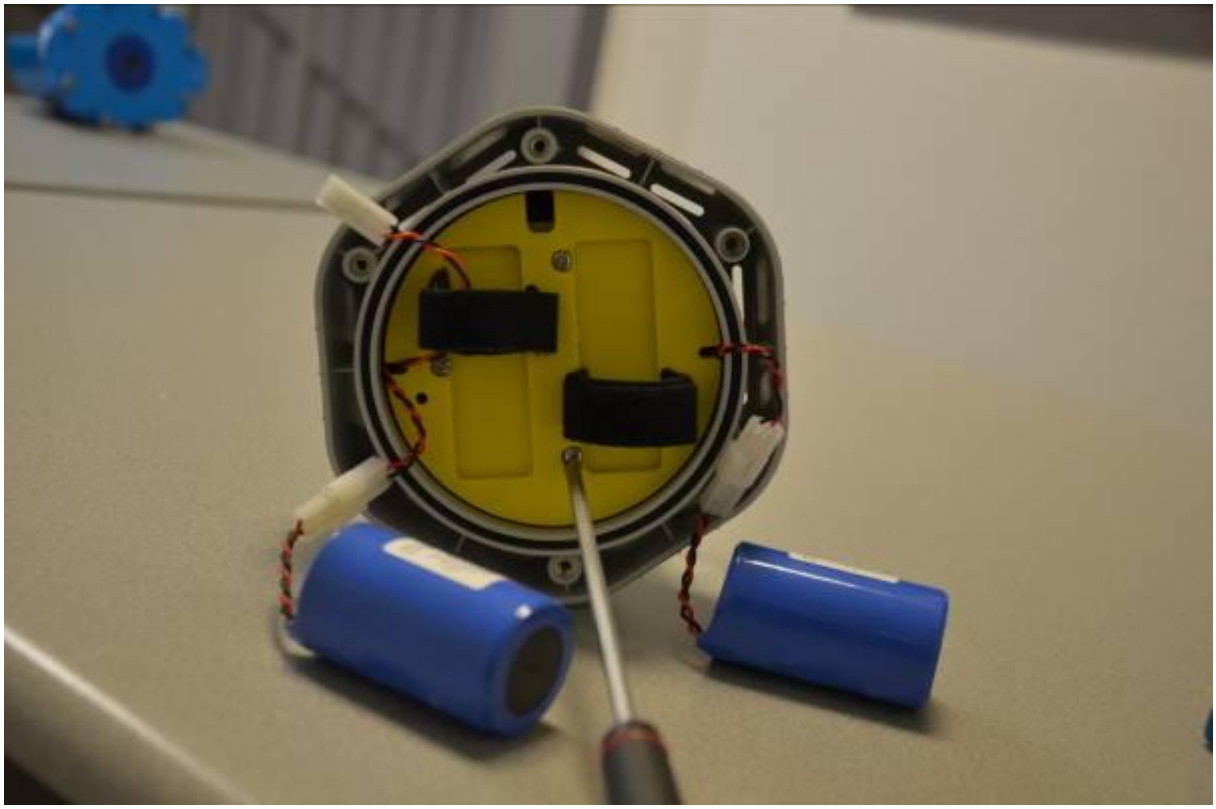


Figure 27: Removal of the head of the HydrINS 2 flow meter from the compartment

7.3.3 Mode change

According to the desired mode, set up the configuration described below:

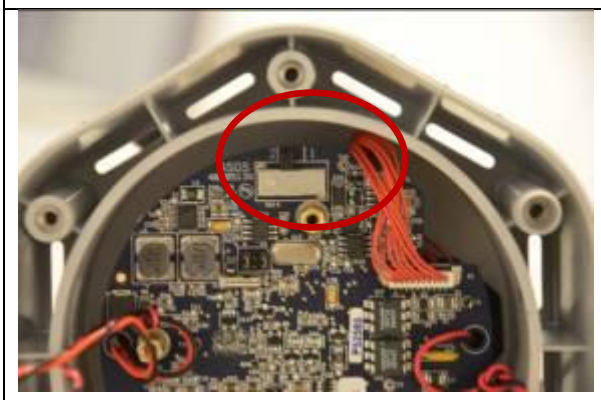
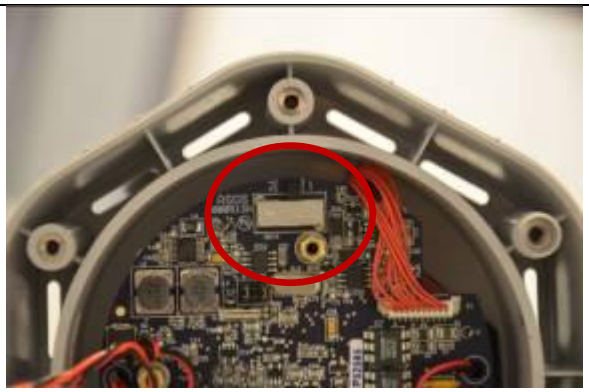
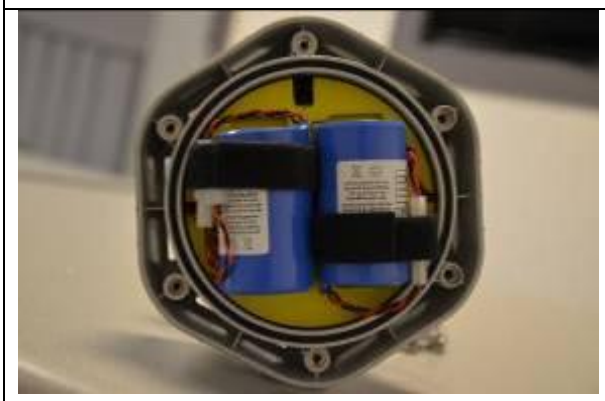
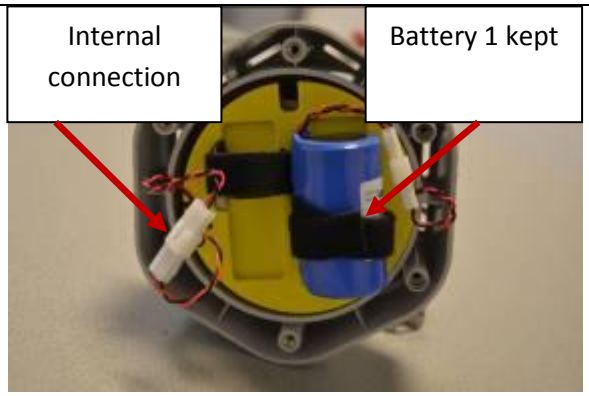
Mode 1: WITHOUT DISPLAY	Mode 2: WITH DISPLAY
	
	

Figure 28: Mode 1/Mode 2 change and arrangement of batteries in the HydrINS 2 flow meter

Reinstall the cover using the alignment guides:

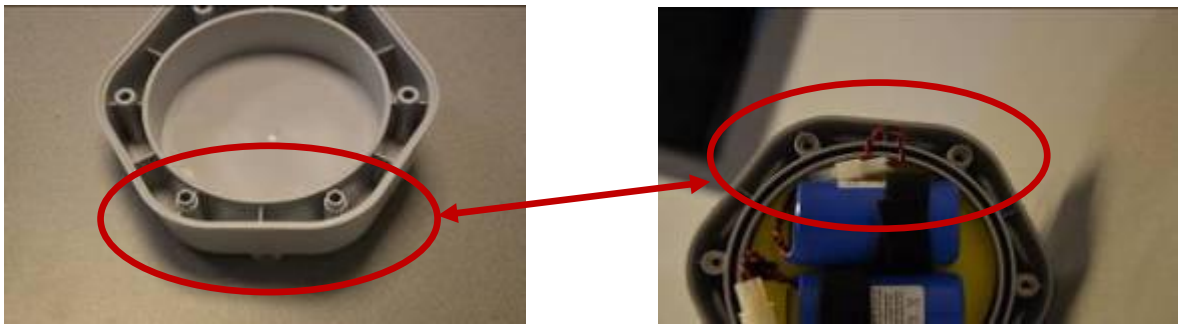


Figure 29: Locating guides for the head of the HydrINS 2 flow meter

7.4 Electrical power supply of Display A

Display A can be powered according to one of the following five modes:

- Internal 3.6 VDC lithium battery pack
- External 3.6 VDC lithium battery pack

- Internal 9 to 28 VDC alkaline battery pack
- An external 9 to 28 VDC power supply connected to the labelled 9-28 VDC terminals
- A 9 to 28 VDC external power supply connected to the military connector

These different power supply modes can be implemented using the two elements illustrated below:

- Switch SW2 with two positions: **Internal** and **External**
- Connector J15

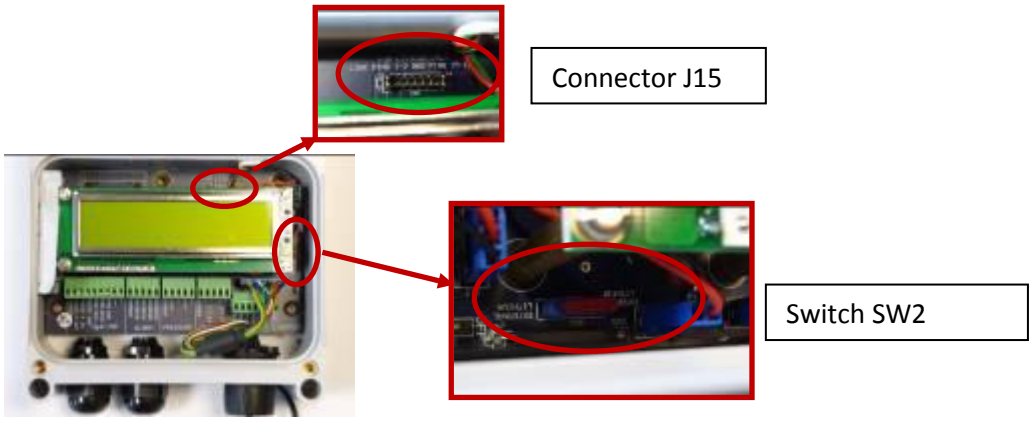


Figure 30: Positions of Connector J15 and Switch SW2 inside Display A

In a case other than lithium battery power supply, an electronic board, Cat. No. 400511, is connected to Connector J15. Two switches, SW1 and SW2, are present on this board.

7.4.1 Internal power supply using 3.6 VDC lithium batteries

1 – Create the following configuration:

- Switch SW2**: Internal**
- Connector J15**: Connect 1-2 and 15-16**

2 – Connect the battery pack (Cat. No. PILESPEHYDA) and close the cover of Display A.

Figure 31: Connection of the lithium battery

7.4.2 External power supply using 3.6 VDC lithium batteries

1 – Create the following configuration:

- Switch SW2: **External**
- Connector J15: **Connect 1-2 and 15-16**

2 – Connect the battery pack to positions **+/- 3.6 V** of the POWER connector, observing the polarities.

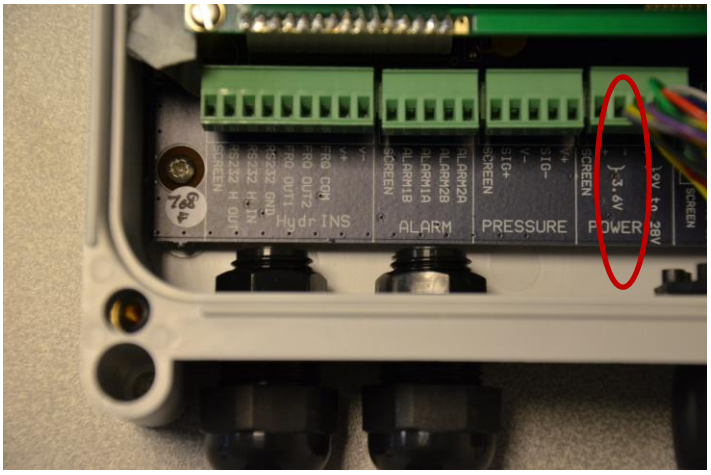


Figure 32: Position to use for an external 3.6 V power supply

7.4.3 Internal power supply using alkaline batteries

1 – Remove all connections from Connector J15, and then connect the additional board, Cat. No., 4005511 to the same connector. In this case, the position of Switch SW2 used earlier is no longer relevant. Switches SW1 and SW2 of the additional board will be used.

2 - Create the following configuration:

- Switch SW1 of the additional board: **Any position**
- Switch SW2 of the additional board: **Internal**

3 – Connect the battery pack to positions **+/- 9 to 28 V** of the **POWER** connector, observing the polarities.

7.4.4 External 9 to 28 VDC power supply connected to the internal terminals.

1 – Remove all connections from Connector J15, and then connect the additional board, Cat. No., 4005511 to the same connector. In this case, the position of Switch SW2 used earlier is no longer relevant. Switches SW1 and SW2 of the additional board will be used.

2 - Create the following configuration:

- Switch SW1 of the additional board: **Terminal**
- Switch SW2 of the additional board: **External**

3 – Connect the external power supply to positions **+/- 9 to 28 V** of the **POWER** connector, observing the polarities.

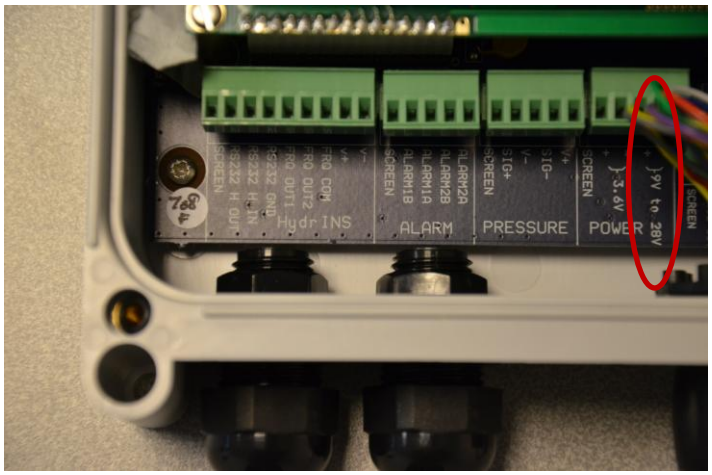


Figure 33: Position to use for an external 9-28 V power supply

7.4.5 External power supply by military connector

For connection to the military connector, use a CNT104/CNT105 cable, and then connect the banana plugs to an external power supply.

Figure 34: Power supply of a Display A with CNT 104 or CNT 105

1 – Remove all connections from Connector J15, and then connect the additional board, Cat. No., 4005511 to the same connector. In this case, the position of Switch SW2 used earlier is no longer relevant. Switches SW1 and SW2 of the additional board will be used.

2 - Create the following configuration:

- Switch SW1 of the additional board: **MilSpec**
- Switch SW2 of the additional board: **External**

7.5 Electrical power supply of Display C

Display C may be powered in two different ways:

- Terminal: By external power supply connected to the 20-28 VDC terminals
- MilSpec: By power supply via the military connector and a CNT 104 or CNT 105 cable as illustrated above (Figure 29)

Select the appropriate switch position indicated on the image below:

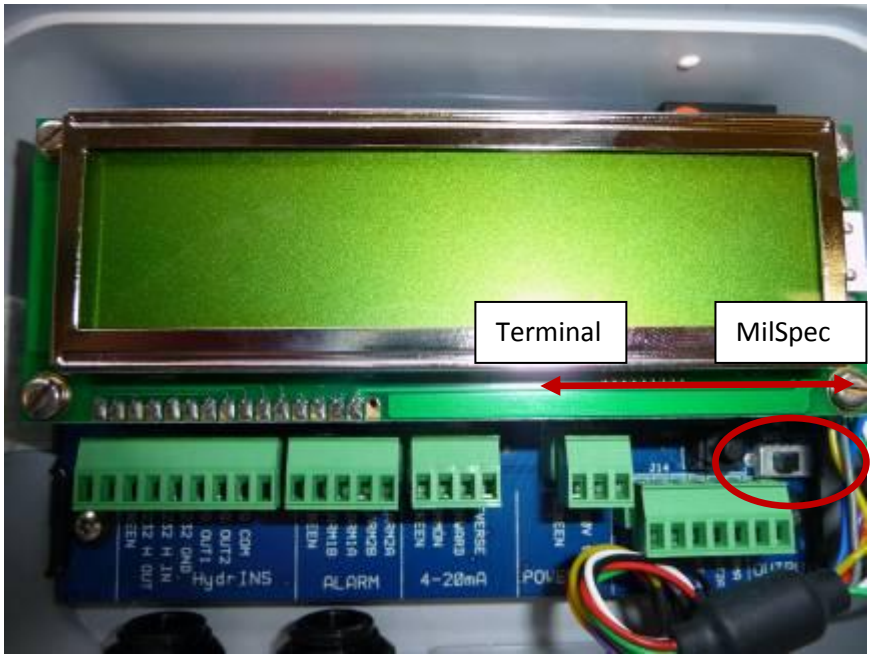


Figure 35: Selection of the type of power supply for Display C

Figure 36: Power supply of a Display C with CNT 104 or CNT 105

7.6 Wiring of the entities of the measurement chain

The connections between the various entities of the HydrINS 2 / HydrINS 2 Mini chain, created using military connectors, are summarised in the diagram below:

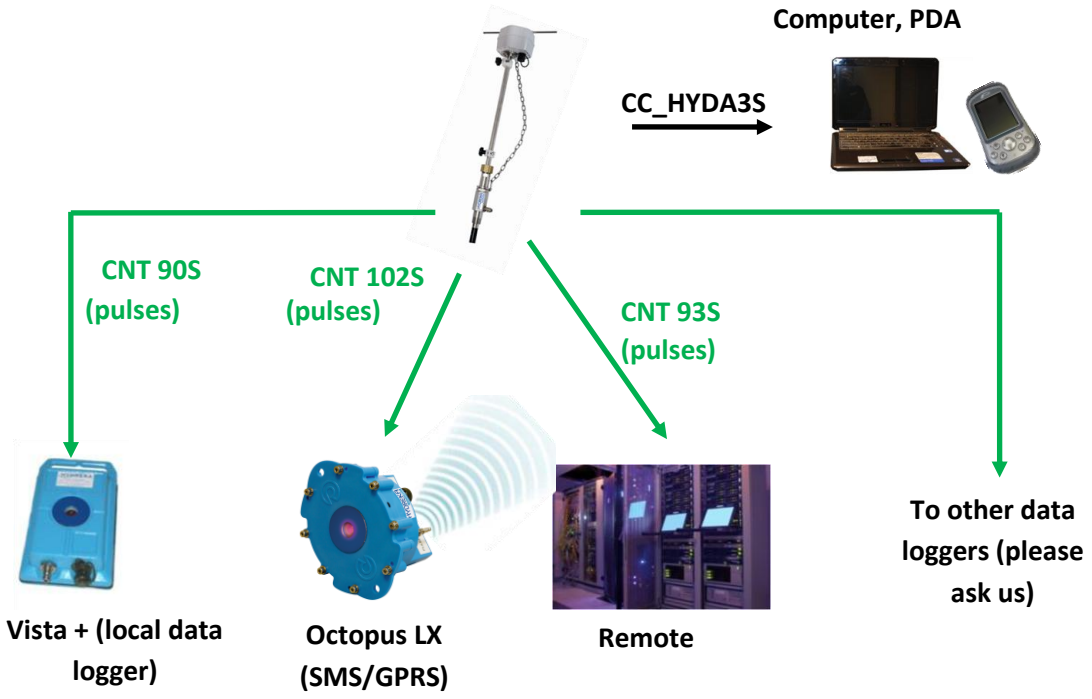


Figure 37: Wiring possibilities from a HydrINS 2 / HydrINS 2 Mini flow meter without Display (Mode 1)

Receiver	Cat. No. of cable used
Standalone data logger (Lolog, Vista +, etc.) 	CNT 90S
Octopus LX standalone data logger 	CNT 102S
SCADA system or remote management	CNT 93S
Other data loggers	(Please ask us)

Table 4: Wiring of HydrINS 2 / HydrINS 2 outputs in Mode 1

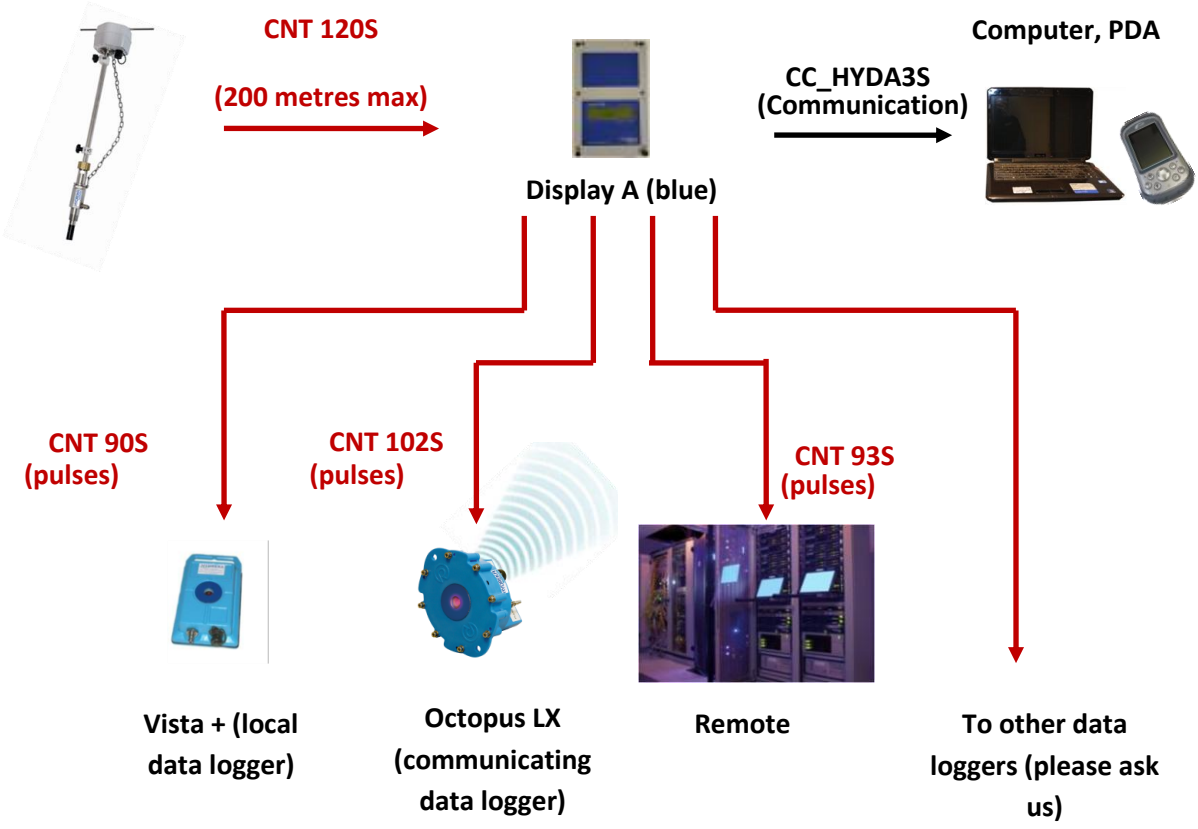


Figure 38: Wiring possibilities from a HydrINS 2 / HydrINS 2 Mini flow meter with Display (Mode 2)

Receiver	Cat. No. of cable used
Display A (blue) 	CNT 120S

It is also possible to retrieve a pulse output from a Display A on another pulse acquisition system (standalone data logger, SCADA or remote management) by connecting the Display and the acquisition system. To do this, use the same cables that were used to connect the HydrINS 2 / HydrINS 2 Mini flow meter and acquisition system, to connect the acquisition system to the Display communication military connector

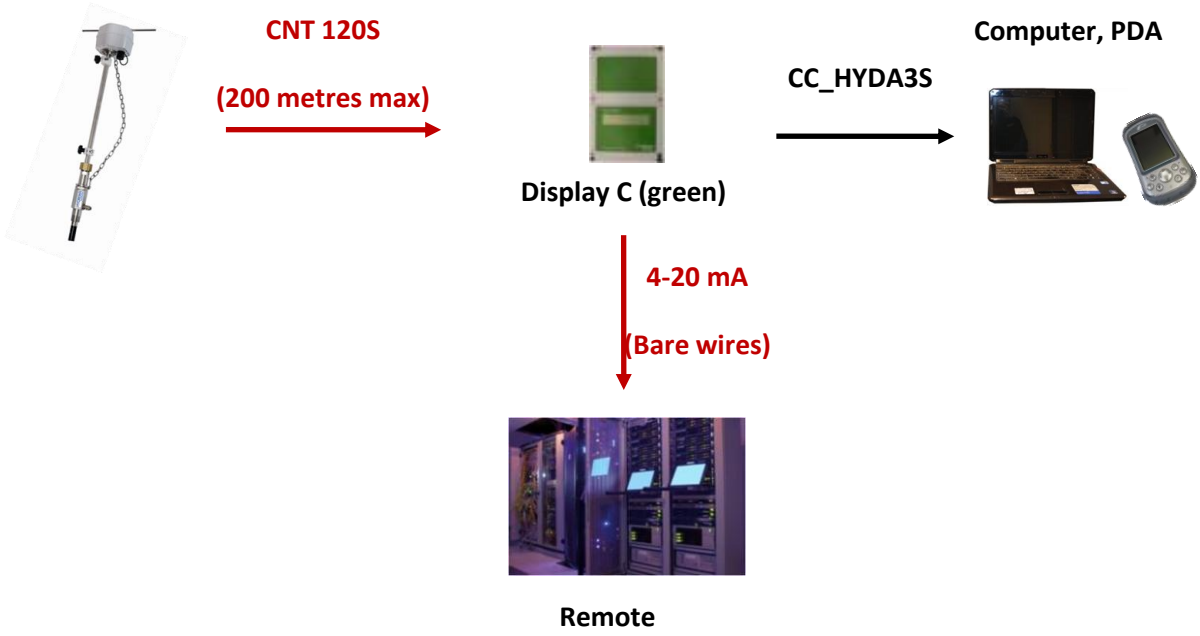


Figure 39: 4-20 mA outputs on Display C

Receiver	Cat. No. of cable used
Display C (green) 	CNT 120S

Power supply to Display C with a **continuous power supply** (between 20 - 28 VDC) is mandatory for the 4-20 mA outputs to be operational.

Possibility of retrieving a pulse output from Display C. For further information, please ask us.

7.7 Internal wiring

7.7.1 Connections of the flow meter pulse output to the Display terminal block

The PIN numbers correspond to the following connector diagram:

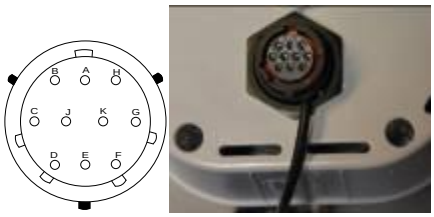


Figure 40: Output connector pin correspondence diagram

Each PIN number corresponds to a coloured wire at the other end of the HydrINS 2/HydrINS 2 Mini connection cable > Display A or C

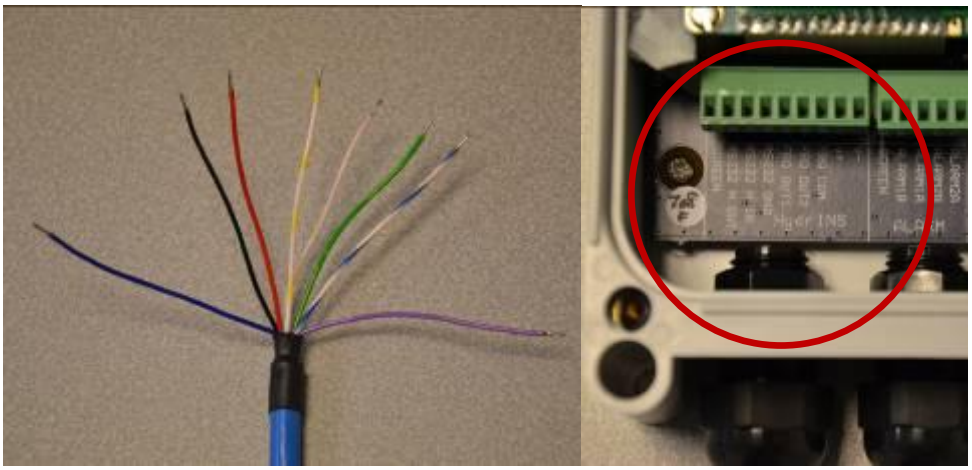


Figure 41: Output connector pin correspondence diagram

Pin No. on Probe Connector	Colour	Terminal Description
Not Connected	Screening	Screen
A	Purple	Com Frq
B	White/Blue	Frq Out 1
C	Black	V-
D	Red	V+
F	Green	RS232 GND
H	White/Yellow	Freq Out 2
J	Blue	RS232 H In
K	White	RS232 H Out

Table 5: Cable connections according to their colour and terminal designation

7.7.2 Pulse output connections to the Display terminal block

Figure 42: Location of pulse outputs

Route the cable into the cable gland, and then fasten the various wires to the pulse connector according to the correspondence table below:

Terminal block designation (output)	Function
Com Frq	Pulse output common
Frq Out 1	Frequency output (normal direction)
Freq Out 2	Frequency output reverse direction or direction

Table 6: Pulse output connections – Terminal block designation – Output

Reconnect the connector and retighten the cable gland.

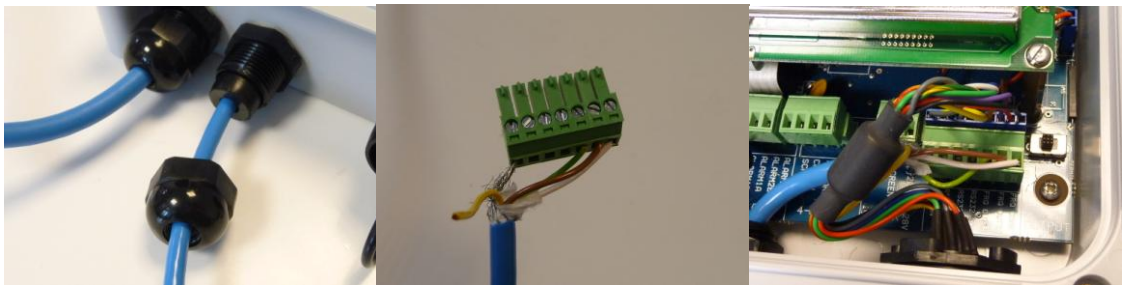


Figure 43: Connection of pulse outputs to terminal block

If the cable has a braid, it can be connected to the **Screen** output of the connector in case of electrical interference.

7.7.3 Wiring the 4-20 mA outputs to the terminal block of Display C

Power supply to Display C with a continuous power supply (between 20 - 28 VDC) is mandatory for the 4-20 mA outputs to be operational.

Figure 44: Location of the 4-20 mA outputs (Display C)

Route the cable into the cable gland, and then fasten the various wires to the **4-20 mA** connector according to the correspondence table below:

Terminal block (4-20 mA outputs) SDU only	Function
Screen	Not Connected
Common	4-20mA GND
Forward	4-20 mA output normal direction
Reverse	4-20 mA output reverse direction

Table 7: Connections for the active 4 – 20 mA outputs (power supplied by the display unit)

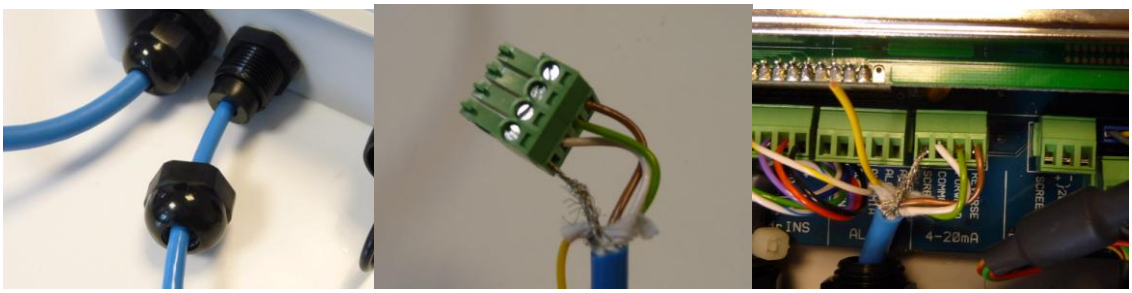


Figure 45: Connection of the pulse outputs to the terminal block of Display C

If the cable has a braid, it can be connected to the **Screen** output of the connector in case of electrical interference.

7.8 Protecting the displays from lightning and surges

the HydrINS2 / HydrINS 2 Mini insertion flow meter and Displays A and C have no protection against lightning and surges.

We recommend the installation of an external device to protect it from surges caused by lightning (lightning arrester, galvanic isolation, etc.).

It is possible to protect **Display C** from surges from external connections using galvanic isolation modules, in accordance with the following diagram:

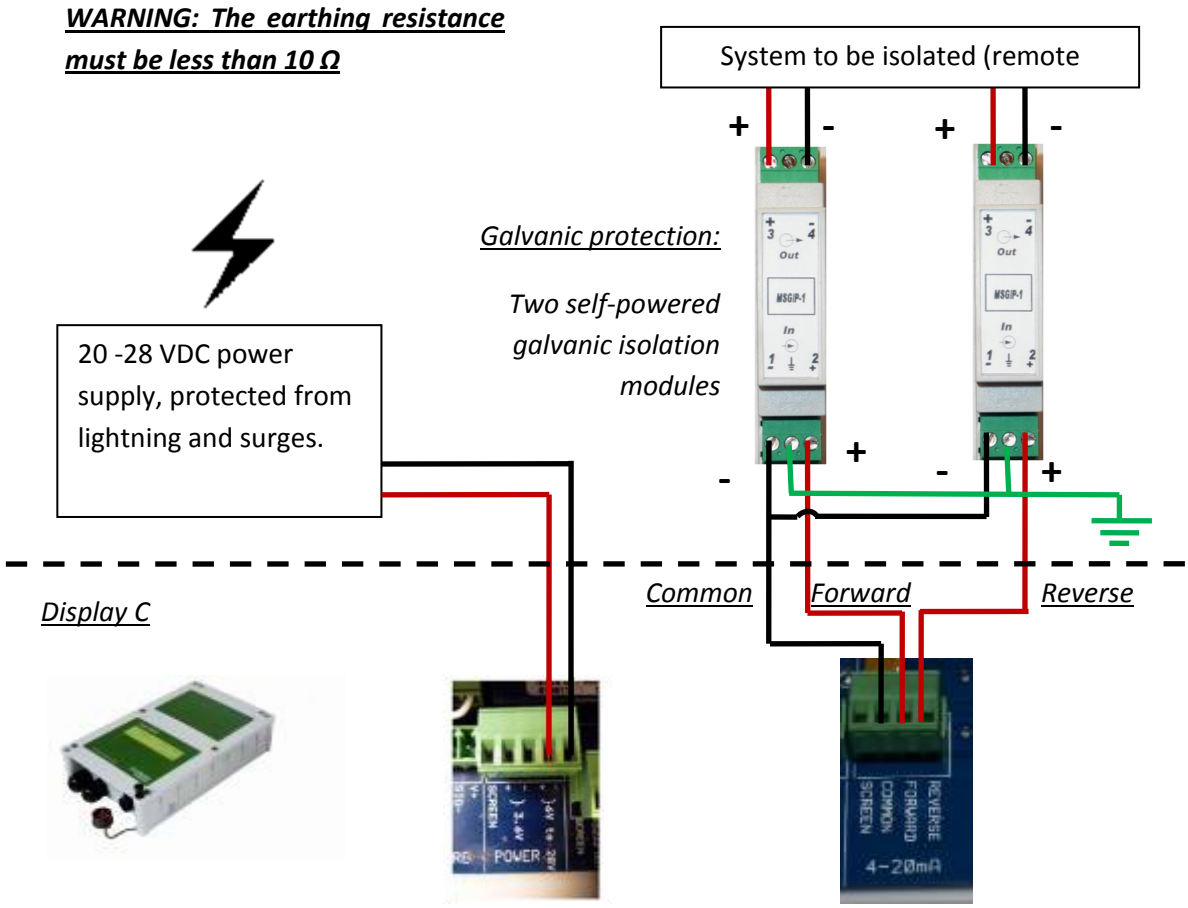


Figure 46: Lightning protection of Display C

8 Maintenance

Maintenance of the HydrINS2 / HydrINS 2 Mini product is very easy: simply remove the probe from the insert (ensure that the chain is taut when reassembling).

This maintenance procedure is very economical compared to the maintenance of an electromagnetic sleeve, for example.

For water loaded with metal particles, in particular, remember to clean the probe regularly.

Figure 47: Maintenance of a flow meter measuring water loaded with metal particles

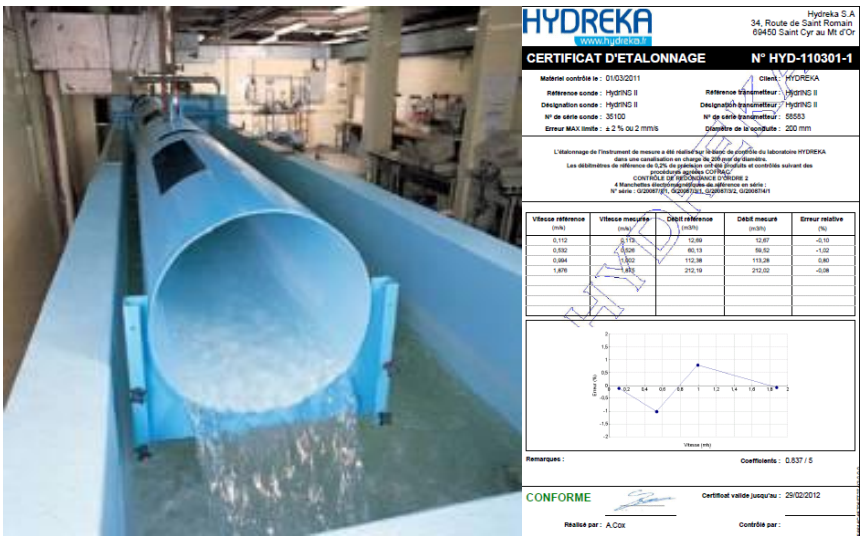
9 Maintenance

The operations described in this section of the manual must be performed by qualified personnel. These operations may be performed by you in accordance with Hydreka procedures, or they may be covered by a maintenance contract. In this case, please contact our customer service department (services@hydreka.fr).

Several planned maintenance operations are necessary. These are described below.

9.1 Calibration

Calibration of the HydrINS 2 / HydrINS 2 Mini flow meter every two years is recommended. This service can be performed by HYDREKA, which has a COFRAC-connected hydraulic bench for flow meter calibration.


HYDREKA
www.hydreka.fr

Hydreka S.A
34, Route de Saint Romain
69450 Saint Cyr au Mt d'Or

CERTIFICAT D'ETALONNAGE N° HYD-110301-1

Matériel contrôlé le : 01/03/2011
Client : HYDREKA
Référence sonde : HydrINS II
Référence transmetteur : HydrINS II
Désignation sonde : HydrINS II
Désignation transmetteur : HydrINS II
N° de série sonde : 35100
N° de série transmetteur : 58583
Erreur MAX limite : ± 2 % ou 2 mm/s
Diamètre de la conduite : 200 mm

L'étalonnage de l'instrument de mesure a été réalisé sur le banc de contrôle du laboratoire HYDREKA dans une canalisation en charge de 200 mm de diamètre.
Les débitmètres de référence de 0,2% de précision ont été étalonnés et contrôlés suivant des procédures conformes à la norme ISO 9001.
CONTROLE DE REPRODUCIBILITE 2
4 Manchettes électromagnétiques de référence en série :
N° série : G20607101, G20607102, G20607103, G20607104

Vitesse référence (m/s)	Vitesse mesurée (m/s)	Débit référence (m3/h)	Débit mesuré (m3/h)	Erreur relative (%)
0,112	0,113	12,69	12,67	-0,10
0,532	0,526	60,13	59,52	-1,02
0,994	1,002	112,39	113,29	0,80
1,876	1,873	212,19	212,02	-0,08

Remarques :
Coefficients : 0.837 / 5

CONFORME
Certificat valide jusqu'au : 29/02/2012
Réalisé par : A.Cox
Contrôlé par :

Figure 48: Hydraulic bench for the calibration of HydrINS 2/ HydrINS 2 Mini flow meters and HYDREKA calibration certificate

A calibration certificate is issued at the end of the calibration phase (see **Appendix 4**).

9.2 Replacing the batteries of the HydrINS 2 / HydrINS 2 Mini flow meter

Apply the following procedure to replace the batteries in the head of the HydrINS 2 / HydrINS 2 Mini flow meter:

1 – Open the head of the flow meter

2 – Disconnect the used battery and connect the new one.

3 – In Winfluid, click input channel **HydrINS II** or **Mini HydrINS**. In the **Sensor** tab, click **Properties**, and then **Advanced**. In the **Maintenance** tab, select the boxes for Batteries 1 and 2 in the head, and then confirm by clicking **OK**. The battery level will then be reinitialised during probe programming.

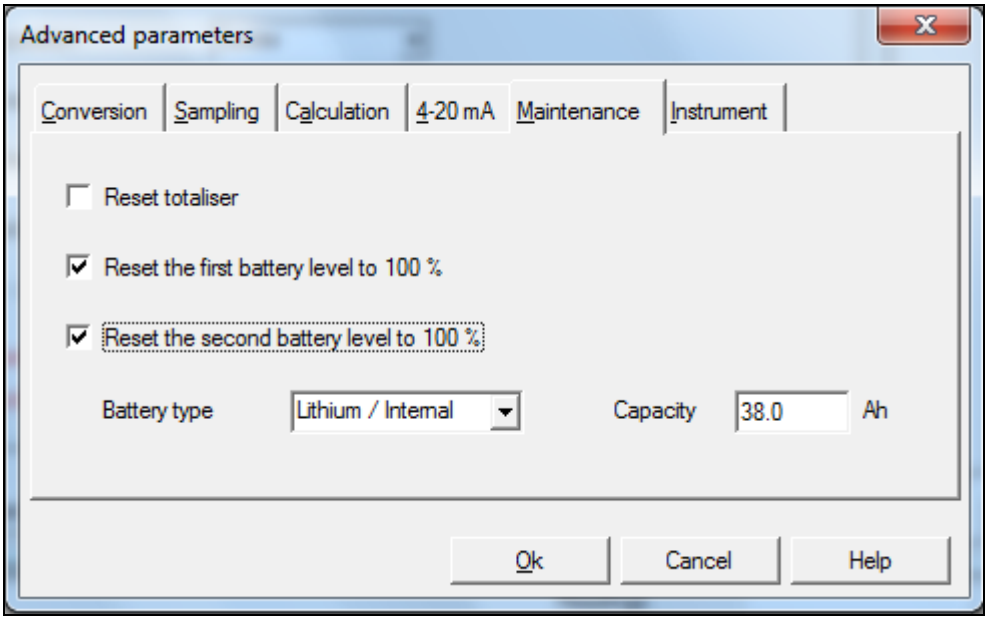


Figure 49: Reinitialisation of the battery levels in HydrINS 2 in Mode 1 in Winfluid

9.3 Replacing the batteries in Display A

1 – Open the cover of Display A

2 – Remove the used battery and insert the new battery

3 – Close the cover of Display A

4 – In Winfluid, click input channel **HydrINS II** or **Mini HydrINS**. In the **Sensor** tab, click **Properties**, and then **Advanced**. In the **Maintenance** tab, select the boxes for Battery 2, and then confirm by clicking **OK**. The battery level will then be reinitialised during probe programming.

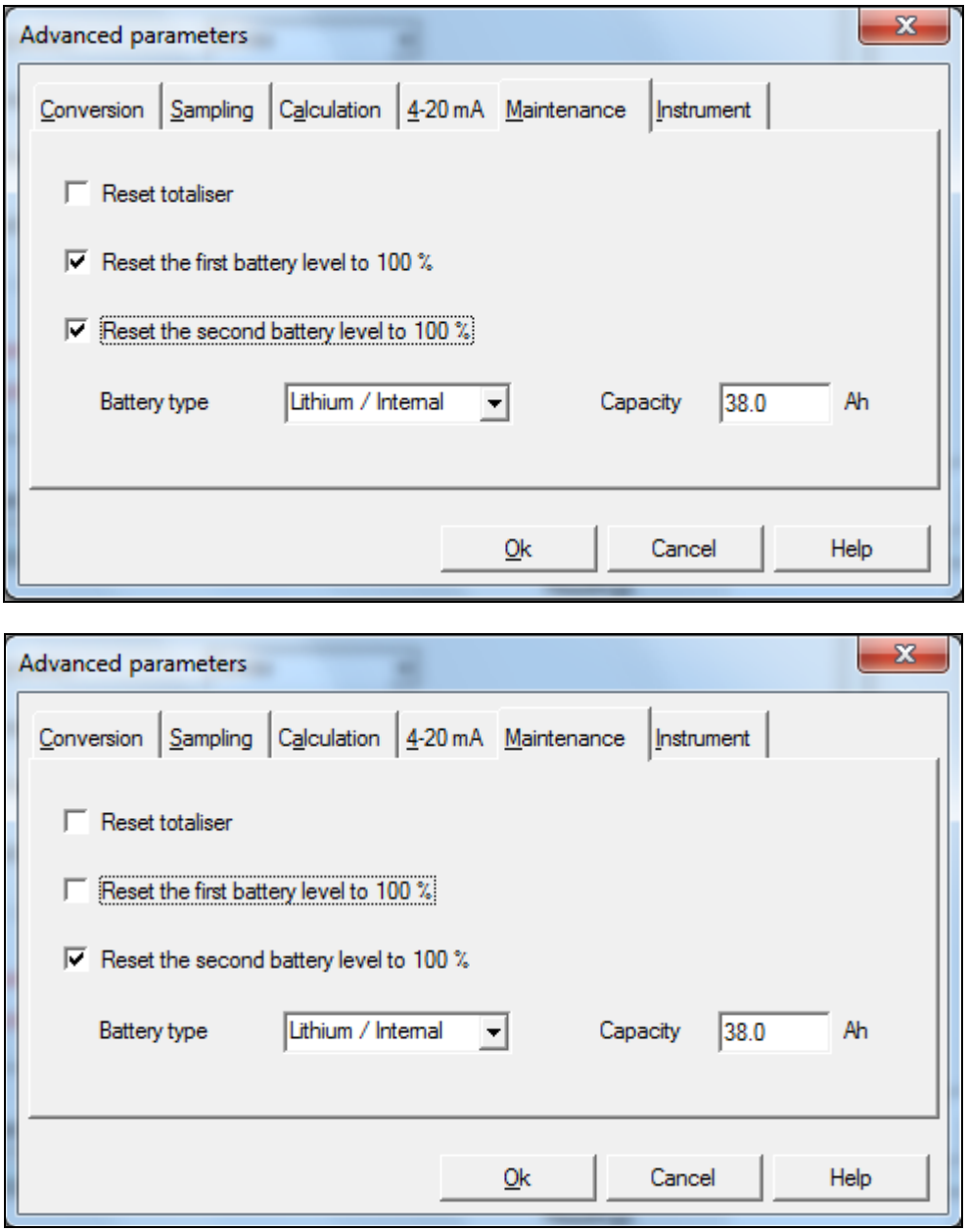


Figure 50: Reinitialisation of battery levels in HydrINS 2 / HydrINS 2 Mini in Mode 2 with a Display A in Winfluid

10 Product disposal

The product must be disposed of in accordance with local regulations concerning the disposal of electronic waste (European WEEE legislation or other).

Appendix 1: Selection Guide - The right HydrINS 2 model for your measurement site according to your pipe

The following table shows the compatibility of standardised diameters with the available HydrINS 2 / HydrINS 2 Mini models

Steel

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Steel	/	Galvanised	90	80.0										
			114	102.0										
		Black	100	107.1										
			125	131.7										
			150	159.3										
			175	182.9										
			200	207.3										
			225	231.9										
			250	260.4										
			300	309.7										
			350	339.6										
			400	388.8										
			500	486.0										

This table is for information only and is not contractually binding

Asbestos - Cement

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Asbestos - Cement	/	Class 20	100	100										
			125	125										
			150	150										
			175	175										
			200	200										
			250	250										
			300	300										
			400	400										
			500	500										
			600	600										
		Class 30	100	100										
			125	125										
			150	150										
			200	200										
			400	400										
			500	500										

This table is for information only and is not contractually binding

HDPE

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
HDPE	PN16	PE100 - SDR11	110	90.0										
			125	102.2										
			140	114.6										
			160	130.8										
			180	147.2										
			200	163.6										
			225	184.0										
			250	204.6										
			315	257.8										
			400	327.4										
			500	409.2										
			630	515.6										

This table is for information only and is not contractually binding

PVC PN 10

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
PVC	PN10	/	90	81.4										
			110	99.4										
			125	113.0										
			140	127.8										
			160	147.6										
			200	184.6										
			225	207.8										
			250	230.8										
			315	290.8										
			355	327										
			400	369.4										
			500	461										
			630	581										
			710	654										
			800	738										

This table is for information only and is not contractually binding

PVC PN 16

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
PVC	PN16	/	110	93.8										
			125	106.6										
			140	121.4										
			160	141.0										
			200	176.2										
			225	198.2										
			250	220.4										
			315	277.6										

This table is for information only and is not contractually binding

K9 Ductile Cast Iron

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Ductile cast iron	/	K9	100	106										
			125	132										
			150	158										
			200	209.4										
			250	260.5										
			300	311.6										
			350	362.6										
			400	412.8										
			450	462.8										
			500	514										
			600	615.2										
			700	716.4										
			800	818.6										
			900	919.8										
			1000	1021										

This table is for information only and is not contractually binding

C40 Ductile Cast Iron

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Ductile cast iron	/	C40	100	108.4										
			125	134.4										
			150	160										
			200	211.2										
			250	262.4										
			300	313.6										
			350	364										
			400	413.4										

This table is for information only and is not contractually binding

Grey cast iron

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Grey cast iron	/	/	100	100										
			125	125										
			150	150										
			175	175										
			200	200										
			300	300										
			400	400										
			500	500										
			600	600										
			800	800										

This table is for information only and is not contractually binding

Bonna Sabla

					HydrINS 2 "300"		HydrINS 2 "500"		HydrINS 2 "700"		HydrINS 2 "1000"		HydrINS 2 Mini	
Material	***PN***	***Type of material***	***DN***	***Inside diameter (mm)***	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**	**Velocity profile**	**Centre**
Bonna Sabla	/	Sheet metal core	200	170										
			300	265										

This table is for information only and is not contractually binding

Appendix 2: Inside diameter gauges

HYDREKA Catalogue Number	Maximum measurable inside diameter (mm)	Thread	Gauge length (mm)	Necessary clearance height (mm)
	BSP thread			
JD_HYD10-088	500	1" BSP	880	1100
JD_HYD10-1000	700	1" BSP	1000	1200
JD_HYD10-125	900	1" BSP	1250	1450
JD_HYD10-144	1000	1" BSP	1440	1650
JD_HYD10-174	1400	1" BSP	1740	1950
JD_HYD15-088	500	1.5" BSP	880	1100
JD_HYD15-1000	700	1.5" BSP	1000	1200
JD_HYD15-125	900	1.5" BSP	1250	1450
JD_HYD20-100	700	2" BSP	1000	1200
JD_HYD20-125	900	2" BSP	1250	1450
	NPT thread			
JD_HYD10A-088	500	1" NPT	880	1000
JD_HYD10A-1000	700	1" NPT	1000	1200
JD_HYD10A-125	900	1" NPT	1250	1450
JD_HYD20A-100	700	2" NPT	1000	1200
JD_HYD20A-125	900	2" NPT	1250	1450

Table 7: Descriptive characteristics of diameter gauges marketed by HYDREKA

Appendix 3: Catalogue Numbers associated with the range of HydrINS 2 / HydrINS 2 Mini products

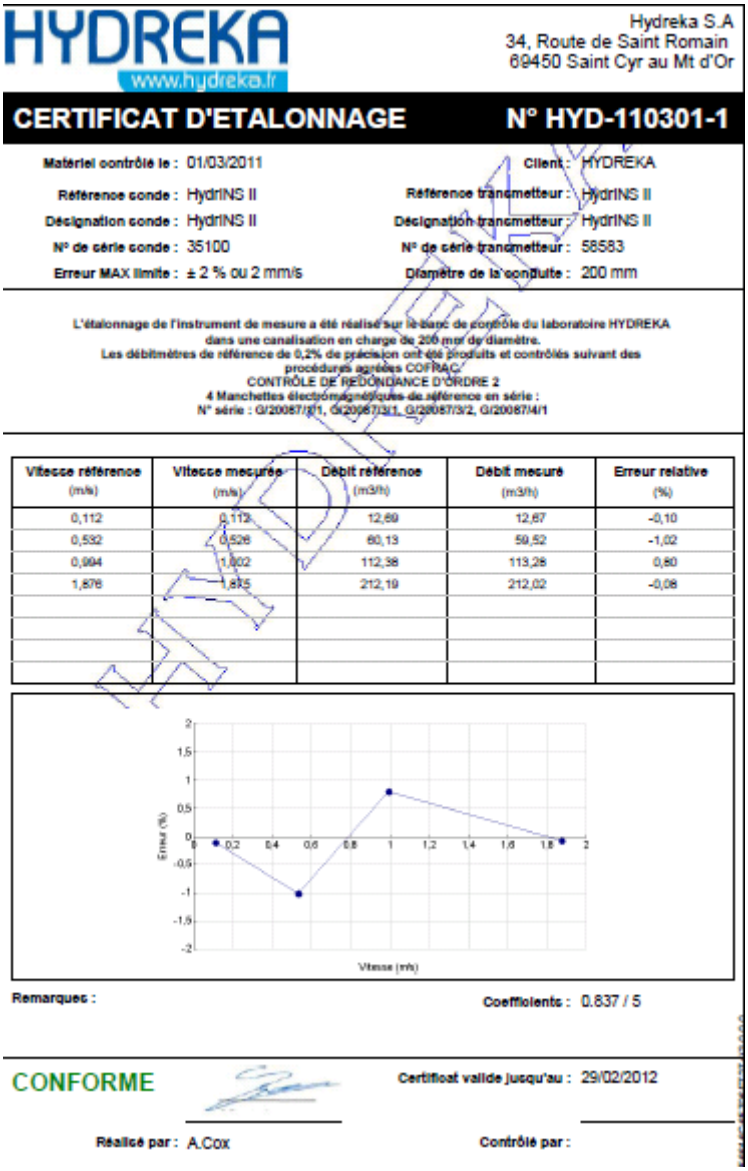
HydrINS 2 flow meters	
HydrINS 2 insertion flow meter - Model 300 - BSP thread	SI_HYDA2P-30
HydrINS 2 insertion flow meter - Model 500 - BSP thread	SI_HYDA2P-50
HydrINS 2 insertion flow meter - Model 700 - BSP thread	SI_HYDA2P-70
HydrINS 2 insertion flow meter - Model 1000 - BSP thread	SI_HYDA2P-100
HydrINS 2 insertion flow meter - Model 1000 - NPT thread	SI_HYDD2P-100
HydrINS 2 insertion flow meter - Model 300 - NPT thread	SI_HYDD2P-30
HydrINS 2 insertion flow meter - Model 500 - NPT thread	SI_HYDD2P-50
HydrINS 2 insertion flow meter - Model 700 - NPT thread	SI_HYDD2P-70
HydrINS 2 Mini flow meters	
HydrINS 2 Mini insertion flow meter - Model 300 - BSP thread	SI_HYDE2-15
HydrINS 2 Mini insertion flow meter - Model 300 - NPT thread	SI_HYDF2-15

Display A	
Standalone Display A two pulse outputs	AFFHYDA
110-220 V power supply, 15 W 24 VDC with terminal block	ALIXPPA
3.6 V 38 Ah lithium battery with connector	PILSPEHYDA
3.6 V 38 Ah lithium battery with connector	PILSPEHYDA
Display C	
Standalone Display A four pulse outputs, two 4-20 mA outputs	AFFHYDC
Communication leads	
HydrINS probe digital output cable - RADCOM recorders	CNT102S
HydrINS 2 - Display signal output cable, 5 m	CNT120S -5
HydrINS 2 - Display signal output cable, 10 m	CNT120S- 10
HydrINS 2 digital output cable, two bare wires, two-way, 2 m	CNT93S
HydrINS 2 - HYDREKA data loggers signal cable	CNT90S
Display A - HYDREKA data logger input cable, digital four-wire cable, 1.5 m	CNT09
Display A - RADCOM data logger input cable, digital four-wire cable, 1.5 m	CNT118
RS232 communication cable - HydrINS 2 / HydrINS 2 Mini	CC_HYDAS-3
RS232 communication cable - IR (Lolog Vista, LX/PC)	CC_RADA
RS232 SMS Lite - PC communication cable	CC_HYDC
Pressure channel	
Spiral tube - PN 18 bars - 1 m	CAPSPIA - 1

Gauges	
BSP thread	
1" BSP gauge - dia. 500 mm max.	JD_HYD_10-088
1" BSP gauge - dia. 700 mm max.	JD_HYD_10-1000
1" BSP gauge - dia. 900 mm max.	JD_HYD_10-125
1" BSP gauge - dia. 1,000 mm max.	JD_HYD_10-144
1" BSP gauge - dia. 1,400 mm max.	JD_HYD10-174
1.5" BSP gauge - dia. 500 mm max.	JD_HYD15-088
1.5" BSP gauge - dia. 700 mm max.	JD_HYD15-1000
1.5" BSP gauge - dia. 900 mm max.	JD_HYD15-125
2" BSP gauge - dia. 1,000 mm max.	JD_HYD20-100
2" BSP gauge - dia. 900 mm max.	JD_HYD20-125
2" BSP gauge - dia. 1,000 mm max.	JD_HYD20-100
2" BSP gauge - dia. 900 mm max.	JD_HYD20-125
NPT thread	
1" NPT gauge - dia. 500 mm max.	JD_HYD10A-088
1" NPT gauge - dia. 1,000 mm max.	JD_HYD10A-1000
1" NPT gauge - dia. 900 mm max.	JD_HYD10A-125
2" NPT gauge - dia. 1,000 mm max.	JD_HYD20A-100
2" NPT gauge - dia. 900 mm max.	JD_HYD20A-125
Electrical adapter	
110-220 VAC - 15 W 24 VDC 625 mA transformer with terminal block	ALIXPPA

PELICASE cases	
Waterproof case (908 x 351 x 133 mm inside) for HydrINS 300	VALPEL1700
Waterproof case (1060 x 343 x 133 mm inside) for HydrINS 500	VALPEL1720
Waterproof case (1280 x 341 x 133 mm inside) for HydrINS 500 and 700	VALPEL1750

Appendix 4: Template for HYDREKA calibration certificate for the HydrINS 2 / HydrINS 2 Mini flow meter



HYDREKA
www.hydreka.fr

Hydreka S.A
34, Route de Saint Romain
69450 Saint Cyr au Mt d'Or

CERTIFICAT D'ETALONNAGE **N° HYD-110301-1**

Matériel contrôlé le :	01/03/2011	Client :	HYDREKA
Référence sonde :	HydrINS II	Référence transmetteur :	HydrINS II
Désignation sonde :	HydrINS II	Désignation transmetteur :	HydrINS II
N° de série sonde :	35100	N° de série transmetteur :	58583
Erreur MAX limite :	± 2 % ou 2 mm/s	Diamètre de la conduite :	200 mm

L'étalonnage de l'instrument de mesure a été réalisé sur le banc de contrôle du laboratoire HYDREKA dans une canalisation en charge de 200 mm de diamètre.
Les débitmètres de référence de 0,2% de précision ont été produits et contrôlés suivant des procédures agréées COFRAC.
CONTRÔLE DE REDONDANCE D'ORDRE 2
4 Manchettes électromagnétiques de référence en série :
N° série : G/20087/3/1, G/20087/3/1, G/20087/3/2, G/20087/4/1

Vitesse référence (m/s)	Vitesse mesurée (m/s)	Débit référence (m3/h)	Débit mesuré (m3/h)	Erreur relative (%)
0,112	0,112	12,69	12,67	-0,10
0,532	0,526	60,13	59,52	-1,02
0,994	1,002	112,38	113,28	0,80
1,876	1,875	212,19	212,02	-0,08

Remarques :

Coefficients : 0.837 / 5

CONFORME

Certificat valide jusqu'au : 29/02/2012

Réalisé par : A.Cox

Contrôlé par :

TABLE OF ILLUSTRATIONS

LIST OF TABLES

NOTES

NOTES

HYDREKA

34, route de Saint Romain – 69450 ST CYR AU MONT D'OR – France

Tél : +33 (0)4 72 53 11 53 – Fax : +33 (0)4 78 83 44 37

Email : hydreka@hydreka.fr ou accueil@hydreka.fr

Service Après Vente : services@hydreka.fr

Location : rent@hydreka.fr

Vente : sales@hydreka.fr

Export : export@hydreka.fr