Hydro-Mix HT

Mechanical Installation Guide

To re-order quote part number:	HD0766
Revision:	1.4.0
Revision date:	December 2021

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CUSTOMER RESPONSIBILITY

The customer in applying the product described in this documentation accepts that the product is a programmable electronic system which is inherently complex and which may not be completely free of errors. In doing so the customer therefore undertakes responsibility to ensure that the product is properly installed commissioned operated and maintained by competent and suitably trained persons and in accordance with any instructions or safety precautions made available or good engineering practice and to thoroughly verify the use of the product in the particular application.

ERRORS IN DOCUMENTATION

The product described in this documentation is subject to continuous development and improvement. All information of a technical nature and particulars of the product and its use including the information and particulars contained in this documentation are given by Hydronix in good faith.

Hydronix welcomes comments and suggestions relating to the product and this documentation

ACKNOWLEDGEMENTS

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CUSTOMER FEEDBACK

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If your feedback is concerning an Atex certified product or associated service it would be very helpful for you to give us your contact details and the model number and serial number of the product if possible. This will enable us to contact you with any relevant safety advice should this be necessary. It is not obligatory to leave your contact details and any information will be treated as confidential.

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Revision history

Revision No	Date	Description of Change
1.1.0	March 2017	First Release
1.1.1	April 2017	Minor formatting update
1.2.0	June 2018	Spacer Plate Installation Advice Added
1.3.0	October 2019	Address update
1.4.0	December 2021	Updated Temperature Ratings. Added indoor and outdoor use statement.

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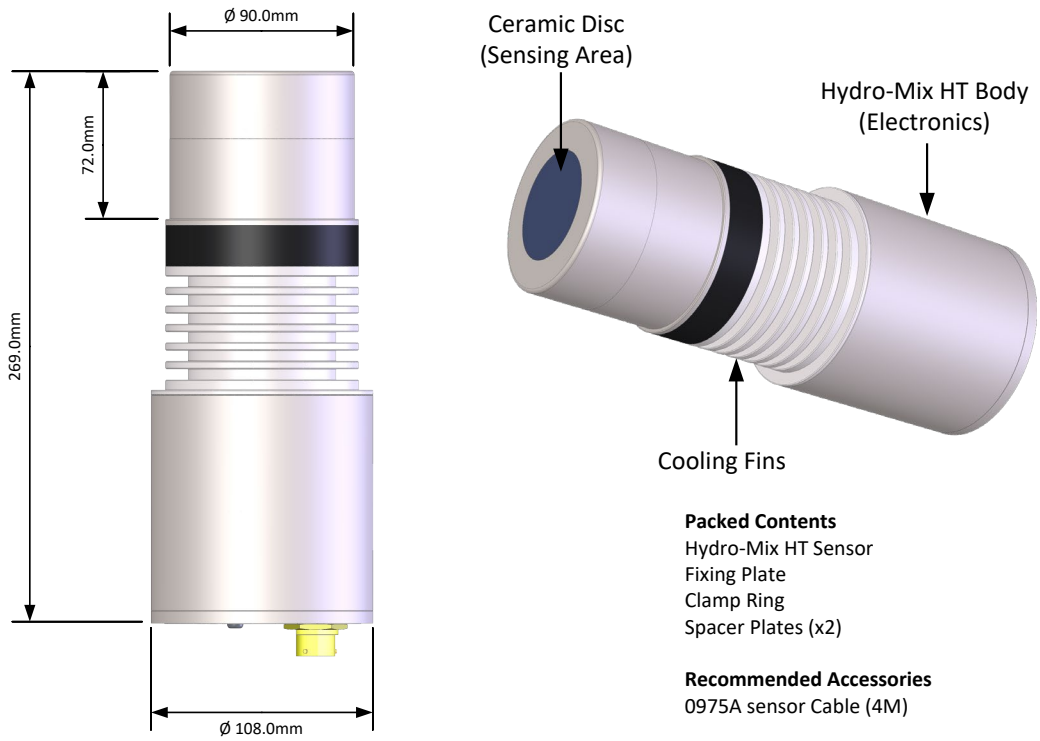

Figure 1: The Hydro-Mix HT

Available accessories:

Part No	Description
4010	HMHT Fixing Plate (Supplied with sensor), Additional plates can be ordered
4020	HMHT Clamp Ring (Supplied with sensor). Additional clamps can be ordered
4030	HMHT Hydro-Mix Adapter
0975A	4m Sensor Cable
0975A-10m	10m Sensor Cable
0975A-25m	25m Sensor Cables
0116	Power Supply – 30 Watt for up to 4 sensors
0049A	RS232/485 converter (DIN rail mounting)
0049B	RS232/485 converter (9 pin D type to terminal block)
SIMXX	USB Sensor Interface Module including cables and power supply
EAK01	Ethernet Adapter Kit including Power Supply
EPK01	Optional Ethernet Power Adapter Kit
DSAHTXX	Ducting System Angled
DSVHTXX	Ducting System Vertical

Hydro-Com configuration and diagnostics software is available for free to download from www.hydronix.com

1 Introduction

The Hydro-Mix HT is a flush mounted digital microwave moisture sensor designed for measuring in flowing organic materials. The sensor can be installed in drying, ducting, mixing, and conveying systems and is manufactured from food safe materials. The sensor is suitable for indoor and outdoor use.

The sensor reads at 25 times per second, which enables rapid detection of changes in moisture content in the process, including determination of homogeneity in mixing processes. The sensor can be easily connected to any control system and may be configured remotely when connected to a PC using dedicated Hydronix software. A large number of parameters are selectable, such as the type of output and the filtering characteristics.

2 General to Flowing Material Applications

For accurate moisture measurement the Hydro-Mix HT should be installed in a location where the material is in contact with the ceramic disc at a controlled consistent flow rate.

Follow the advice below for good sensor positioning:

- Locate the sensor where the material flows at a consistent rate.
- When installing the sensor in a curved surface, ensure that the centre of the ceramic disc is flush with the radius of the internal wall.
- A sampling point has to be available close to the sensor for calibration purposes.
- Avoid areas of severe turbulence in the material flow.
- Ensure the sensor is located where the material is not allowed to build up on the ceramic disc.
- Position the sensor away from any electrical interference (See Electrical Installation Guide HD0678).
- Position the sensor so that it is easily accessible for routine maintenance, adjustment and cleaning.

3 General to Mixer Applications

A significant benefit of the Hydronix system is that only one sensor is required in the mixer. However, it is important that it is positioned correctly in relation to the mixer type, material and water inlets, and other moving parts such as blades and paddles. Although paddles or scraper blades can be a useful mechanism to keep the sensor free from material build up, they could cause damage to an incorrectly positioned sensor. It will be necessary to periodically check the position as the mixer blades, paddles and floor wear away. In all installations, it is recommended that the sensor is fitted in an area where it is away from any possible collection of ‘sitting’ water.

As the mixer floor wears, the sensor will occasionally need to be adjusted downwards in the mixer, to maintain the correct position in relation to the mixer floor. Additionally the blades will need to be adjusted to maintain the efficiency of the mixing action and cleanliness of the ceramic disc.

If the sensor is allowed to protrude into the mixer it will be susceptible to damage from the mixer blades/paddles as well as from abrasive materials becoming trapped between the paddles, mixer floor and exposed side wall of the sensor.

NOTE: Damage caused under these circumstances will not be covered by warranty

For accurate and representative moisture measurement the sensor must be in contact with the moving stream of material. It is equally important that no material can build up over the Ceramic Disc to obscure the sensor readings.

Follow the advice below for good sensor positioning:

- It is a good idea to provide a small inspection lid in the mixer cover, so that during mixing, and when the mixer is empty, the Ceramic Disc may be observed without having to raise the main cover plate.

- Ensure that the sensor is fitted away from the water and material inlets. Particular care should be taken in keeping the sensor clear of heavy falling objects.
- When installing the sensor in a curved surface, ensure that the centre of the ceramic disc is flush with the radius of the internal wall
- Avoid areas of severe turbulence. The best signal will be obtained where there is a smooth flow of material over the sensor.
- The sensor should be positioned where it will see a continuous sample of the flowing material and where the sweeping action of the blades ensures no build-up of material on the face of the sensor.
- Position the sensor away from any electrical interference (See Electrical Installation Guide HD0678).
- Position the sensor so that it is easily accessible for routine maintenance, adjustment and cleaning.

4 General Mounting Advice

For installation in flat surfaces, the top of the sensor must be flush with the internal wall surface.

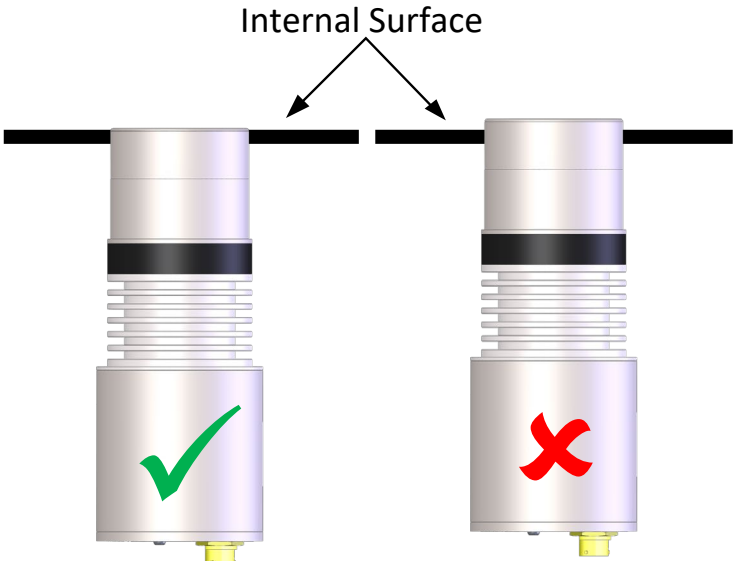

Figure 2: Flat Surface Installation (Fixing Plate and Clamp Ring Not Shown)

When installing the sensor in a curved surface, ensure that the centre of the ceramic disc is flush with the radius of the internal wall

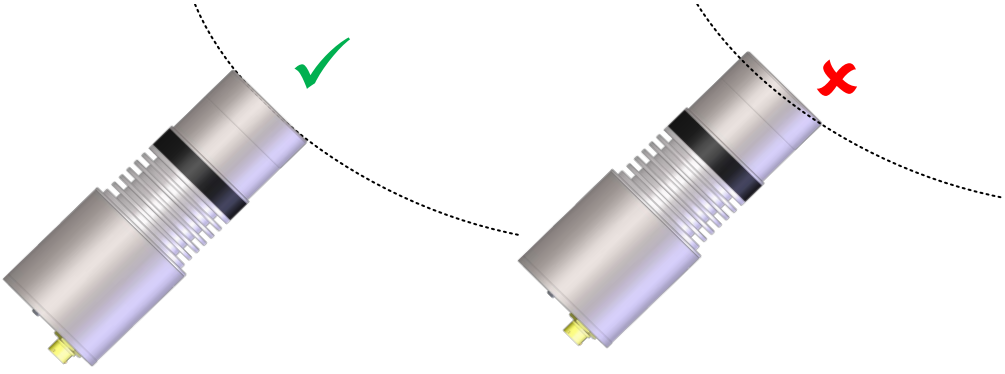

Figure 3: Curved Surface Installation (Fixing Plate and Clamp Ring Not Shown)

5 Organic Material Mixers

When installing in a mixer it is important that the end wall scraper arm is adjusted to ensure that the Ceramic Disc is kept clean to avoid material build up. A build-up of material on the end wall will indicate that the scraper arm is not correctly adjusted and this will affect the sensor reading.

5.1 Twin Shaft

It is recommended that the Hydro-Mix HT should be located in the end wall between the two shafts. The sensor should be located at a level lower than the shafts to maintain complete coverage of the ceramic disc.

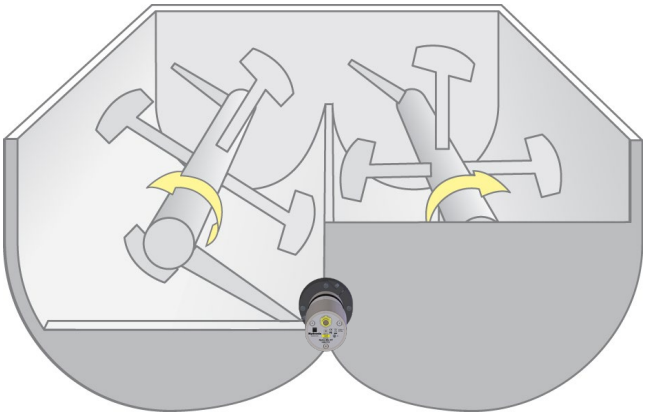

Figure 4: Twin Shaft Organic Mixer Installation

5.2 Single Shaft

Single shaft mixers should have the sensor installed in the end wall at 30° from the centre.

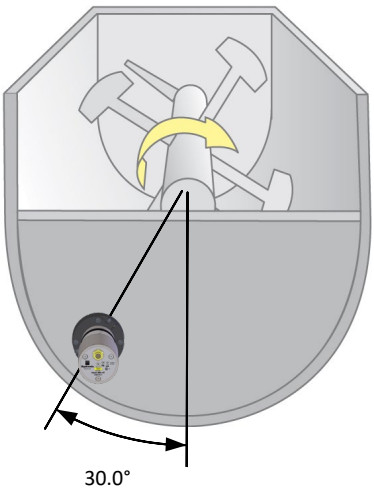

Figure 5: Single Shaft Organic Mixer Installation

6 Screw Conveyor

It is recommended that the sensor is installed at 30° above the base (See Figure 6).

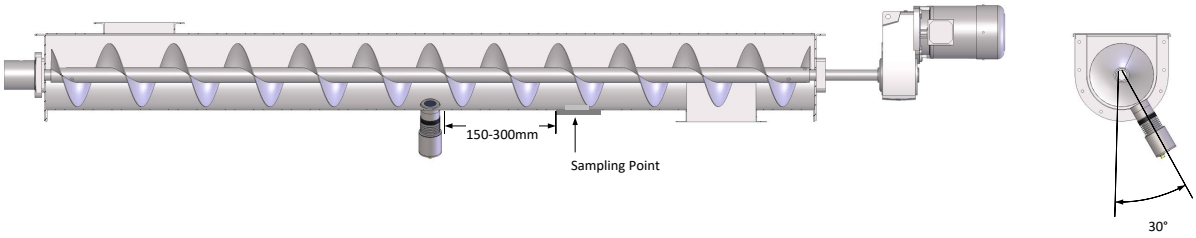

Figure 6: Screw Conveyor Installation

It is essential that the sensor is located so that the ceramic disc is continuously covered by at least 100mm of material (Figure 7).

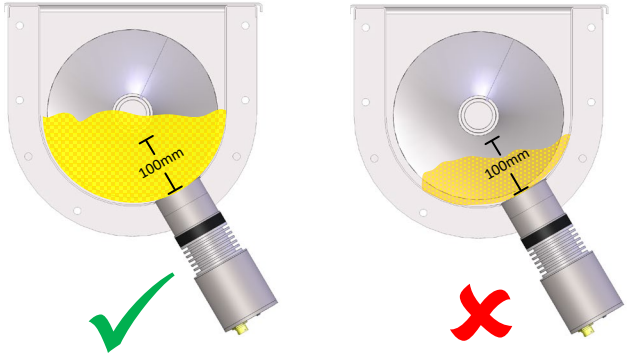

Figure 7: Screw Conveyor Material Level

7 Integration of Hydro-Mix HT in Ducting

The Hydro-Mix HT can be integrated into ducting. Modifications to the ducting might be required to achieve consistent results.

Hydronix recommends the use of the Hydronix Ducting System (DSVHT or DSAHT) when installing the Hydro-Mix HT into ducting (Figure 8). The systems are designed for use in vertical (DSVHT) or angled ducting (DSAHT). Contact Hydronix for further details about the available ducting systems.

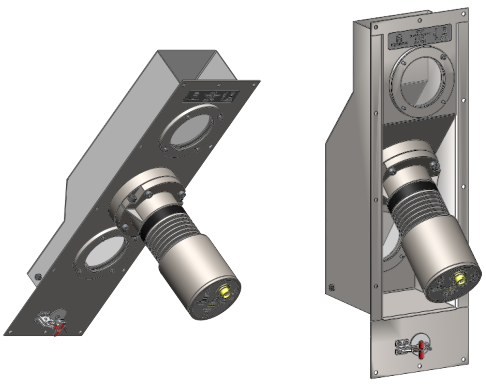

Figure 8: Hydronix Ducting Systems (DSAHT and DSVHT)

Any material in the duct must be free flowing for the sensor to be able to measure accurately.

Best results are achieved when:-

- The sensor head is at 40º from the material flow.
- Material flow above the sensor is ducted to provide a smooth, constant flow.
- Flow rate is controlled down-stream of the sensor thus allowing material to back-up over the sensor and provide a constant material depth of at least 100mm.
- All ducting is smooth with no edges where the flow can be interrupted.
- A material flow rate of minimum 1kg/sec (3.54 ton/hour (long)) is used.

Figure 9 shows the Hydro-Mix HT integrated into a duct. The outlet dimensions will need to be adjusted to suit each application to provide a suitable flow rate and a minimum of 100mm of material above the sensor.

To achieve the required 100mm of material above the sensor and a stable flow the Hydro-Mix HT should be installed in an overflow ducting system. This allows any additional material not required to maintain 100mm in front of the sensor to overflow, reducing the possibility of a blockage.

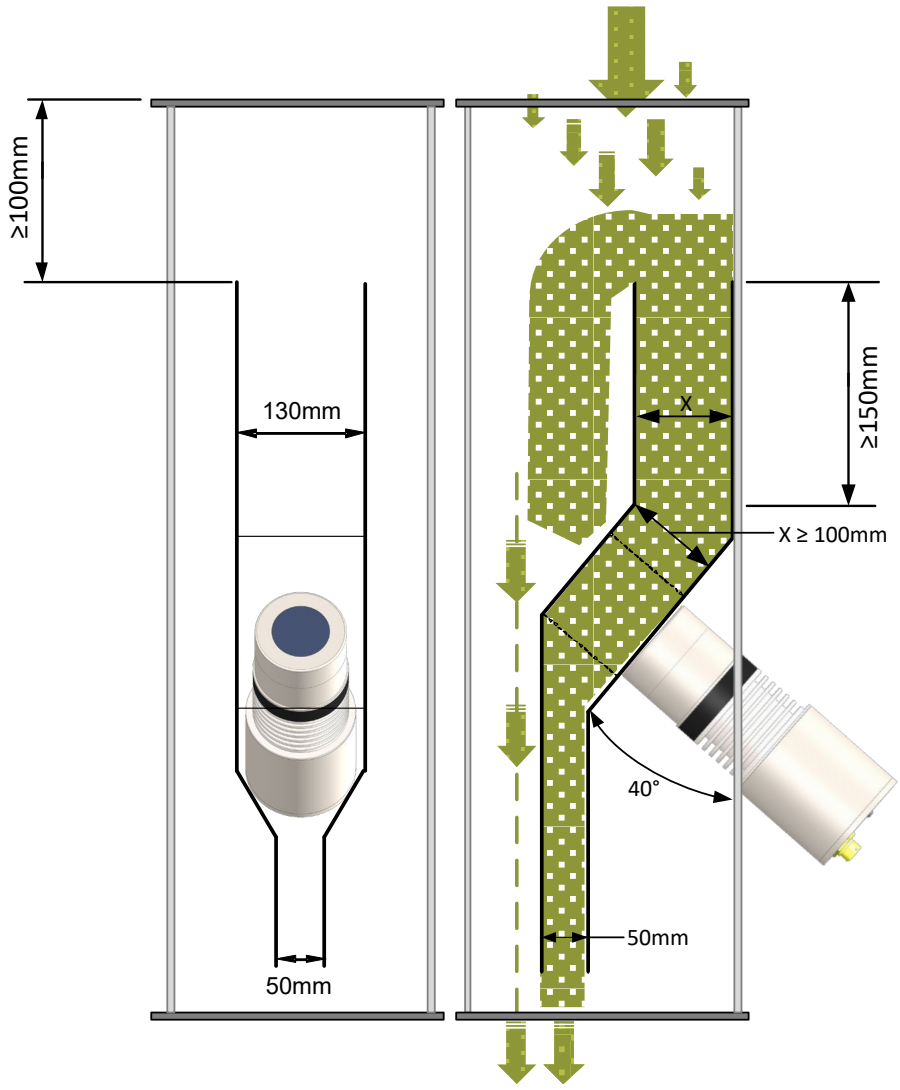

Figure 9: Hydro-Mix HT Integrated in a Duct

8 Installing the Sensor

These instructions refer to installing the Hydro-Mix HT on a flat surface; all other installation locations use the same mounting arrangement.

Each sensor is supplied with a Clamp Ring. When attached this allows the sensor to be connected to the Fixing Plate which is welded externally or flush to the floor or wall of the installation location.

The Clamp Ring facilitates the correct positioning and subsequent height adjustment of the sensor.

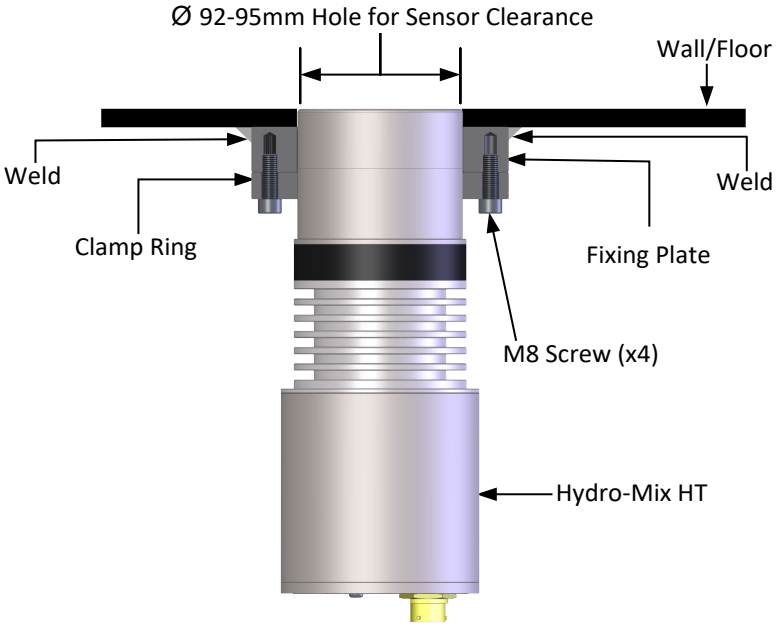

Figure 10: Sensor Installation (Fixing Plate Externally mounted)

When installing the Fixing Plate flush with the internal wall (Figure 11) the supplied Spacer Plates can be used to ensure the sensor is correctly aligned.

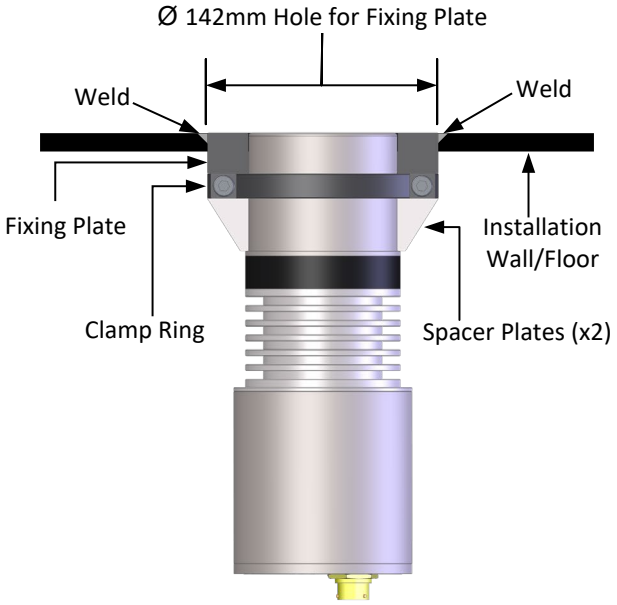

Figure 11: Sensor Installation (Fixing Plate Flush mounted)

8.1 Cutting the Hole for the Sensor and Installing the Fixing Plate

8.1.1 Externally Mounting the Fixing Plate

Before welding the Fixing Plate to the installation location a 92-95mm diameter hole should be cut through the external wall and any internal wear plates.

Although the outside diameter of the sensor is 90mm it is recommended to cut a hole of 92-95mm diameter to allow for tolerances.

The Fixing Plate is then welded in position over the hole. Ensure that the Fixing Plate is perpendicular to the internal wall.

During any welding operations the sensor must be removed.

8.1.2 Internally Mounting the Fixing Plate

To enable the Fixing Plate to be installed flush with the internal wall of the installation location it is necessary to cut a 142mm hole through the external wall and any internal wear plates. The supplied Spacer Plates can be used to ensure that the sensor is installed flush with the internal wall.

Depending on the installation requirements, the Fixing Plate can be welded either from the inside or the outside. Ensure that the Fixing Plate is flush with the internal wall.

8.2 Fitting the Clamp Ring to the Sensor (without Spacer Plates)

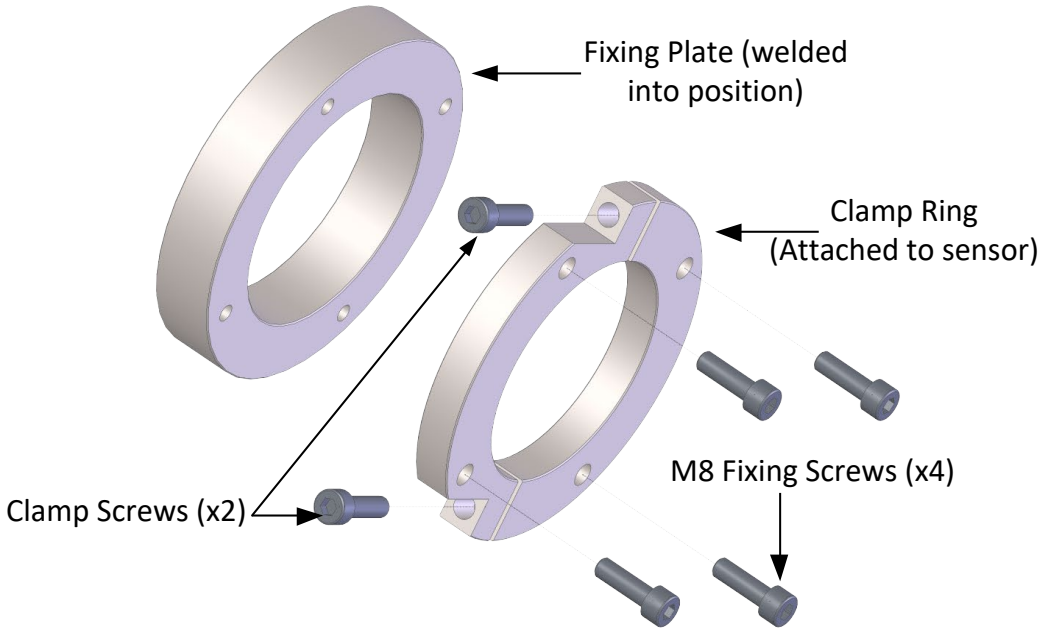

Figure 12: Hydro-Mix HT Mounting Components

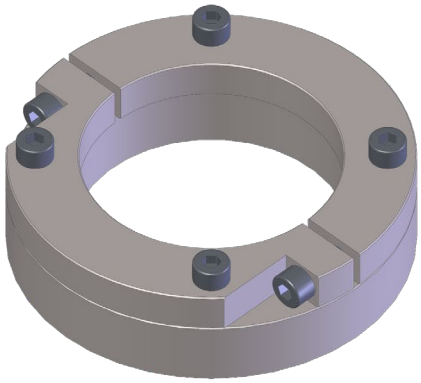

Figure 13: Clamp Ring Assembled and Connected to the Fixing Plate

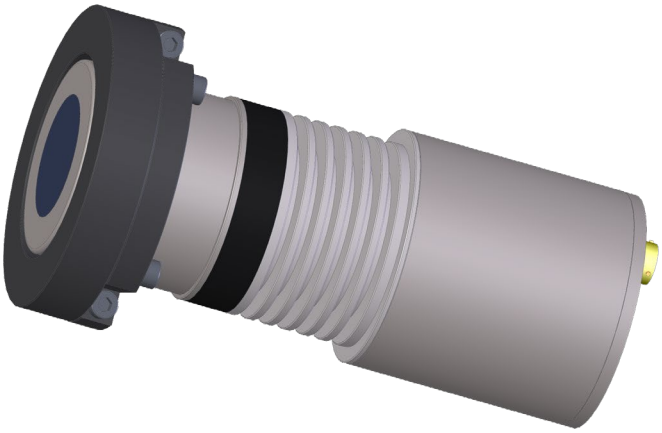

Figure 14: Clamp Ring and Fixing Plate Attached to a Hydro-Mix HT

8.3 Fitting the Clamp Ring using the Spacer Plates

If the Fixing Plate has been installed flush with the internal wall the Spacer Plates can be added to the Clamp Ring to assist with the installation (Figure 15). The Spacer Plates will guarantee that the ceramic face plate is installed flush with the Fixing Plate.

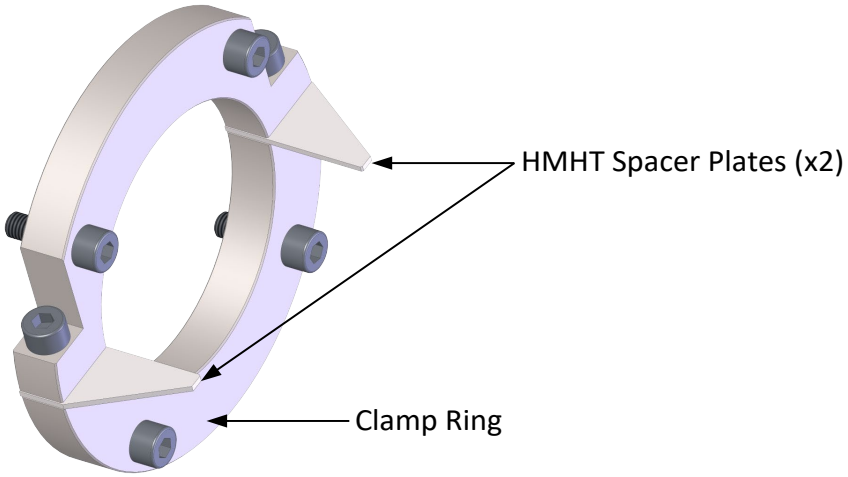

Figure 15: HMHT Spacer Plates

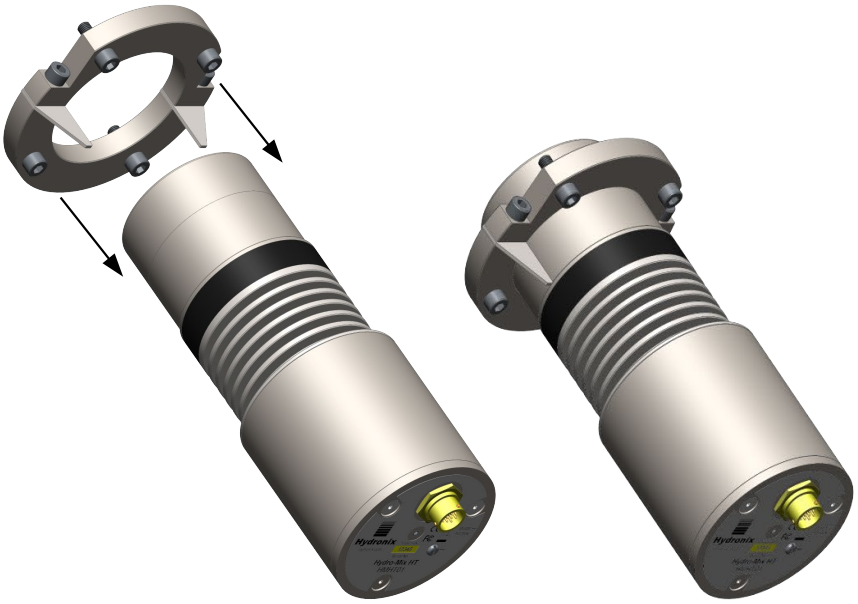

Figure 16: Clamp Ring with Spacer Plates attached to the Sensor

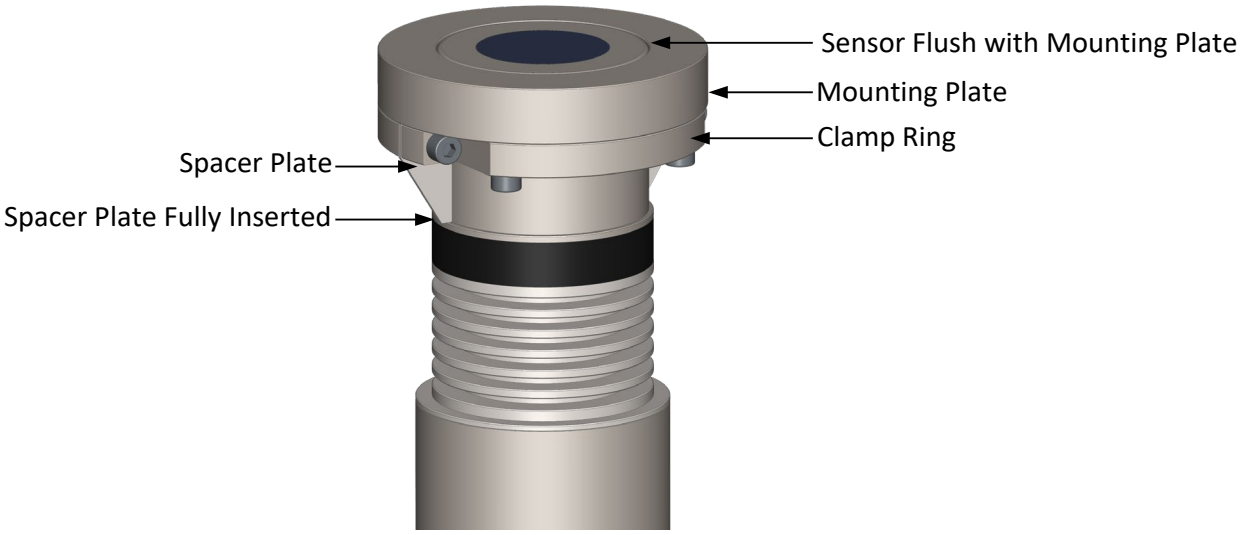

Figure 17: Final Assembly with Fixing Plate Attached

8.4 Mounting the Sensor

NEVER HIT THE CERAMIC DISC

THE CERAMIC IS VERY HARDWEARING BUT IS BRITTLE AND WILL CRACK IF STRUCK

When installing the Hydro-Mix HT it is imperative that the Ceramic Face Plate is flush with the internal wall. The sensor can be adjusted by up to 32mm by adjusting the position of the Clamp Ring (Figure 18)

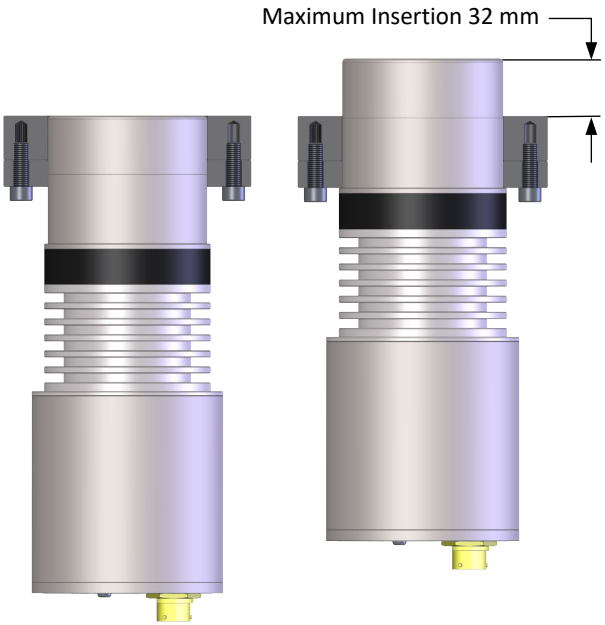

Figure 18: Minimum and Maximum Insertion

8.5 Installing the Sensor on to the Fixing Plate

8.5.1 Externally Mounted Fixing Plate

1. Once the Fixing Plate has been welded into position over the appropriately sized hole, the distance from the external face of the Fixing Plate to the internal wall (x) should be measured (Figure 19).

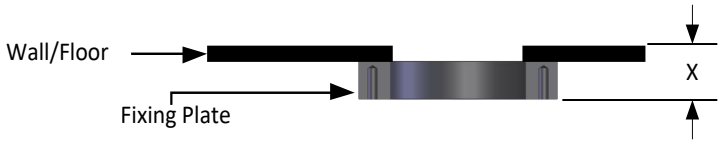

Figure 19: Measuring the Insertion Depth

2. Attach the Clamp Ring to the Hydro-Mix HT
3. Adjust the position of the Clamp Ring to match the required insertion depth (Figure 20)

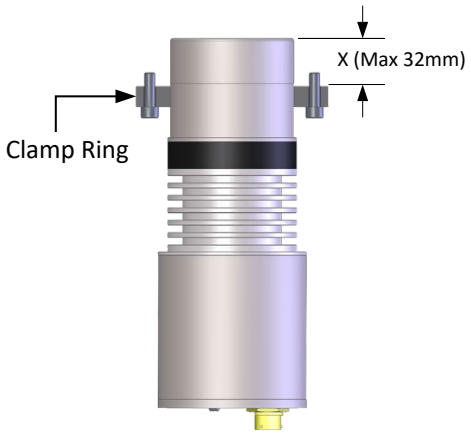

Figure 20: Positioning the Clamp Ring

4. Insert the sensor through the Fixing Plate and attach using the 4 screws.
5. Confirm that the sensor is flush with the internal wall. Adjust the Clamp Ring position if the sensor is not flush.

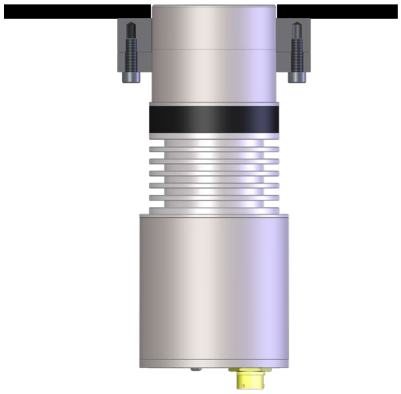

Figure 21: Sensor Final Position

8.5.2 Flush Mounted Fixing Plate

1. When the Fixing Plate has been welded into position ensure that it is flush with the internal surface (Figure 22).

Figure 22: Flush Mounted Fixing Plate

2. Attach the Clamp Ring with the Spacer Plates installed to the Hydro-Mix HT Figure 23). Tighten the Clamp Ring Screws to lock the Clamp Ring into place

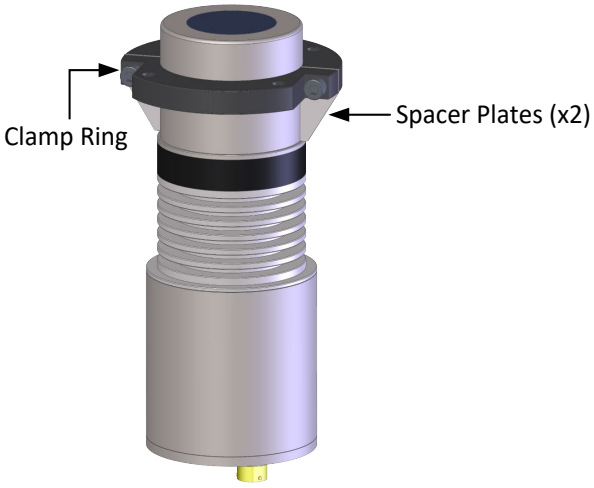

Figure 23: Clamp Ring (Flush Mount)

4. Insert the sensor into the Fixing Plate and attach using the 4 M8 Fixing screws.
5. Confirm that the sensor is flush with the internal wall of the installation location (Figure 24).

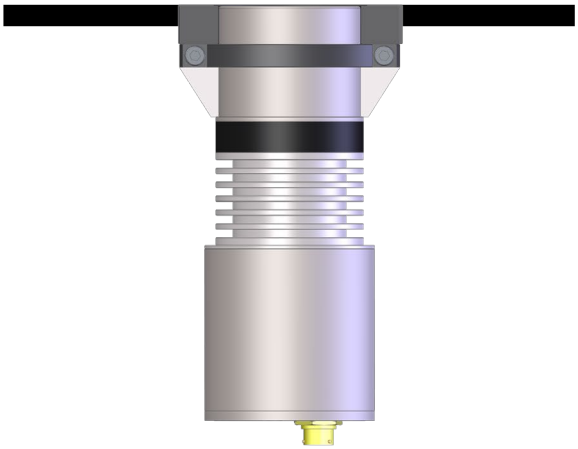

Figure 24: Flush Mounted Sensor

8.6 Removal of the Sensor

Clean out compacted material or sealant from around the sensor.

Remove the 4 Fixing Plate screws and extract the sensor.

Warning: Do not hit the Ceramic Disc to remove the sensor.

The maximum temperature ranges stated in this installation guide are only valid if the Hydro-Mix HT is installed using the supplied mounting system (Fixing Plate and Clamp Ring).

1 Process Temperature Range

The Hydro-Mix HT has been designed to operate in applications where the process temperature is between 0-120°C. The sensor will operate at intermittent temperatures of up to 130°C to enable cleaning to take place (maximum 10 minutes).

The Hydro-Mix HT has been designed with additional cooling fins to enable heat to dissipate quickly. The cooling fins must not be covered and must remain clean at all times to enable effective cooling.

Additional cooling may be required if the sensors electronics exceed 70°C.

2 Ambient Temperature Range

The ambient temperature around the sensors body will affect the overall maximum process temperature the sensor can operate in. The maximum ambient temperature for the Hydro-Mix HT is 60°C. However, the upper ambient temperature limit is reduced as the process temperature increases. The following temperature profile graph indicates the maximum process temperatures for a given ambient temperature (Figure 25)

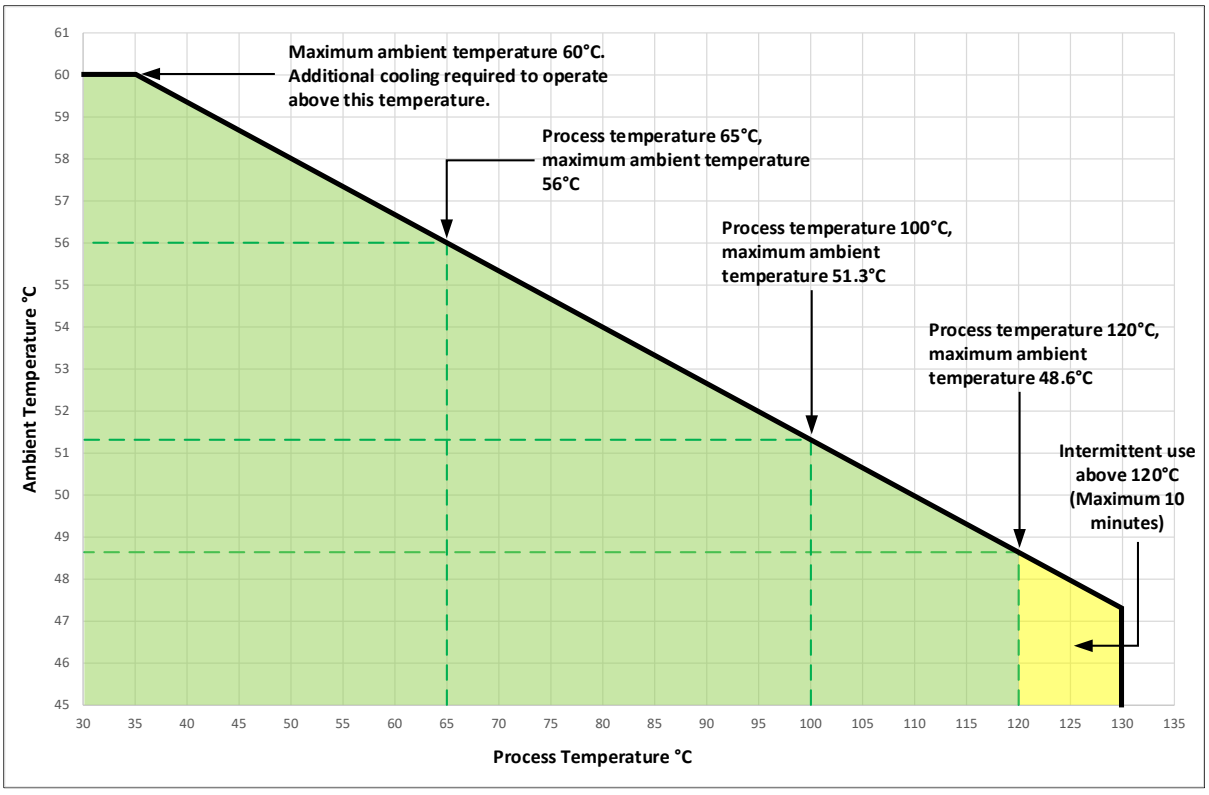

Figure 25: Temperature Profile

3 Additional Cooling

If the temperature of the sensor electronics exceeds 70°C then additional cooling will be required. Cooling can be achieved by installing a forced air supply. The air should be directed over the cooling fins and the sensor body.

A water cooling system can also be installed using a suitable water pipe coiled around the sensor body (Figure 26).

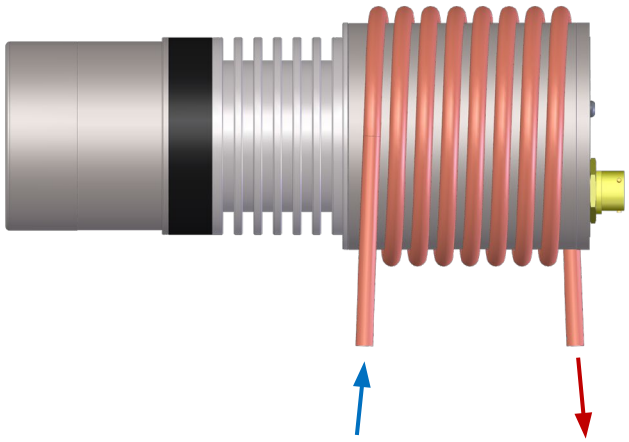

Figure 26: Water Cooling

1 Corrosion Protection

In situations where corrosive materials are in use, there is potential for the cable connector to be damaged. Protection from this corrosion is possible with a few simple adjustments to how the sensor is installed.

1.1 Sensor Position

Position the sensor so no material comes into contact with the connector.

The sensor must remain in the main flow of the material at all times to produce accurate measurements of the moisture.

1.2 Drip Loop

Although the connector is specified to withstand water ingress it is recommended to install the sensor with a drip loop in the cable. See (Figure 27).

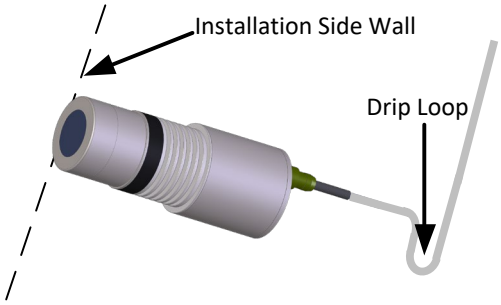

Figure 27: Hydro-Mix HT Installed with a Drip Loop

1.3 Protection Cover

Install a cover over the top of the sensor to deflect the material away from the connector. (See Figure 28). Self-amalgamating tape can also be used to seal the connector

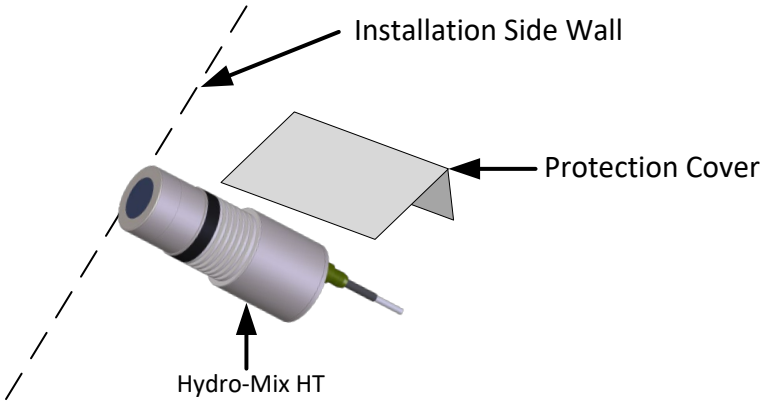

Figure 28: Hydro-Mix HT with Protection Cover Installed

1 Technical Specifications

1.1 Dimensions

Diameter: 90mm (Sensing Head)

Length: 285mm (Including Mil Spec Connector)

Fixing: 92-95 mm Diameter Hole for sensor or 142mm Diameter hole for Fixing Plate

1.2 Construction

Body: 316 Stainless Steel (Food Safe)

Faceplate: Ceramic (Food Safe)

O Rings: FDA Food Grade Approved

1.3 Penetration of Field

Approximately 75 -100mm dependent upon material

1.4 Range of Moisture

For bulk materials the sensor will measure up to the point of saturation.

1.5 Operating Temperature Range (Process Temperature)

0 – 120°C (32 – 248°F) continuous, up to 130°C (266°F) intermittent. The sensor will not measure in frozen material

1.6 Power Supply Voltage

15 – 30 VDC. 1 A, minimum required for start-up (normal operating power is 4W).

1.7 Analogue Outputs

Two configurable outputs 0 – 20mA or 4 – 20mA current loop outputs available for moisture and temperature. The sensor outputs may also be converted to 0 – 10 V DC.

1.8 Measurement Modes

Mode F, Mode V and Mode E

1.9 Brix Measurement Output

No

1.10 Digital (Serial) Communications

Opto-isolated RS485 2 wire port – for serial communications including changing operating parameters and sensor diagnostics.

1.11 Digital inputs

- One configurable digital input 15 – 30 V DC activation
- One configurable digital input/output – input specification 15 – 30 V DC, output specification: open collector output, maximum current 500 mA (over current protection required).

1.12 Connections

1.12.1 Sensor Cable

- Six pairs twisted (12 cores total) screened (shielded) cable with 22 AWG, 0.35mm2 conductors.
- Screen (shield): Braid with 65% minimum coverage plus aluminium/polyester foil.
- Recommended cable types: Belden 8306, Alpha 6373
- 500 Ohm resistor – The recommended resistor is an epoxy sealed precision resistor of the following specification: 500 Ohm, 0.1% 0.33W)
- Maximum cable run: 100m, separate to any heavy equipment power cables.

1.13 Grounding

The sensor body is connected to the cable shield. Ensure equipotential bonding of all exposed metalwork. In areas of high lightning risk, correct and adequate protection should be used.

The sensor cable shield is connected to the sensor body. To prevent earth loops the shield must not be connected at the control panel

1 Document Cross Reference

This section lists all of the other documents that are referred to in this User Guide. You may find it beneficial to have a copy available when reading to this guide.

Document Number	Title
HD0678	Hydronix Moisture Sensor Electrical Installation Guide
HD0679	Hydronix Moisture Sensor Configuration and Calibration Guide

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