



Hydro-Mix

Mechanical Installation Guide



To re-order quote part number:	HD0676
Revision:	1.7.0
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ACKNOWLEDGEMENTS

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Revision history

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1.0.0	Feb 2015	First Release
1.1.0	May 2015	Sensor cable product number changed
1.1.1	Jan 2016	Minor Formatting Change
1.2.0	March 2016	Reference to SIM02A added
1.2.1	July 2016	Accessories list updated
1.3.0	March 2017	Title Changed, Introduction added. Installation in Ducting and Organic mixer sections removed
1.4.0	Nov 2017	Air and Water Factory Calibration advice added to ceramic replacement section
1.5.0	Oct 2019	Address update
1.6.0	July 2021	Routine Maintenance
1.7.0	Sept 2025	Risk assessment section added, maintenance section updated, specifications section updated. Sensor positioning information updated.

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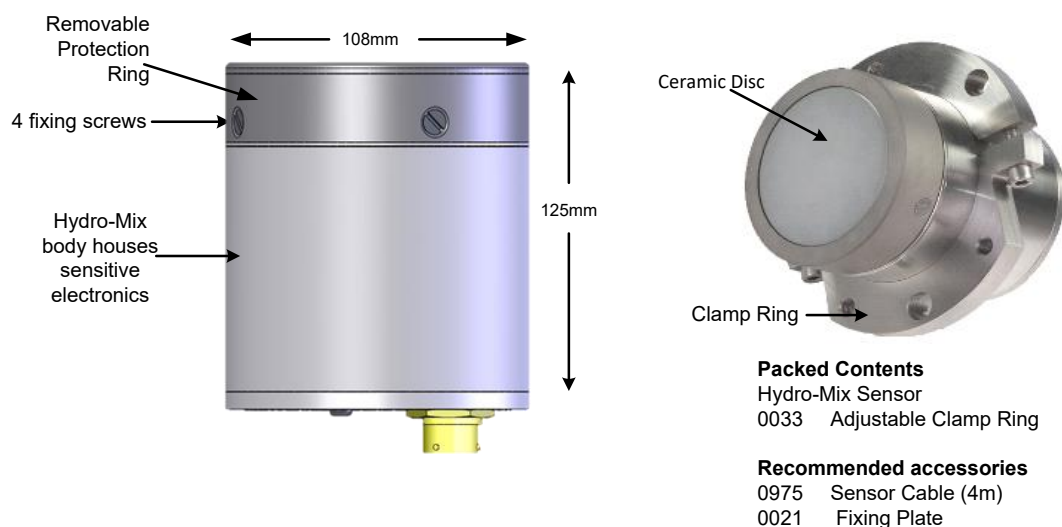


Figure 1: The Hydro-Mix and Adjustable Clamp Ring

Available accessories:

Part No	Description
0021	Fixing Plate for welding to installation location
0033	Adjustable Clamp Ring (supplied with sensor). Additional rings can be ordered
0035	Blanking Plate (for covering hole when sensor is removed)
HS02	Hydro-Skid – Mounting option for belt conveyors
0975A	Sensor cable, available in lengths: 4m, 10m, 25m and 50m
0975AT	Sensor cable with network termination, available in lengths: 4m, 10m, 25m and 50m
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
0900	Replacement Ceramic Kit (Ceramic Disc, Protection Ring and Ceramic Retaining Ring)
0910	Replacement Ceramic Kit (Ceramic Disc and Protection Ring kit)
0920	Replacement Ceramic Kit (excluding Protection Ring)
0930	Replacement Protection Ring (including screws)

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

This Hydro-Mix Installation Guide is only valid for model numbers HM08 onwards. User guides for earlier Hydro-Mix model numbers are available from www.hydronix.com

1 Introduction

The Hydro-Mix digital microwave moisture sensor with integral signal processing provides a linear output (both analogue and digital). The sensor may be easily connected to any control system and is ideally suited to measure the moisture of materials in mixer applications as well as other process control environments.

The sensor reads at 25 times per second, which enables rapid detection of changes in moisture content in the process, including determination of homogeneity. The sensor 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.

The sensor is constructed to operate under the most arduous conditions with a wear life of many years. The Hydro-Mix should never be subjected to unnecessary impact damage as it houses sensitive electronics. In particular, the replaceable ceramic faceplate, although extremely hardwearing, is brittle and may crack if subjected to severe impact.

2 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 floor, 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 sensor head 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 sensor head may be observed without having to raise the main cover plate.
- If the floor is not level, fit the sensor in the highest point in the floor.
- 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 such as large aggregate.
- 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 may be easily accessible for routine maintenance, adjustment and cleaning.

3 General to Flowing Material Applications

For accurate moisture measurement the Hydro-Mix 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 may be easily accessible for routine maintenance, adjustment and cleaning.

4 General Mounting Advice

4.1 Positioning the Sensor

The sensor can be mounted in an outdoor location. The 'in-process' part of the sensor is designed to be in contact with wet material. The 'out-of-process' side of the sensor must not come in contact with any liquid.

The optimum location for the sensor varies depending on the type of installation – a number of options are detailed on the following pages. The mounting assembly used to affix the sensor is shown in Section 11.2

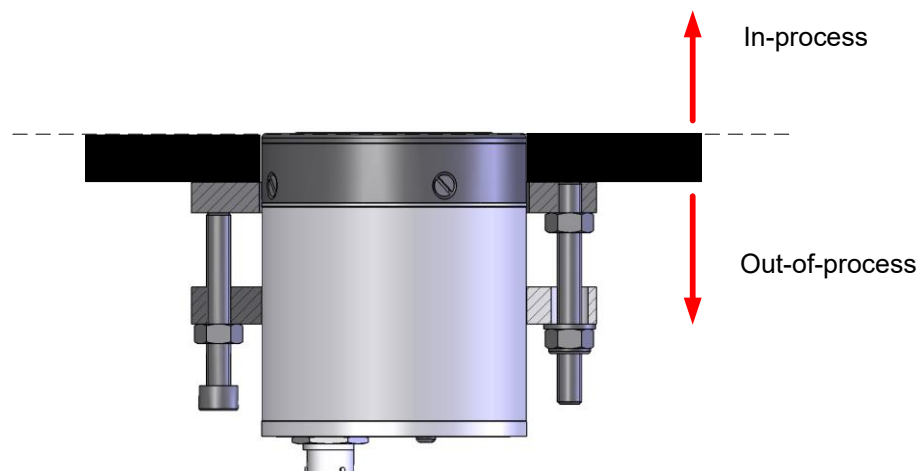
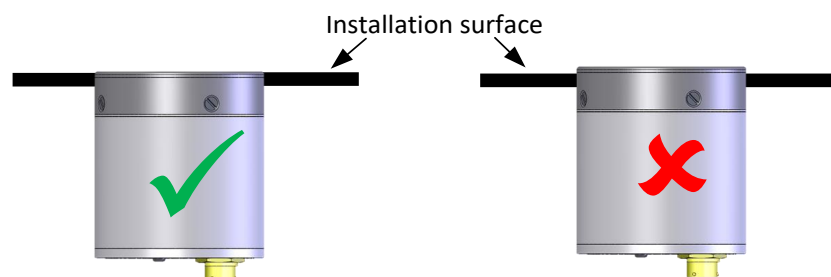
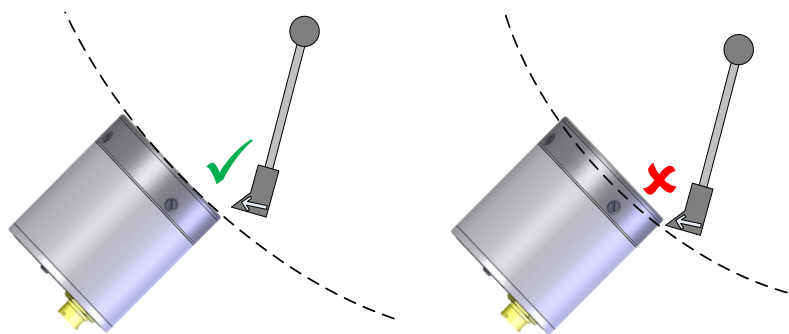


Figure 2: Outdoor installation conditions

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

**Figure 3: Flat Surface Installation**

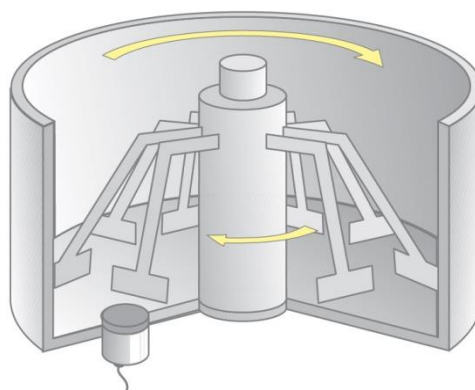
When installing the sensor in a curved surface, ensure that the centre of the ceramic disc is flush with the radius of the internal wall.

**Figure 4: Curved Surface Installation**

5 Turbo Mixers

The sensor must be installed in the floor of turbo mixers

The sensor should be approximately 2/3 distance from the mixer centre to the side wall

**Figure 5: Turbo Mixer Installation**

6 Planetary Mixers

The sensor should be fitted in the base of the planetary mixer, ideally in a position where the flow of material is smoothest and away from the area of severe turbulence caused by the mixing action of the blades. This is normally close to the side wall of the mixer. Therefore it is generally recommended that the sensor be positioned with the inner edge approximately 10 cm to 15cm from the side wall of the mixer. The minimum distance should never be less than 5cm. See the advice for flat surface mounting on page 14.

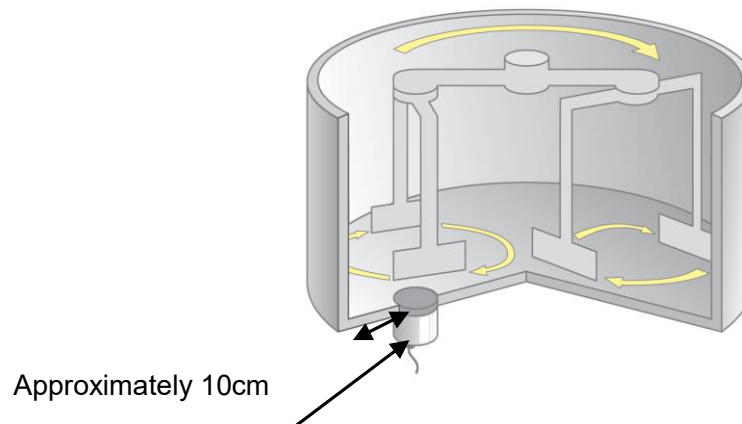


Figure 6: Planetary Mixer Installation

7 Single Shaft Horizontal and Ribbon Mixers

The sensor should be positioned near the base of horizontal mixers at 30 degrees to prevent water pooling. It should be placed approximately half way along the length of the mixer. The sensor should be on the 'up' stroke of the mixer. If this is not possible, for example when the mixer unloading doors obstruct this area, then it should be positioned on the opposite side on the 'down' stroke

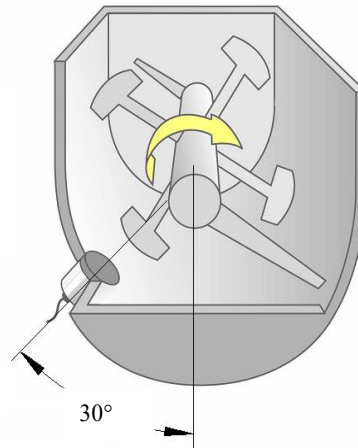


Figure 7: Single Shaft Mixer Installation

8 Twin Shaft Horizontal Mixers

The best position on horizontal twin shaft mixers is half way along the length of the mixer, near the base at approximately 30 degrees above the base to prevent water pooling on the sensor head.

The sensor should be mounted on the 'up' stroke of the mixer. If this is not possible, for example when the mixer unloading doors obstruct this area, then it should be positioned on the opposite side on the 'down' stroke

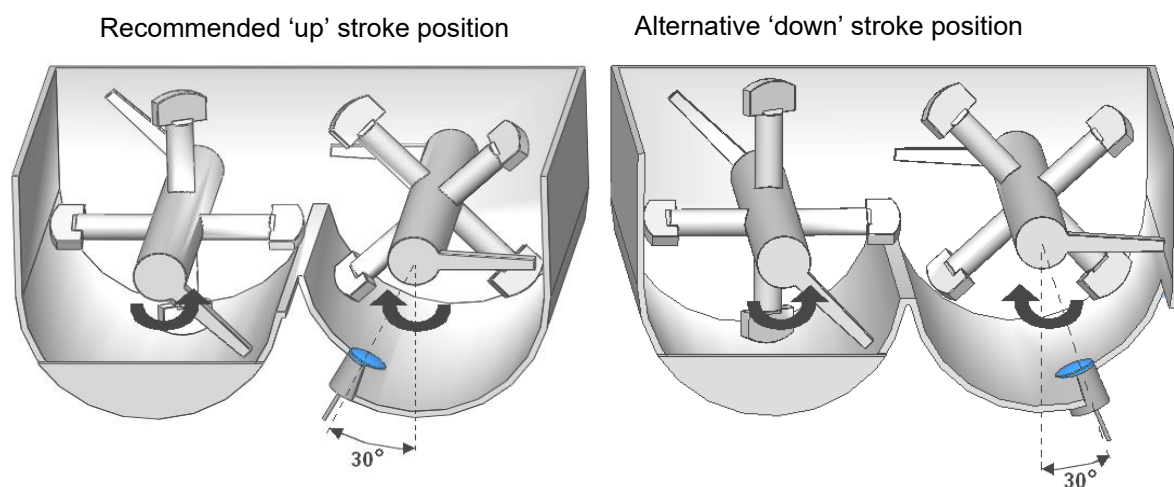


Figure 8: Twin Shaft Mixer Installation

9 Screw Conveyor

It is recommended that the sensor is installed at 30° above the base. (See Figure 9).

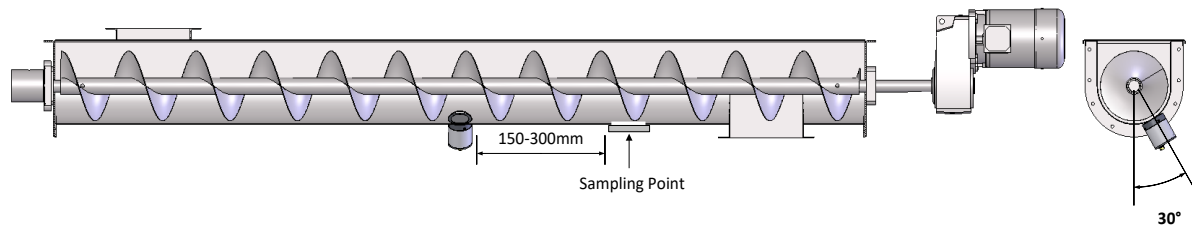


Figure 9: Screw Conveyor Installation

It is essential that the sensor is located so that the ceramic disc is continuously covered by at least 100mm of material. (Figure 10).

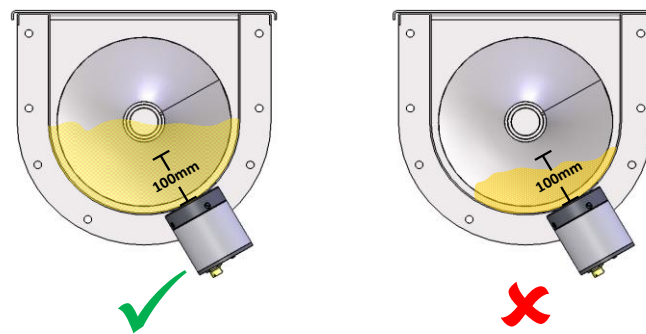


Figure 10: Screw Conveyor Material Level

10 Conveyor Belt Applications Using Hydro-Skid

The Hydro-Skid is a mounting device designed to enable a Hydronix Hydro-Mix moisture sensor to ride over the surface of flowing material on a belt conveyor. Measurements are then taken by the flush mounted sensor as the material passes underneath.

The Hydro-Skid should be installed above the conveyor belt. The arm must be installed so that the Hydro-Skid faces towards the pantograph arm fixings. For correct operation the Hydro-Skid must be installed parallel to the conveyor belt. See the Hydro-Skid User Guide (HD0551) for installation guidance.

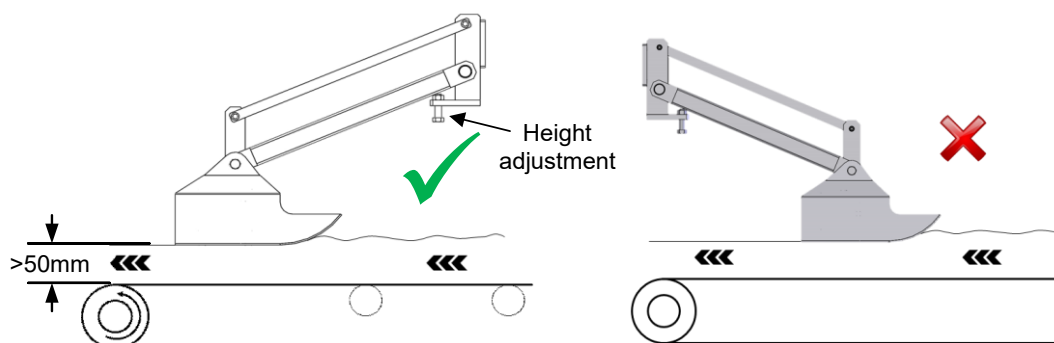


Figure 11: Hydro-Skid Installation on a Conveyor Belt

11 Installing the Sensor

These instructions refer to installing the Hydro-Mix in a mixer application, all other installation locations use the same mounting arrangement.

Each sensor is supplied with an Adjustable Clamp Ring assembly. When attached this allows the sensor to attach to the Fixing Plate (part 0021) which is welded externally to the floor or wall of the mixer.

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

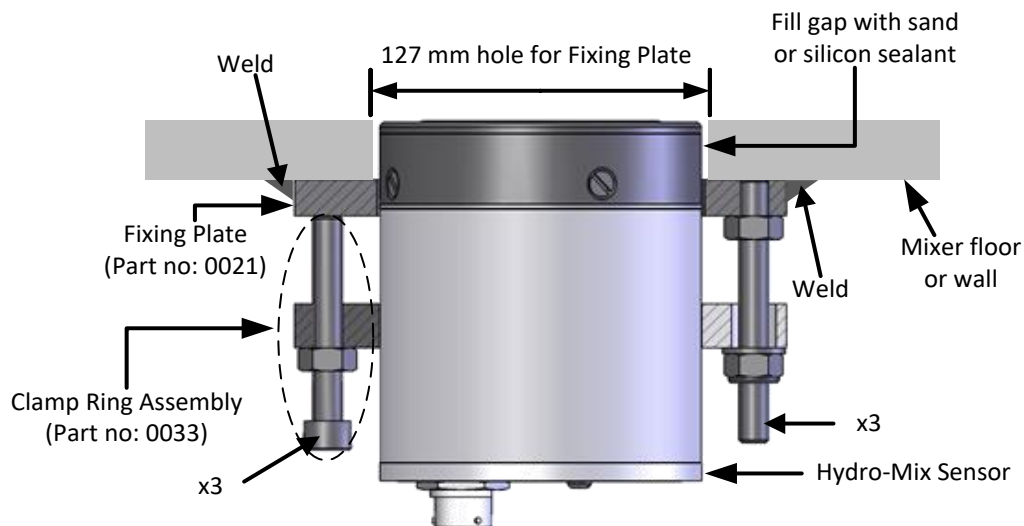


Figure 12: Sensor Installation

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

Before welding the Fixing Plate to the mixer a 127mm diameter hole should be cut through the external mixer wall and the internal wear plates.

Although the outside diameter is 108mm, it is recommended to cut a hole of 127mm diameter to allow for tolerances.

The fixing plate is then welded in position over the hole.

During any welding operations the sensor should be removed.

11.2 Fitting the Adjustable Clamp Ring Assembly to the Sensor

The Adjustable Clamp Ring comprises the following components:

- A. 3 x M10 screws
- B. 6 x M10 lock nuts (Three shown)
- C. 3 x M10 Nyloc nuts
- D. 3 x washers
- E. 2 x M8 screws
- F. 3 x M10 threaded stud
- G. Clamp Ring

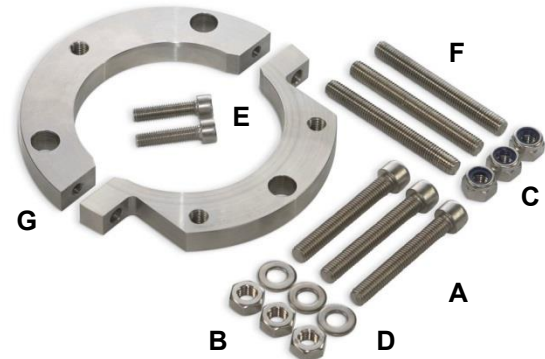


Figure 13: Adjustable Clamp Ring Components

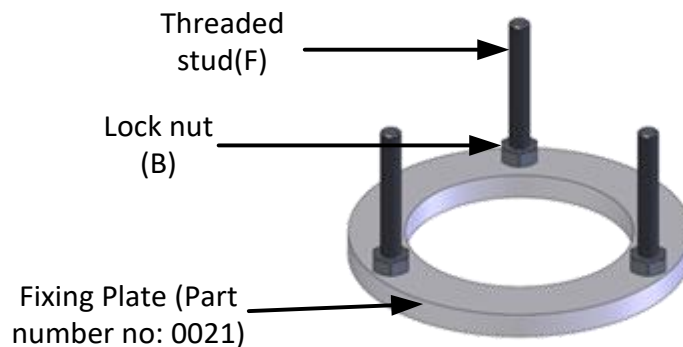


Figure 14: Fixing Plate Prepared for Attaching Clamp Ring

1. Screw the 3 threaded studs (F) to the Fixing Plate (already welded in place), and tighten securely using 3 lock nuts (B)
2. Fit the Clamp Ring (G) onto the sensor using the 2 x M8 screws (E). Position the Clamp Ring so that adjustment is possible with the ceramic disc level with the mixer floor or side wall.
3. Fit the Clamp Ring and sensor assembly over the threaded studs of the Fixing Plate and use the Nyloc nuts (C) and washers (D) to position the sensor with the ceramic disc level with the floor or side wall

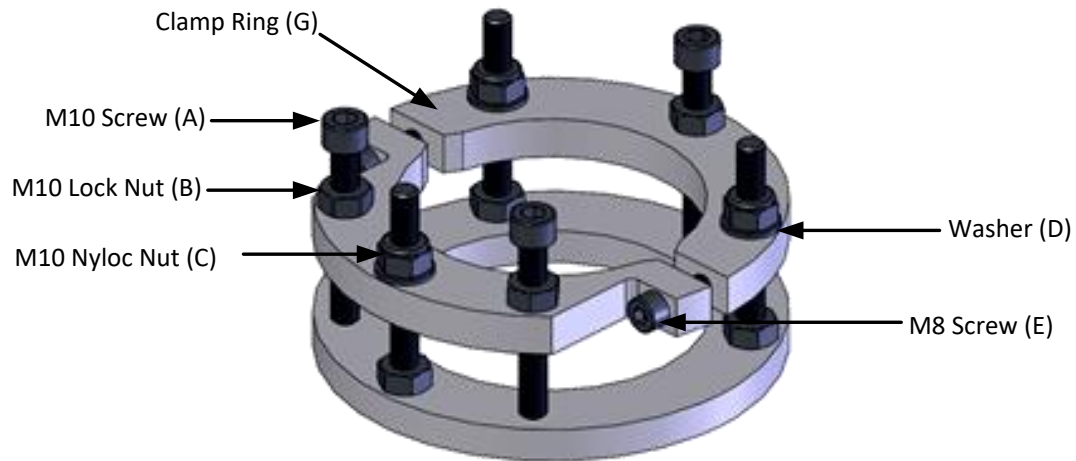


Figure 15: Adjustable Clamp Ring Assembled and Fitted to Fixing Plate

4. Fit the three screws (A) along with the 3 remaining lock nuts (B) to the Clamp Ring to push against the Fixing Plate.
5. CHECK again to ensure that the sensor head is in the correct position, using a steel rule, and ensure that any mixer blades and scrapers clear the ceramic disc by manually rotating the blades.
6. Fully tighten the complete assembly including the lock nuts.
7. Once the sensor has been correctly fitted and adjusted, fill the gap around the sensor with appropriate sealant (preferred) or compacted sand.

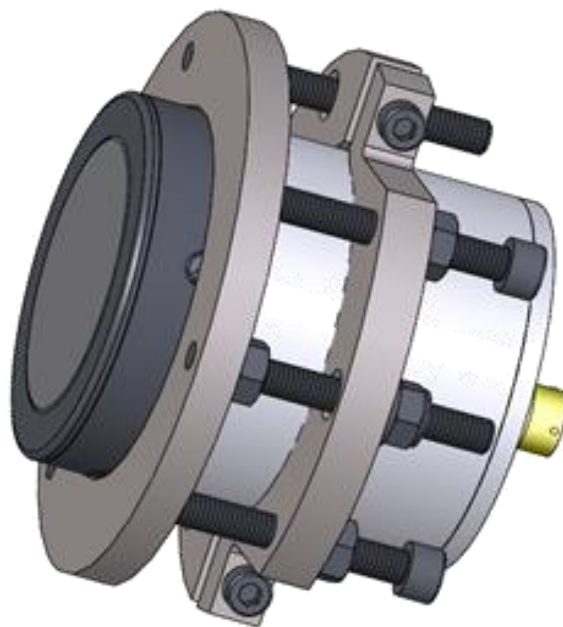


Figure 16: Adjustable Clamp Ring (0033) Fitted to Fixing Plate (0021) and Hydro-Mix

12 Adjusting the Sensor



NEVER HIT THE CERAMIC DISC

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

The ceramic disc of the sensor is extremely resistant to abrasion. When installed in a mixer the wear plates will wear more rapidly than the ceramic disc. Consequently from time to time it will be necessary to adjust the sensor so that it maintains the same relative position to the wear plates (following this procedure a recalibration of the recipes may be required).

12.1 To Move the Sensor IN to the Mixer

1. Clean out compacted sand or sealant from around the sensor.
2. Loosen the lock nuts B and screws A.
3. Tighten nuts C evenly (max 50Nm or 37ft/lb) until the sensor is in the desired position.
4. Tighten screws A (20Nm or 15ft/lb).
5. Tighten lock nuts B (40Nm or 30 ft/lb).
6. Fill the gap around the mixer with appropriate sealant (preferred) or compacted sand.

12.2 To Move the Sensor OUT of the Mixer

1. Clean out compacted sand or sealant from around the sensor.
2. Loosen lock nuts B and nuts C.
3. Tighten screws A evenly (max 60Nm or 45ft/lb) until the sensor is in the desired position.
4. Tighten nuts C (20Nm or 15ft/lb).
5. Tighten lock nuts B (40Nm or 30ft/lb).
6. Fill the gap around the mixer with appropriate sealant (preferred) or compacted sand.

12.3 Removal of the Sensor

Clean out compacted sand or sealant from around the sensor.

Remove nuts C and carefully ease out the sensor and clamp ring assembly.

If the sensor is to be removed and the mixer used, a sensor blanking plate (part no: 0035) can be used to seal the hole.

12.4 Replacing the Ceramic Disc

Should the ceramic disc of the sensor become damaged it can easily be replaced. It is advised that a replacement kit (part no: 0900) is held in reserve in case of this event. Full instructions on replacing the ceramic disc can be found in the Ceramic Disc Replacement Instructions HD0411.

After completion of the Ceramic Disc replacement it is necessary to perform an Air and Water Factory Calibration. This will ensure the sensor is correctly configured for the new Ceramic Disc. To perform the factory calibration please refer to the Hydro-Com user guide HD0682.

Ensure the ceramic is always flush with the mixer wear plates.

Fit the adjustable clamp ring (part no 0033) for ease of adjustment and extraction.

13 Routine Maintenance

- The only user-serviceable parts of the sensor are the Ceramic Disc and the Protection Ring (see section 12.4 for more details). The unit contains no other user-serviceable parts and cannot be opened, modified, or field repaired. If damaged, or in the case of a fault, the unit must be returned for repair.
- Periodic inspection of the sensor shall be carried out to ensure it is not damaged or showing excessive wear. If discovered, stop using the sensor immediately and arrange a return for repair.
- Do not disconnect any sensor wiring when energised.
- Periodic inspection of the sensor's ceramic face for encrusted with hardened, dry material. If found the ceramic face must be cleaned with water. No cleaning chemicals are required.

Keep the mixer blades adjusted to 0-2mm above the mixer floor. This will have the following benefits:

- All the residual mix is discharged when emptying the mix.
- Mixing action close to the floor of the mixer is improved, thereby improving the reading of the sensor.
- Reduced cycle times will result in savings on power and wear.

Regular inspection of the Protection Ring. If the wear has reached the 4mm mark, replace the Protection Ring (see Figure 17). If it is not replaced the ceramic retaining ring can become damaged, this could result in the sensor needing to be returned for repair. Full instructions on replacing the ceramic can be found in the installation instructions accompanying the replacement kit or the Ceramic Disc Replacement Instructions HD0411.



Figure 17: Protection Ring

REMEMBER – DO NOT HIT THE CERAMIC

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 with a drip loop in the cable. See (Figure 18).

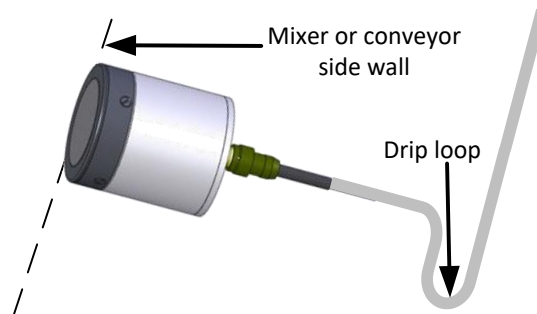


Figure 18: Hydro-Mix Installed with a Drip Loop

1.3 Protection Cover

Install a cover over the top of the sensor to deflect the material away from the connector. (See Figure 19). Self-amalgamating tape can also be used to seal the connector

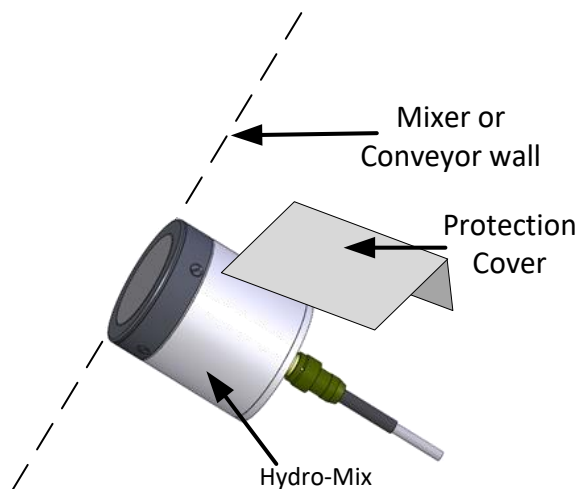


Figure 19: Hydro-Mix with Protection Cover Installed

1 Technical Specifications

1.1 Dimensions

Diameter:	108mm (4.3")
Length:	125mm (4.3"); 200mm (7.9") including connector
Fixing:	127mm (5.0") diameter cut hole.
Mass:	4.2kg (9.3lbs)

1.2 Construction

Body:	Stainless steel
Faceplate:	Ceramic
Protection ring:	Hardened steel

1.3 Operating Temperatures

Operation Temperature Range:	0°C to +60°C (32°F to 140°F)
Moisture Detection Temperature Range:	0°C to +60°C (32°F to 140°F)
Storage Temperature Range:	-20°C to +75°C (-4°F to 167°F)

1.4 Operating environment

Humidity Range:	0-90%RH Non-Condensing
Rated Altitude:	2000 Metres
Pollution Degree Environment:	Pollution Degree 2
Overvoltage Category:	Category 1

1.5 Measurement Field and Frequency Range

Material Penetration:	75 -100mm, dependent upon material
Operating Frequency:	760 – 870MHz

1.6 Range of Moisture

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

1.7 Electrical Ratings

Nominal Power Consumption:	4 W
Supply Voltage Range:	15 to 30 VDC
Power-On Current:	≤1ADC

1.7.1 Digital Inputs

- One configurable digital input: 15 - 30 VDC
- One configurable digital input/output:
 - input specification 15 - 30 VDC
 - output specification: open collector output, maximum current 500mA (over current protection required)

1.7.2 Analogue Output

Two configurable 0-20mA or 4-20mA current loop outputs (sink) available for moisture and temperature. The sensor outputs may also be converted to 0-10 VDC

1.8 Digital (Serial) Communications

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

1.9 Connections

Connector on Sensor: MIL-DTL-26482 Circular 10-Pin Male Socket

1.9.1 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.

1.9.2 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.

1.10 Measurement Modes

Mode F, Mode V and Mode E

1.11 Brix Measurement Output

No

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
HD0411	Ceramic Disc Replacement Instructions
HD0678	Hydronix Moisture Sensor Electrical Installation Guide
HD0551	Hydro-Skid User Guide
HD0679	Hydronix Moisture Sensor Configuration and Calibration Guide
HD0682	Hydro-Com User Guide

2 Risk Assessment

Information in this section aims to assist with risk analysis.

Severity Group	People	Equipment / Facility	Environment
Catastrophic	Once or more fatalities	System or facility loss	No catastrophic environmental impact
Severe	Disabling injury/illness	Major subsystem loss of facility damage	N/A
Moderate	Medical treatment or restricted work activity.	Minor subsystem loss of facility damage	N/A
Minor	First aid only	Non-serious equipment or facility damage	N/A

Table 1: Severity of Harm

Likelihood	Expected rate of occurrence
Frequent	More than five times a year.
Likely	More than once per year, but not more than five times a year.
Possible	More than once in five years, but not more than one a year.
Rare	More than once in ten years, but no more than one in five years.
Unlikely	No more than once in ten years.

Table 2: Probability of Harm

Risk assessment / Risk category			
Risk	Probability of Harm	Severity	Remark
Electric shock	Unlikely	Minor	Sensor is supplied with 24VDC will not cause harm.
Ceramic shattering, flying shards	Unlikely	Minor	Sensor should be installed behind safety gate and in location where people are not present during operation.

Table 3: Risk Category

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