Hydro-Probe Orbiter

Installation Guide

To re-order quote part number:	HD0677
Revision:	1.2.0
Revision date:	January 2020

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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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Revision history

Revision No	Date	Description of Change
1.0.0	Feb 2015	First Release
1.1.0	May 2015	Orbiter Arm product numbers changed
1.2.0	Jan 2020	Address Change

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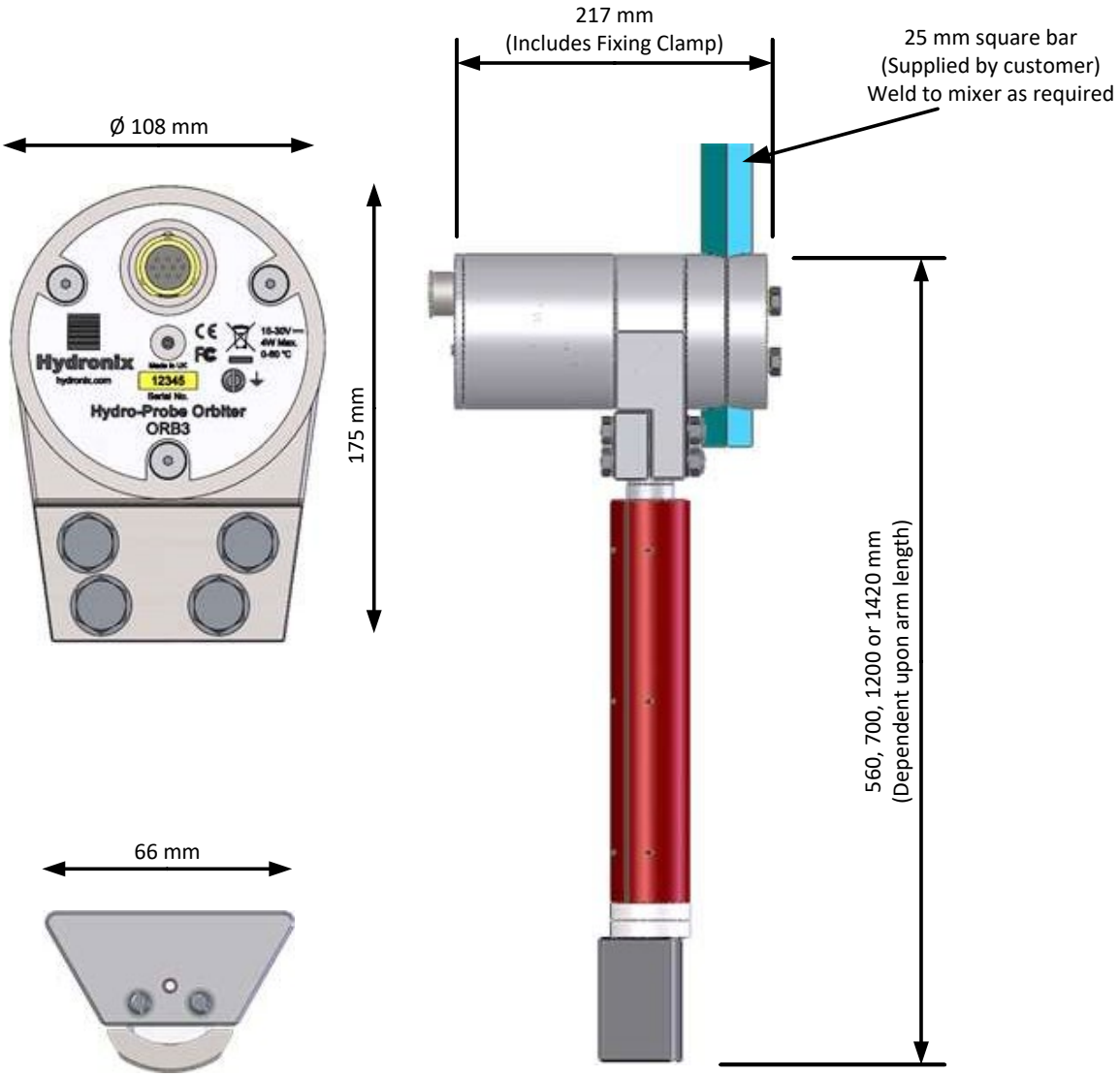
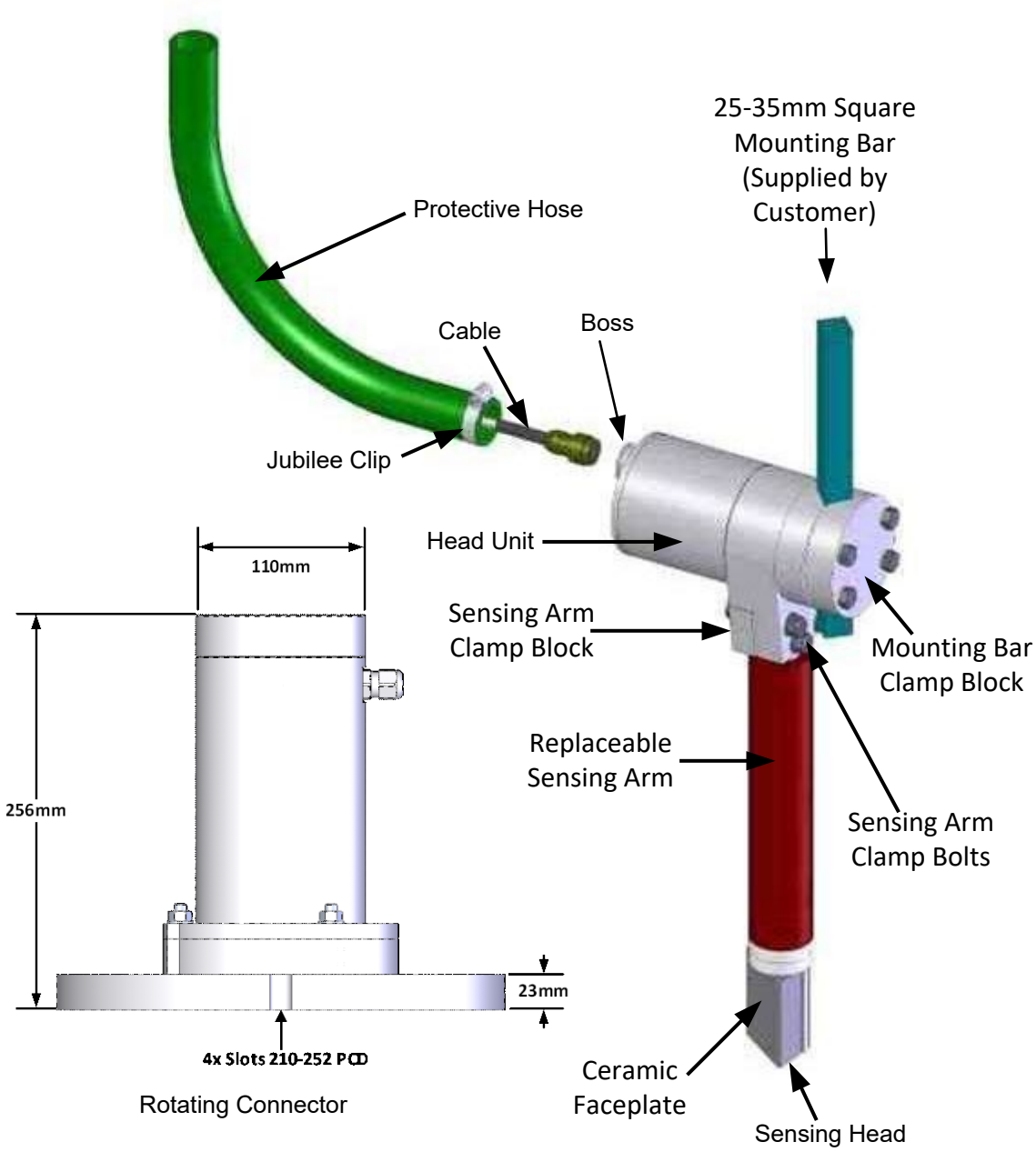
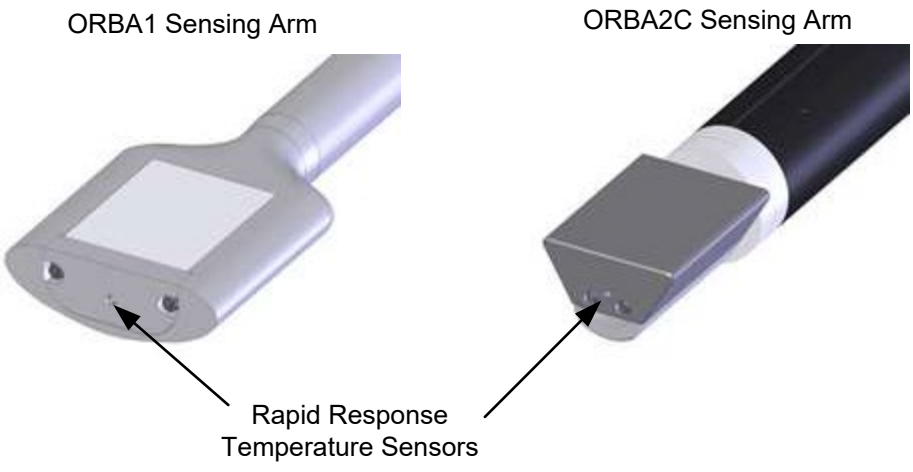

217 mm
(Includes Fixing Clamp)
25 mm square bar
(Supplied by customer)
Weld to mixer as required
Ø 108 mm
175 mm
Hydronix
Hydro-Probe Orbiter
ORB3
560, 700, 1200 or 1420 mm
(Dependent upon arm length)
66 mm


25-35mm Square
Mounting Bar
(Supplied by
Customer)
Protective Hose
Cable
Boss
Jubilee Clip
Head Unit
110mm
Sensing Arm
Clamp Block
Mounting Bar
Clamp Block
Replaceable
Sensing Arm
256mm
Sensing Arm
Clamp Bolts
23mm
4x Slots 210-252 PCD
Rotating Connector
Ceramic
Faceplate
Sensing Head


ORBA1 Sensing Arm
ORBA2C Sensing Arm
Rapid Response
Temperature Sensors

This Hydro-Probe Orbiter Installation Guide is only valid for model numbers ORB3 onwards. User guides for earlier Hydro-Probe Orbiter model numbers are available from www.hydronix.com

1 General to all Applications

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

Follow the advice below for good sensor positioning:

- If installed in a mixer provide a small inspection lid in the mixer cover so that, during mixing and when the mixer is empty, the movement of the sensor and its ceramic face may be observed without having to raise the main cover plate.
- If installed in a mixer avoid areas of severe turbulence. The best signal will be obtained where there is a smooth flow of material over the sensor. Mount the sensor so that it does not get hit directly by flow from any mixing stars or wirblers.
- The sensor should be positioned where it will see a continuous sample of the flowing material.
- Position the sensor away from any electrical interference (See Electrical Installation Guide HD0678 for connection details).
- Position the sensor so that it may be easily accessible for routine maintenance, adjustment and cleaning.

2 Orbiter Sensing Arm Options

There are two designs of Orbiter Sensing Arm available, ORBA1C and ORBA2C, each design is available in multiple lengths. The ORBA1-HT is a high temperature option. The Sensing Arm used will depend on the material being measured and the installation. The ORBA2C is the latest model and is recommended for all mixing applications.

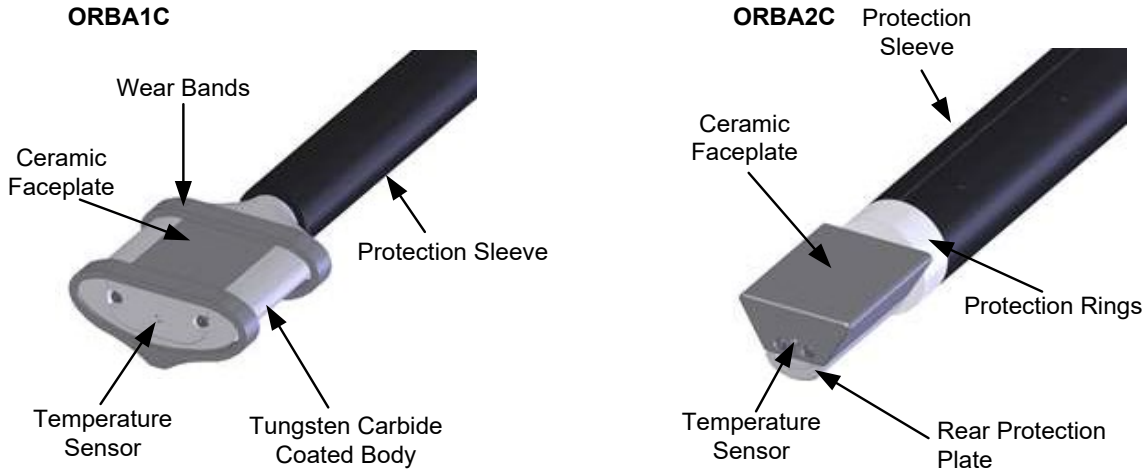


Figure 1: The two Orbiter Arm Sensing Heads

3 Protection of Orbiter Sensing Arms

Hydronix supplies Protection Sleeves to help increase the wear life of the Orbiter Sensing Arm. Protection Sleeves are easily removed and replaced without having to disconnect the Sensing arm from the Head Unit.

ORBA2C models also require Protection Rings to be fitted. Stainless Steel Protection Rings are fitted as standard with an option to upgrade to ceramic versions if required.

4 Assembly of Sensing Arm and Head Unit

The Sensing Arm and Head Unit are shipped unattached from one another. They need to be connected before installation into the mixer.

- Place the Head Unit on a clean, flat surface.
- Loosen the 4 Sensing Arm Clamp Bolts on the Head Unit and remove the Locking Bolt (A).
- Fit the two 'O' rings. These need to be located inside the Sensing Arm Clamp Block up against the step (Figure 2).
- Ensure that the key on the electrical connector at the top of the Sensing Arm is on the same side as the Ceramic Faceplate. The connector can be rotated by hand if required.

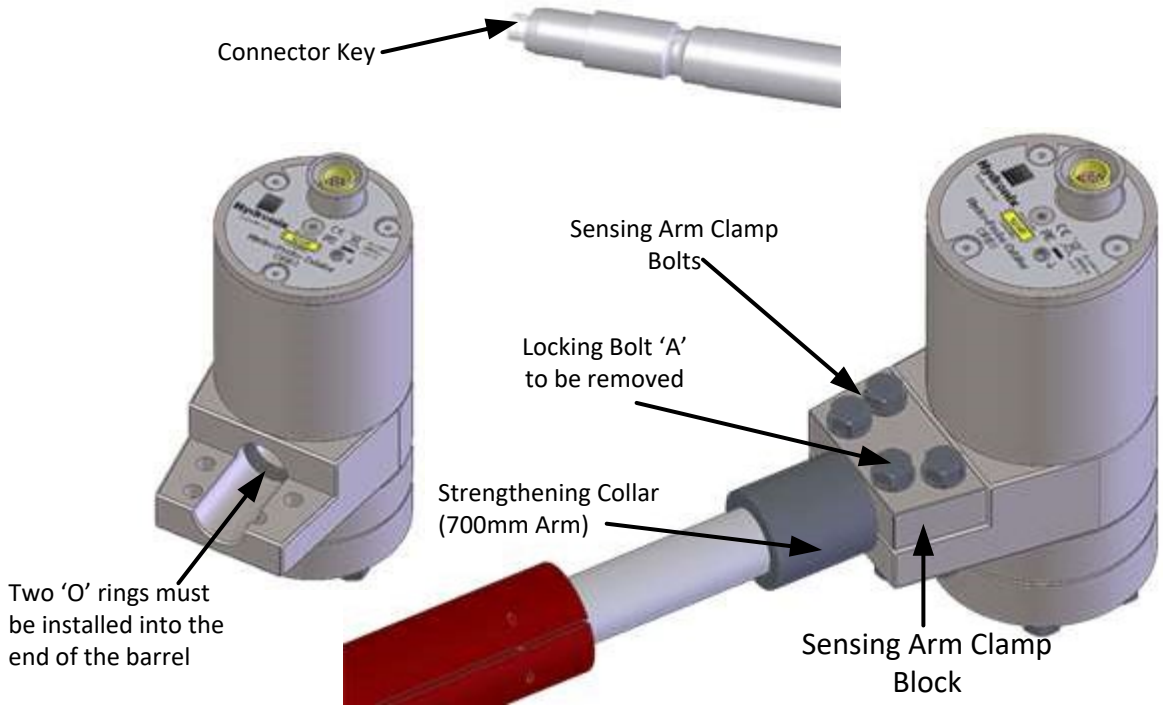


Figure 2: Installation of Sensing Arm into Head Unit

- Place the Sensing Arm on the same clean, flat surface with the Ceramic Faceplate facing upwards, align the hole in the Head Unit and the keyway on the connector.
- For ease of fitting, apply a small amount of grease to the connector end of the arm or around the two 'O' rings.
- Gently locate the connector at the top of the Sensing Arm in the Head Unit, so that the Connector Key lines up correctly in the Head Unit. Push the Sensing Arm home into the Head Unit.
- Replace Locking Bolt 'A'.

- The sensing Arm must be able to be twisted within the Sensing Arm Clamp Block to allow for directional adjustment when finally fitting the sensor. Tighten the four Sensing Arm Clamp Block Bolts to hold the sensing arm firmly in position but ensuing that it may still be twisted within the Sensing Arm Clamp Block. Once the sensor is in the correct location the Sensing Arm Clamp Blots can be fully tightened.

If replacing a previous Sensing Arm the new Sensing Arm must be matched to the Head Unit. See Hydro-Com User Guide HD0682 for detailed instructions.

5 General Sensing Arm Mounting Advice (Mixers)

The following considerations need to be taken into account when selecting the optimum position:

- Select a position where the flow of material is the smoothest, and as far as possible from the turbulence created by the mixer blades.
- The Sensing Arms are available in multiple lengths. The sensor should be mounted such that there is a 50mm gap between the underside of the Sensing Arm and the mixer floor (Figure 5)
- A protective cover can be placed over the Head Unit to protect the sensor from falling materials and prevent unnecessary build-up of materials on the Head Unit (Figure 3).

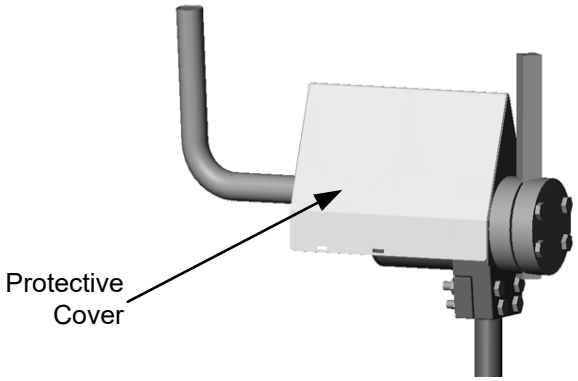


Figure 3: Protective cover placed over the Head Unit

6 Fitting the Square Mounting Bar

A 25-35mm square bar should be very firmly welded to the appropriate scraper blade arm, or alternative mixer arm, depending on the mixer configuration. It should be suitably reinforced to provide a rigid fixing that will withstand the forces generated on the sensing head and arm whilst moving though the material. Ensure that the bar is perpendicular to the floor in both planes.

Undo and remove the four bolts securing the Mounting Bar Clamp Blocks to the Head Unit and remove the clamp blocks (Figure 4). Depending on the configuration, the clamp blocks can be rotated for either vertical or horizontal fixing to the square bar.

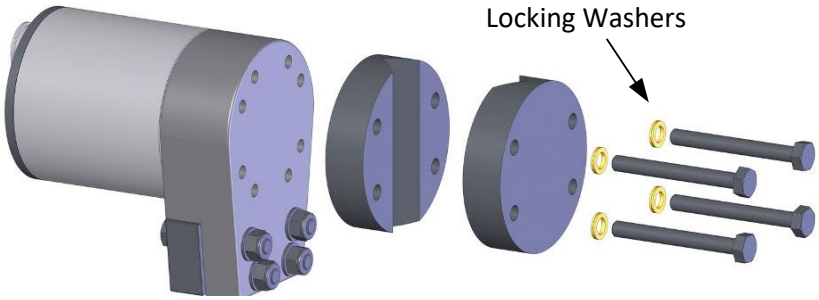


Figure 4: Removing the Mounting Bar Clamp Blocks ready for fitting to the mixer

7 Mounting the Sensor and Making Final Adjustments (Mixer)

The recommended height for typical applications is 50mm above the floor of the mixer (Figure 5). This height can be set using the Angle Aligner, which has a width of 50mm.

The correct length of arm should be selected to allow the Sensing Head to sit a minimum of 50mm above the floor of the mixer and to ensure that the Ceramic Faceplate is in a smooth flow of material.

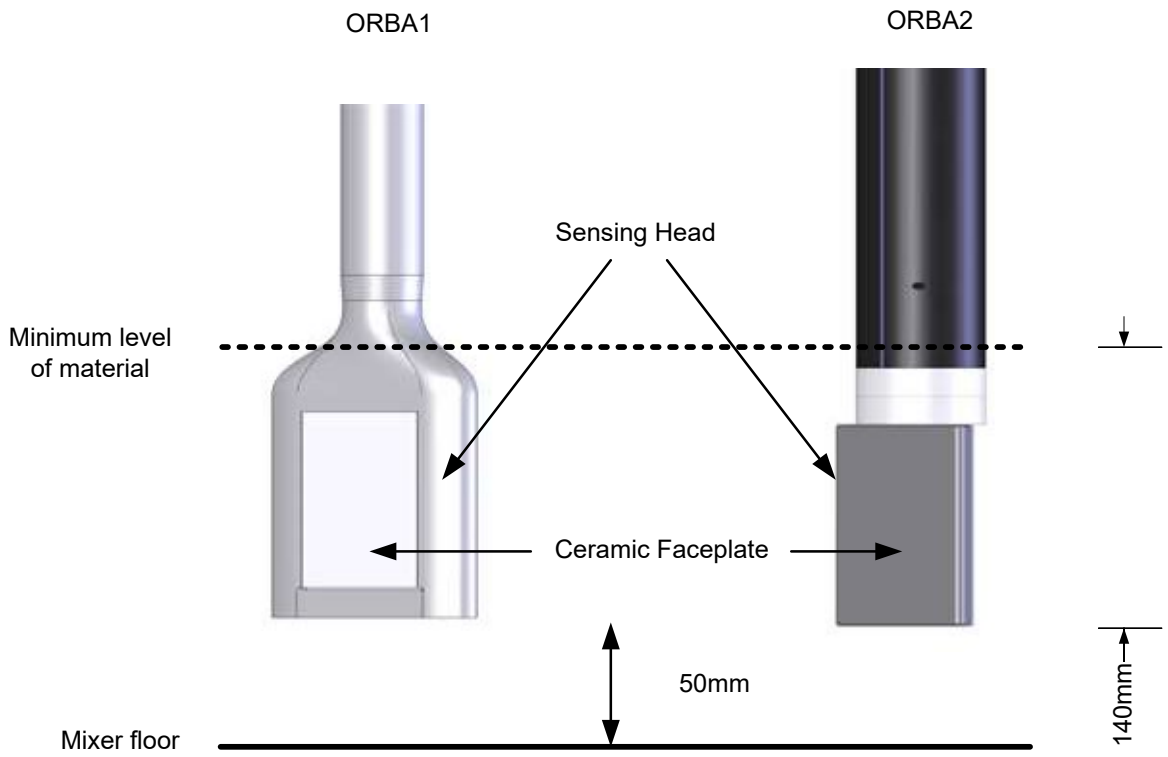


Figure 5: Height setting of the Sensing Arm

When adjusted to the desired height, securely tighten the Mounting Bar Clamp Block bolts to a torque of 60Nm (44lb/ft). It is essential to ensure the locking washers are fitted to the clamp bolts so that the sensor is securely retained on the mounting bar.

8 Mounting in a Static Pan Mixer

The sensor should be attached along the scraper blade arm approximately 1/4 to 1/3 of the distance in from the wall of the mixer (see Figure 16). The Ceramic Faceplate of the Sensing Arm should be angled at 55º to the centre of the mixer, which can be set using the aligner provided (see Figure 17 for further information).

When installing in a turbo (pan) mixer that incorporates sprung mixing arms the sensor's performance may be improved by installing a separate unsprung arm from which to mount the sensor.

The Head Unit may be mounted underneath or above the scraper blade arm (Figure 6). In both cases the Head Unit should be as far out of the mix as possible in order to keep it reasonably clean and minimise wear.

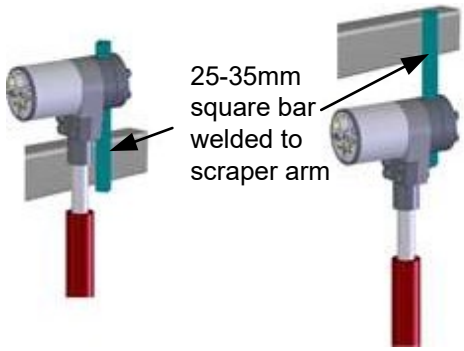


Figure 6: Fixing the sensor above or under the scraper blade arm

When installing the sensor in a static pan mixer, the sensor cable must be routed via a Rotating Connector which is fitted to the centre of the mixer top (See Page 25 for more details).

Error! Reference source not found. shows how the square mounting bar may be welded to the scraper blade arm or an alternative arm.

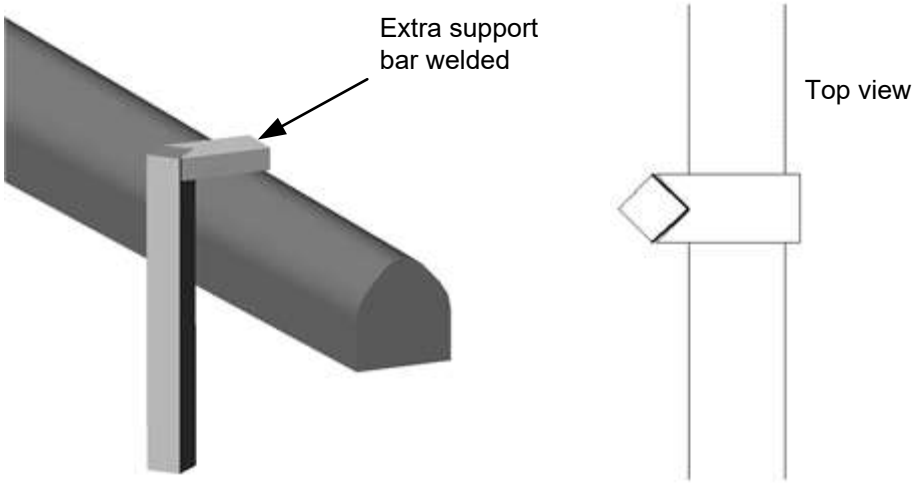


Figure 7: Square mounting bar welded to scraper blade arm

9 Mounting in a Rotating Pan Mixer

It is recommended to install the Hydro-Probe Orbiter so that the Head Unit is outside of the mixer. This will protect the head unit from debris and damage.

The Sensing Head should be positioned in an area where the flow of material is the smoothest. Normally this is a quarter or a third of the distance in from the outer edge of the mixer wall. (Figure 17)

The sensor may be attached to the mixer in one of two ways. Attaching the sensor using the Mounting Bar Clamp Block supplied with the sensor (Figure 8) or using a custom engineered mounting assembly (Figure 9).

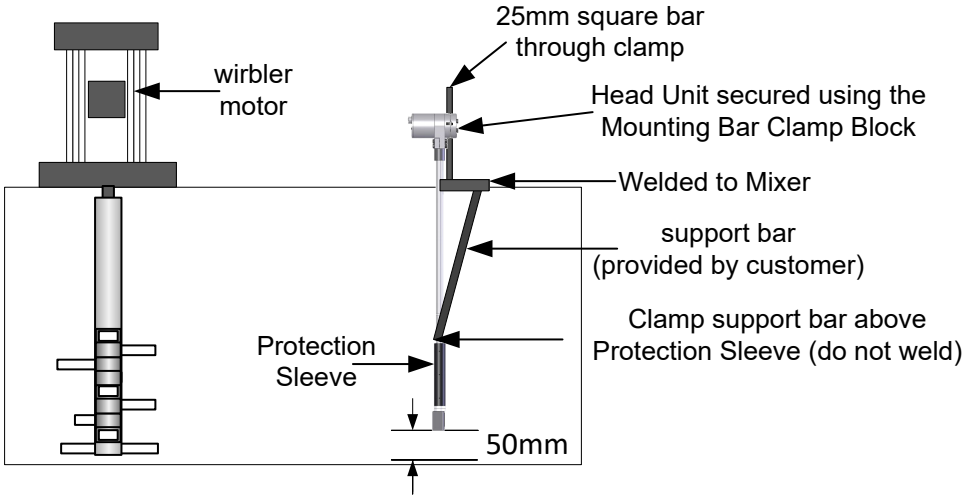


Figure 8: Sensor mounted above the mixer using the clamp bar

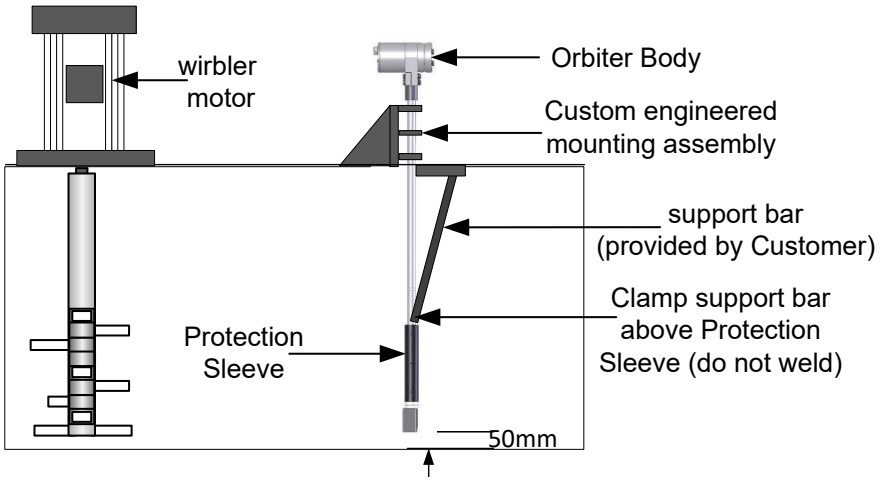


Figure 9: Sensor mounted above mixer using clamp blocks

It is recommended to add an additional support bar when using a 1200mm or 1420mm Sensing Arm (Figure 9). The support needs to be attached to the top of the mixer and clamped to the Sensing Arm just above the Protection Sleeve.

10 Mounting on a Conveyor Belt

The Ceramic Faceplate should be positioned in the centre of the material flow. The angle of the Ceramic Faceplate should be approximately 35° to the flow of the material (Figure 10).

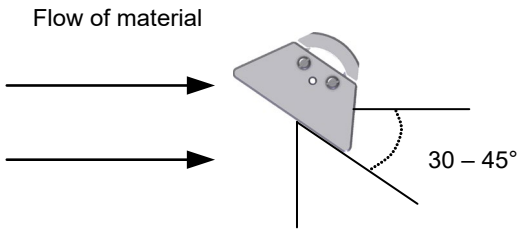


Figure 10: Orientation of the Hydro-Probe Orbiter Ceramic Faceplate in the flow of material

Allow a 25mm gap between the sensor and the conveyor belt with a minimum of 150mm of material depth (Figure 11).

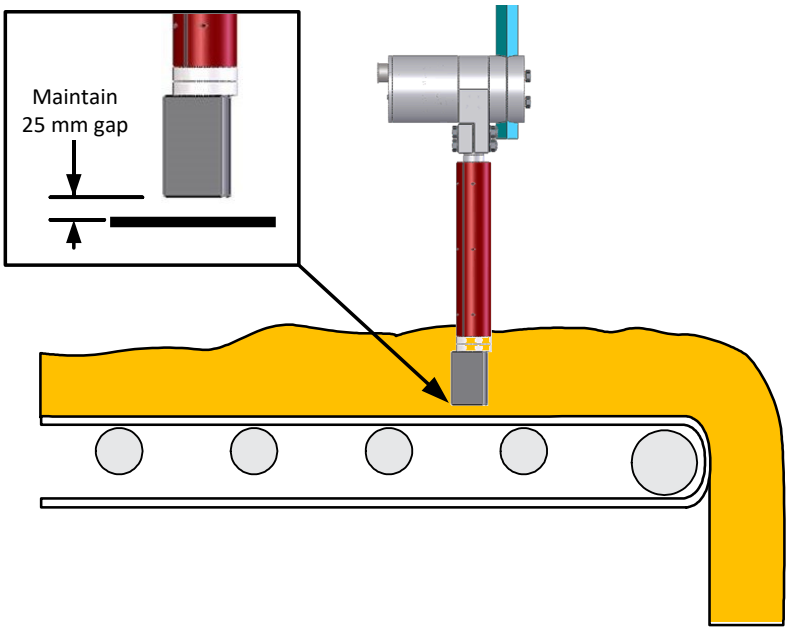


Figure 11: Mounting the Hydro-Probe Orbiter on a conveyor belt

To maintain a consistent material depth diverters can be added to the belt (Figure 12).

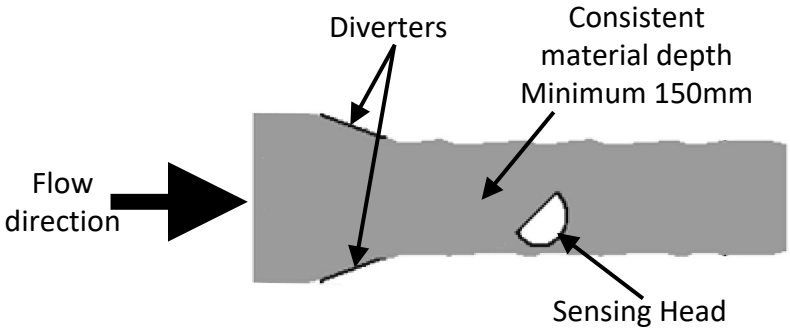


Figure 12: Adding diverters to increase material depth

11 Mounting in a Free Fall Application

Weld an appropriate mounting bar to ensure that the sensor is positioned in the centre of the material flow. The Sensing Head should be installed at an angle between 45°and 60° to the material flow.

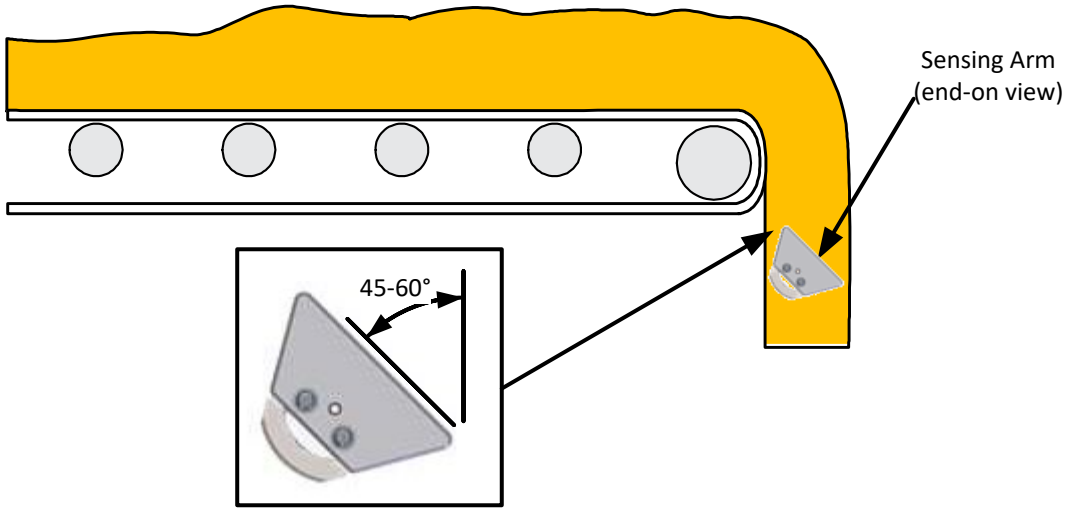


Figure 13: Mounting the Sensor at the end of a conveyor

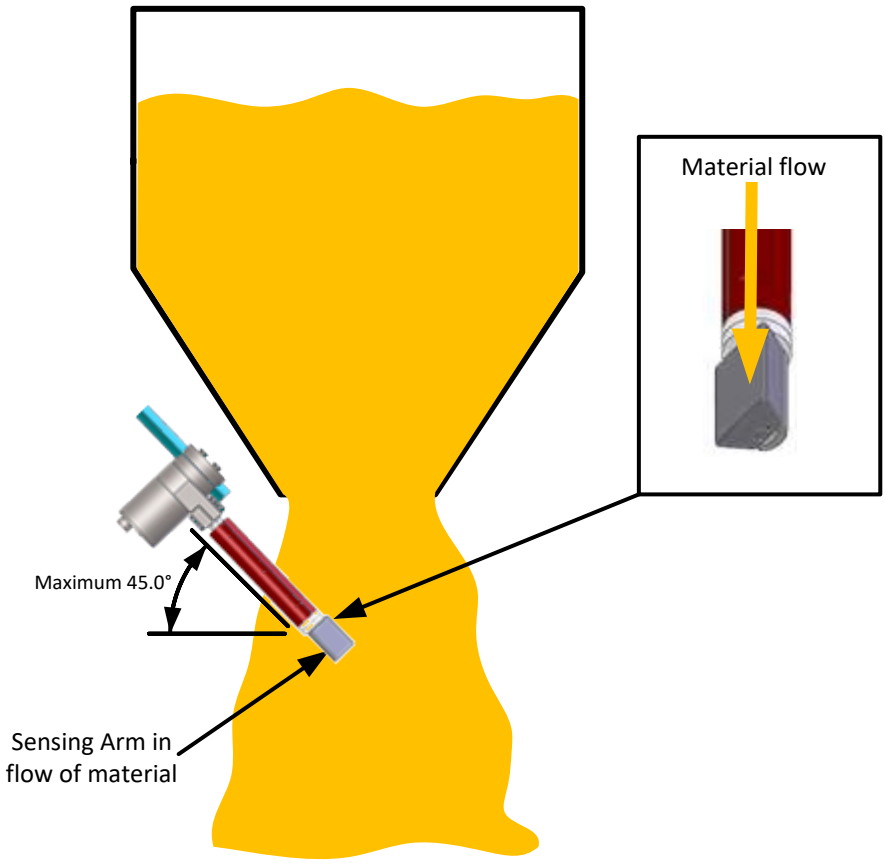


Figure 14: Mounting the sensor in a silo outlet

12 Sensing Head Angle Adjustment for Optimum Performance

Loosening the four Sensing Arm Clamp Bolts allows the arm to be rotated through an angle of approximately 300° (Figure 15). The sensing arm is fitted with a mechanical stop to protect the internal cables from being over-rotated. If the mechanical stop prevents the Ceramic Faceplate from being adjusted to the desired angle in relation to the flow of material (Figure 16) remount the Hydro-Probe Orbiter Head Unit on the mounting bar at a different angle. Care should be taken not to twist the arm without having the lock bolt inserted to prevent damage to the internal cables.

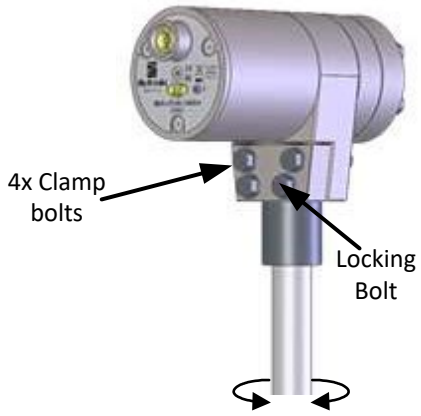


Figure 15: Adjusting the Sensing Head angle

The angle of the sensing head face should be adjusted to provide consistent compaction of material against the ceramic measuring face and at an angle that avoids build-up of material on the sensing head.

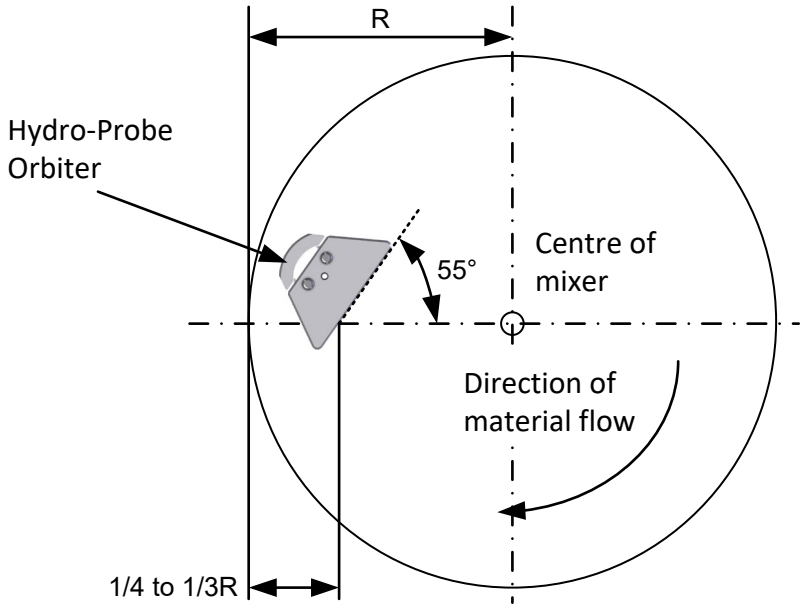


Figure 16: Setting the sensor angle for optimum performance

- An angle of 55º generally provides good results. Use the angle aligner provided to set the angle (Figure 17).
- In some rotating pan mixers an angle of approximately 65° to the mixer centre is more appropriate to prevent material build-up on the Ceramic Faceplate.
- Ensure all clamp bolts are tightened to a torque of 28Nm (21 lb/ft) after adjustment.

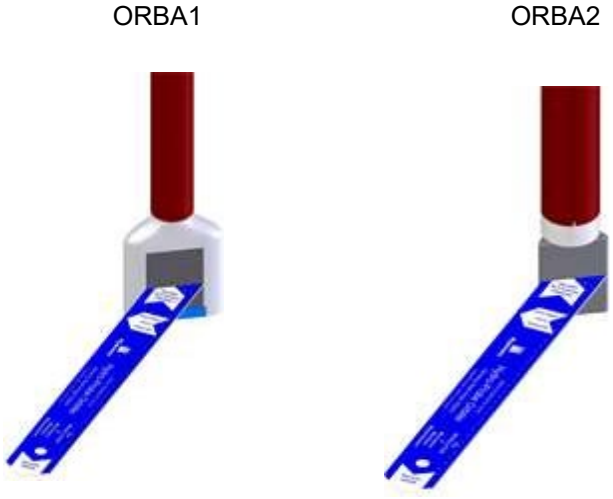


Figure 17: The Hydronix Angle Aligner for Ceramic Faceplate alignment

IMPORTANT:

If the alignment of the sensing arm is changed inside a mixer, the resultant density change of the material passing over the Sensing Head will have an effect on the measurement. It is therefore necessary to recalibrate the recipes before the continuation of batching.

13 Replacing the Sensor Arm

The Sensing arm is a replaceable wear part. The wear life of the arm will depend on the chemical and abrasive properties of the material being measured and the type of application.

Wear life may be extended by correct maintenance and the replacement of worn Protection Sleeves and Wear Rings.

13.1 Removing the Head Unit and Sensing Arm

Warning: The sensor is heavy. Before loosening any bolts ensure that the sensing Arm is supported.

- Undo the Clamp Bolts securing the Head Unit to the Mounting Bar.
- Remove the complete sensor and take to a clean environment.
- It is recommended that removal of the Sensing Arm from the Head Unit is performed in a clean, dust free environment.
- Lay the Head Unit and Sensing Arm on a clean flat surface.
- Undo Sensing Arm Clamp Bolts and pull out the worn Sensing Arm.
- Attach the new Sensing Arm by following the installation instructions in this guide (See Page 14).

13.2 Matching a Replacement Sensing Arm to the Head Unit

After replacing a Sensing Arm it is necessary to match the new Sensing Arm to the Head Unit. This process ensures that the sensor's high and low signal levels are matched to a Hydronix standard. The new Sensing Arm and Head Unit combination will operate in exactly the same range as the previous combination and material calibration data remains valid.

Matching is achieved by performing an Air Water Calibration for the new combination.

Matching may be achieved by connecting the sensor to a PC running Hydro-Com software, using a Hydro-Control or by using the Hydronix Auto-Cal Dongle (part 0097). For matching using the Hydro-Com software refer to the Hydro-Com software user guide HD0682. For matching using the Hydro-Control refer to the Hydro-Control Installation Guide HD0455

After a new Sensing Arm has been matched it is recommended to run test batches to ensure the calibration data remains valid.

14 Matching without a PC Using the Auto-Cal Dongle

The Auto-Cal Dongle (Figure 18) has been designed for matching without the need for the sensor to be connected to a PC or Hydro-Control unit. For example when the Hydro-Probe Orbiter is connected directly to a control system using only the analogue output.

Figure 18: Auto-Cal Dongle

Matching of the Head Unit and the Sensor Arm is achieved by connecting the Auto-Cal Dongle between the sensor cable and the Head Unit (Figure 19).

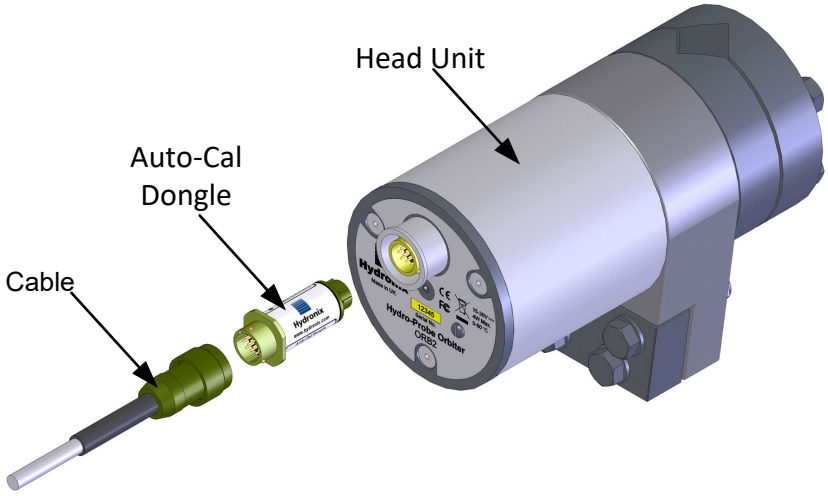


Figure 19: Connecting the Auto-Cal Dongle

This process is only suitable for mixer applications. If the sensor is installed in a free flowing material application, such as under a silo/bin, the full matching process should be followed. See Hydro-Com user guide HD0682 for details.

The following procedure for matching using the Auto-Cal Dongle should take less than one minute to complete:

1. Ensure that the Ceramic Faceplate is facing upwards and is completely clean and dry
2. Connect the Auto-Cal Dongle to the Head Unit and sensor cable (Figure 19). The Auto-Cal Dongle should begin flashing (red) bright-dim-bright for 30 seconds.
3. After 30 seconds the Auto-Cal Dongle will start flashing on-off-on. It is important to keep clear of the Ceramic Faceplate during this phase so as not to affect the measurement.
4. After 10 seconds the Auto-Cal Dongle should illuminate constantly. The matching process is finished and the Hydro-Probe Orbiter is now ready to be fitted back into the mixer. Disconnect the Auto-Cal Dongle and re-attach the cable for normal use.
5. If the Auto-Cal Dongle continues to flash on-off-on, as in stage three, then the matching process was unsuccessful due to variations during the measurement stage (stage four). Disconnect the dongle and repeat the matching process, ensuring that the Ceramic Faceplate is clean and free from any obstructions during stage four.

15 Rotating Connector

A Rotating Connector may be used to transmit wired power and data when the sensor is mounted so that it is rotating within a static environment. Hydronix offer two types of Rotating Connector to cover the different mounting options. A model selection chart assists with the selection of the correct equipment on page 35.

Type A is designed to be installed where the mixer has an available central threaded hollow shaft.

Type B is designed to be installed on top of mixers with a central hole in the mixer lid (pan mixer)

Wiring information can be found in the Electrical Installation Guide HD0678. For further advice please contact support@hydronix.com

15.1 Type 'A' Rotating Connector Assembly

15.1.1 Suitable Applications

Suitable for mixers that have a threaded, hollow central shaft through the gearbox and where the motor is not positioned centrally. Rotation is via the mixer threaded rotating shaft.

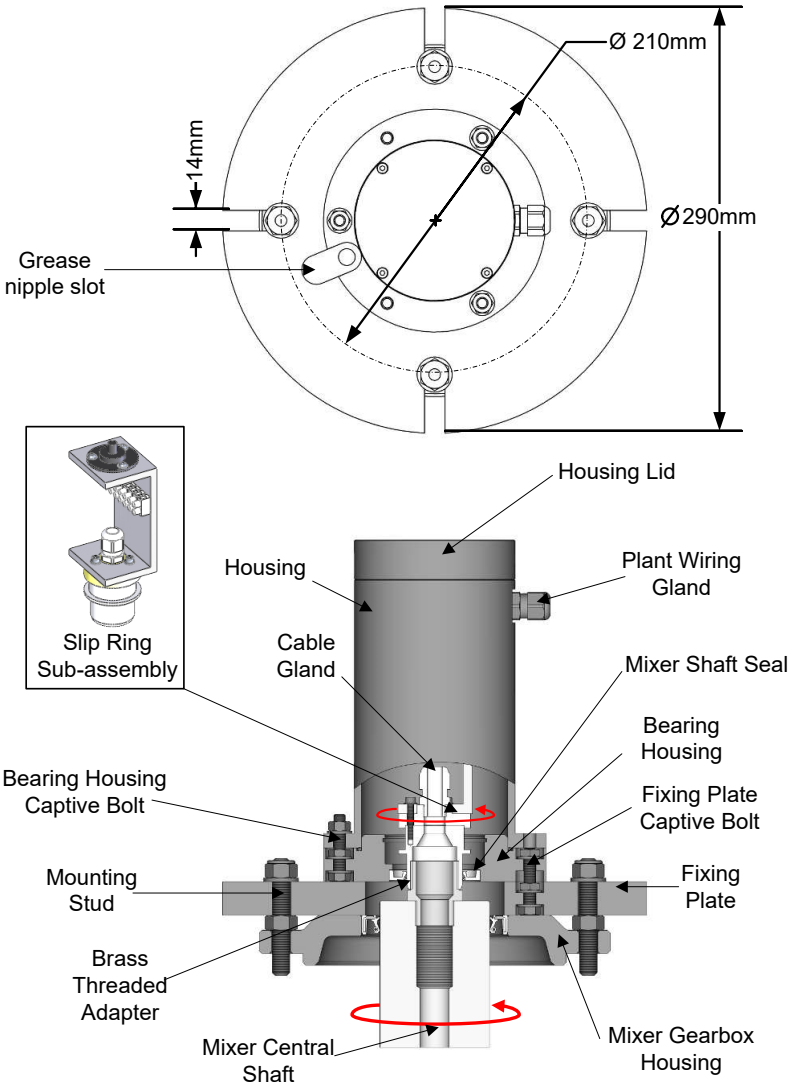


Figure 20: Type 'A' Rotating Connector Assembly

15.1.2 Mounting

The Type ‘A’ Rotating Connector mounts directly on the top of the mixer using the supplied Mounting Plate.

Connects directly to the mixer central threaded hollow shaft by means of the threaded adapters supplied

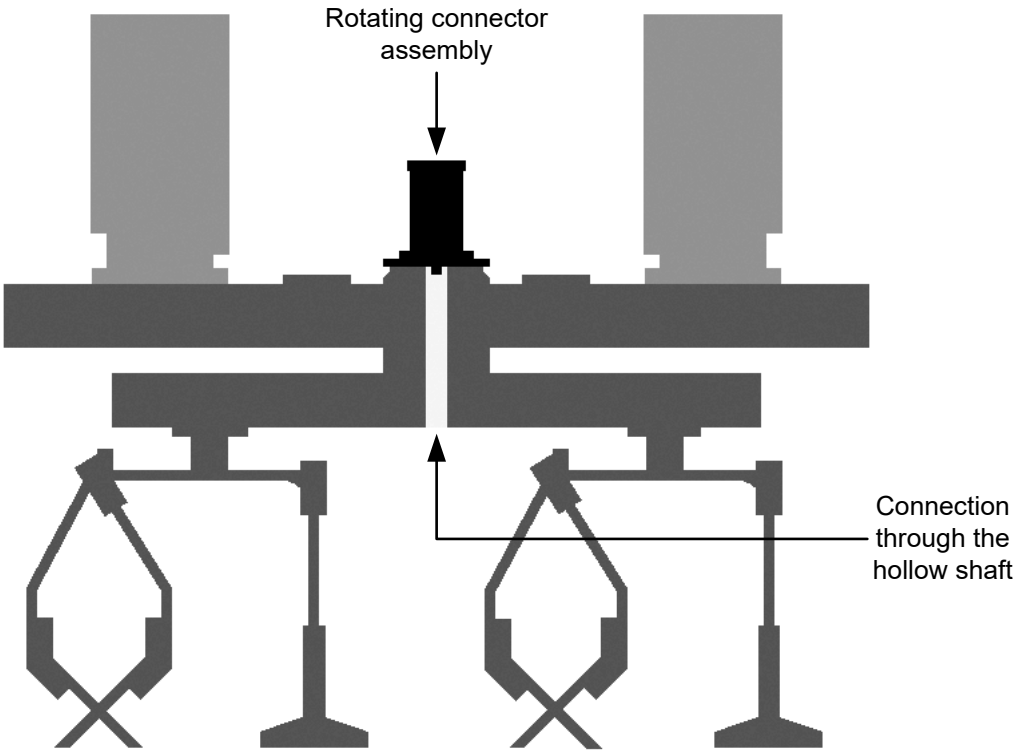


Figure 21: Connection to the Rotating Connector through the gearbox

15.1.3 Threaded Adapters

Two brass threaded connectors are included in the Type ‘A’ kit. One is a 1" BSP male to ½" BSP male adapter and the other is a 1" BSP male to 3/4" BSP male adapter.

15.1.4 Cabling arrangements

The cable should be fitted so that there is sufficient clearance to ensure that the rotating parts of the mixer do not hit the cable (Figure 22).

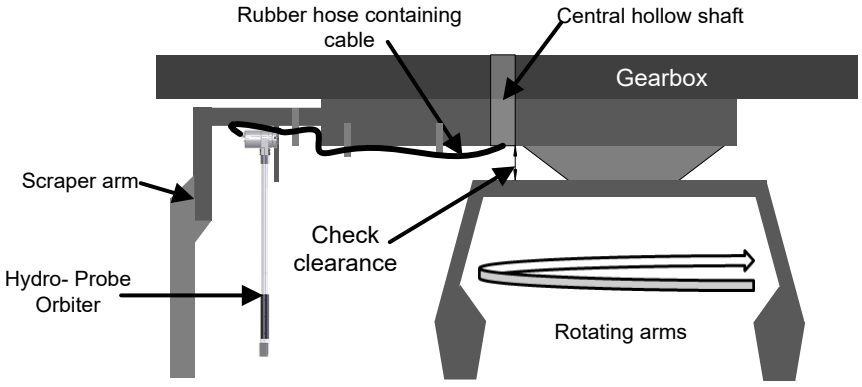


Figure 22: Checking the clearance between the revolving Arm and the gearbox of the mixer

The cable should be protected by feeding it through a length of 32mm ID rubber hose (Figure 23).

The rubber hose should fit over the boss surrounding the connector on the Hydro-Probe Orbiter Head Unit and secured by a hose clip

Metal straps can be welded or bolted as appropriate to provide securing points for the rubber hose and cable (Figure 23).

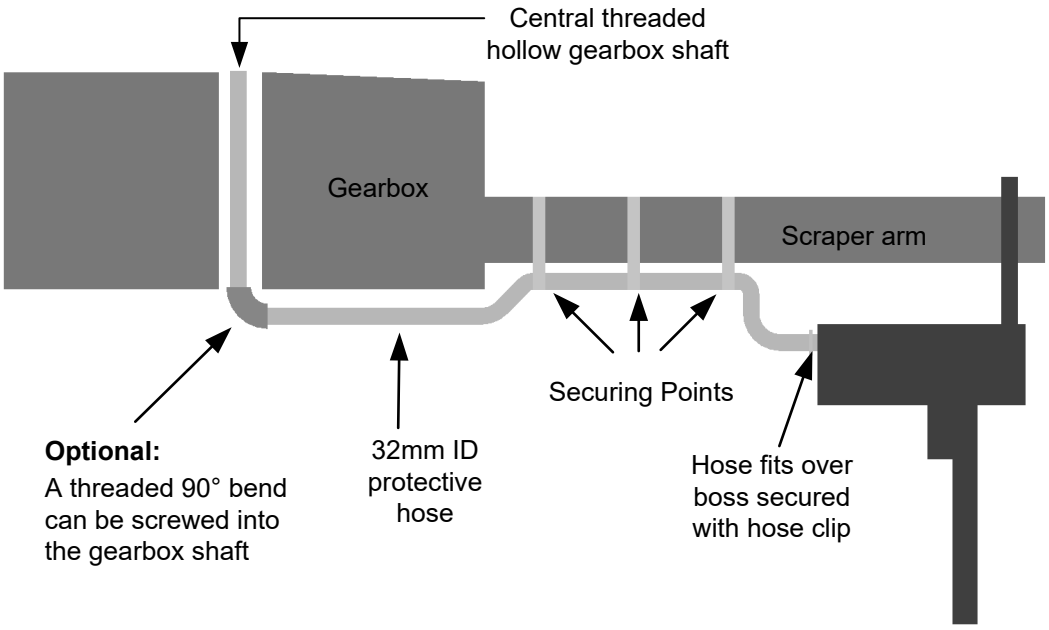


Figure 23: Fitting the cable with good clearance

15.1.5 Installing Rotating Connector Type 'A'

Refer to Figure 20 for part names

- Remove blanking bolts from both ends of the gearbox shaft.
- Remove four of the bolts securing the cover plate to the gearbox.
- Screw four Mounting Studs into the bolt holes and secure using the nuts supplied (Figure 24).

Figure 24: Mounting Studs installed

- Screw the correct Brass Threaded Adapter into the end of the shaft (Figure 25).

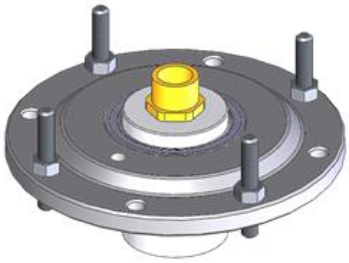


Figure 25: Brass Threaded Adaptor

- Ensure the Fixing Plate Captive Bolts for securing the Bearing Housing are fitted to the Fixing Plate (Figure 26).

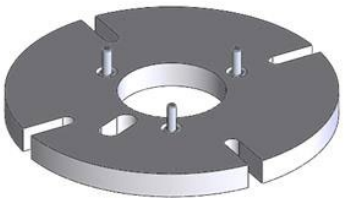


Figure 26: Captive Bolts

- Place the Fixing Plate over the Mounting Studs on top of the mixer allowing the grease nipple to protrude through the slot provided (Figure 27).

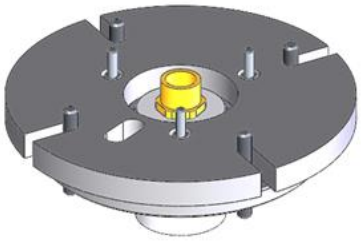


Figure 27: Fixing Plate installed

- Ensure that the Bearing Housing Captive Bolts are in place (Figure 28).

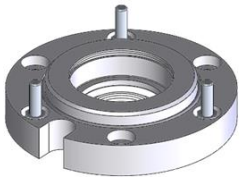


Figure 28: Bearing Housing Captive Bolts

- Fit the Bearing Housing to the Fixing Plate using the Bearing Housing Captive Bolts (Figure 29).

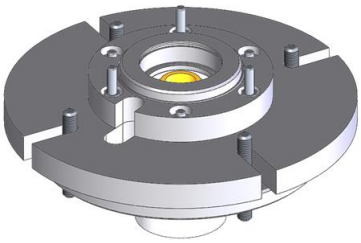


Figure 29: Bearing Housing installed

- Mount the Slip Ring Sub-assembly on to the Brass Thread Adapter and tighten. Secure the Fixing Plate to the mixer and the Bearing Housing to the Fixing Plate using the supplied nuts (Figure 30).

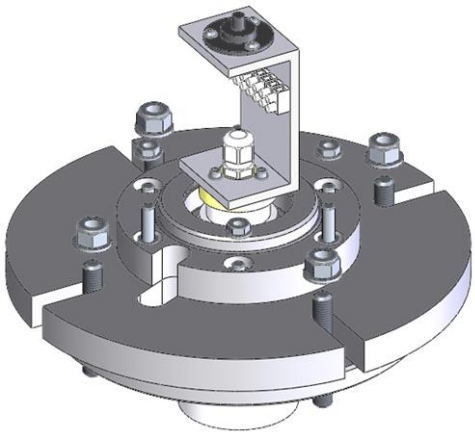


Figure 30: Slip Ring Sub Assembly installed

For electrical connection details see Electrical Installation Guide HD0678

15.2 Type 'B' Rotating Connector Assembly

15.2.1 Suitable Applications

Type ‘B’ is suitable for static pan mixers where the motor is fitted to the underside of the mixer. The cable is taken through a central hole in the top of the mixer. It is important to maintain the ability to remove the cover lid to the gear box for maintenance and blade adjustment.

The Slip Ring Sub-assembly is fitted to a bearing protected by a seal (Figure 31). Rotation is via the protective hose.

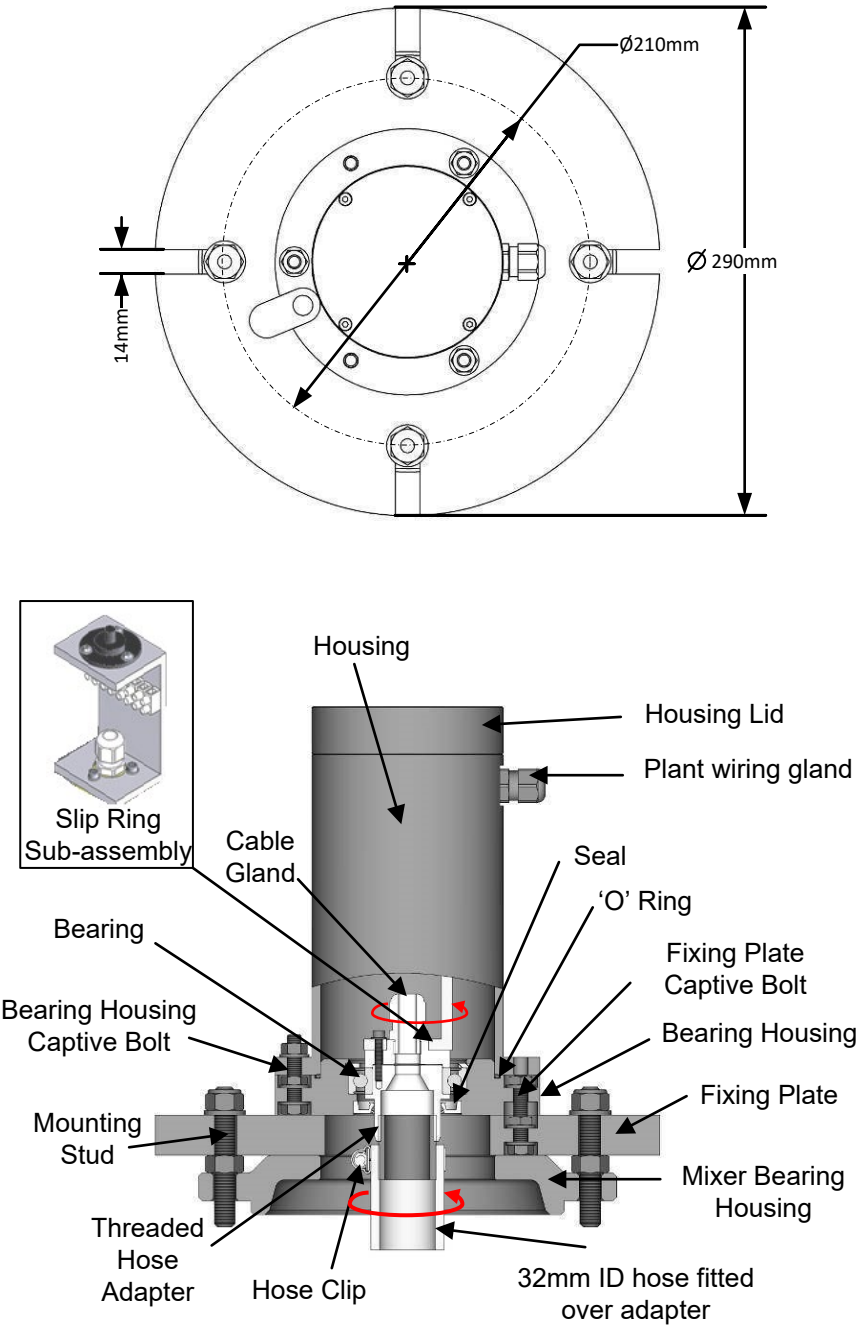


Figure 31: Type 'B' Rotating Connector assembly

15.2.2 Mounting

The Rotating Connector mounts directly on the top of the mixer over a central hole (Figure 32).

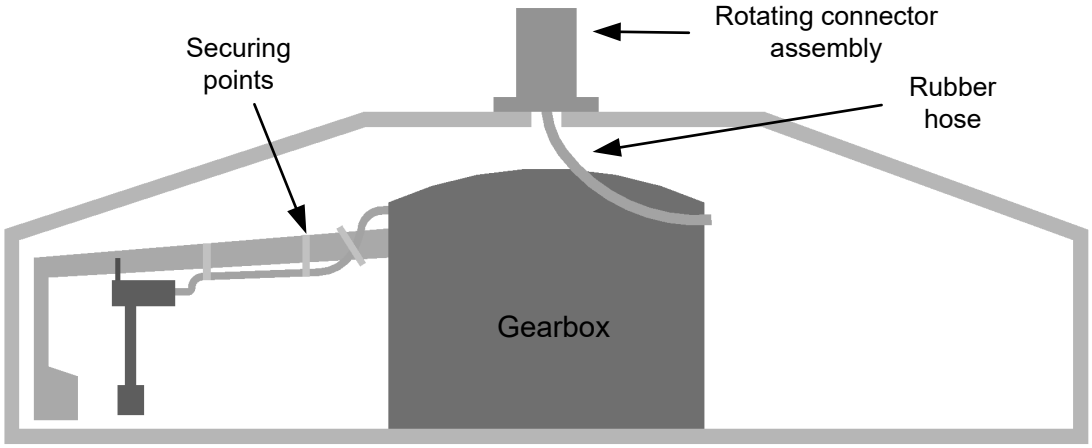


Figure 32: Routing the cable to the Rotating Connector for turbo type pan mixers

15.2.3 Cable Arrangements

The cable should be protected by feeding it through a length of 32mm ID rubber hose.

The rubber hose should fit over the boss covering the connector on the Hydro-Probe Orbiter Head Unit and is secured by a hose clip

The protective rubber hose can be secured to the edge of the gear box lid using hooks (Figure 33).

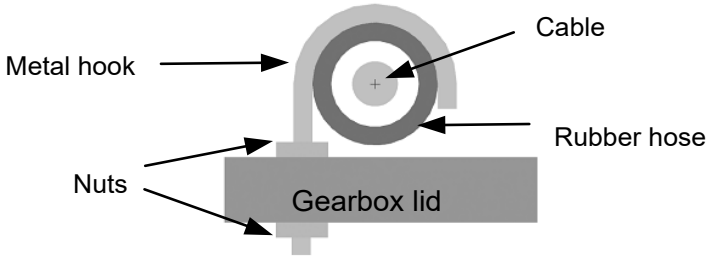


Figure 33: Securing the cable

15.2.4 Installing Rotating Connector Type 'B'

Refer to Figure 31 for part names

- Drill or cut a central hole in the mixer cover, approximately 80mm diameter.
- Using the Fixing Plate as a template, mark and drill four holes for the Mounting Studs (Figure 34).

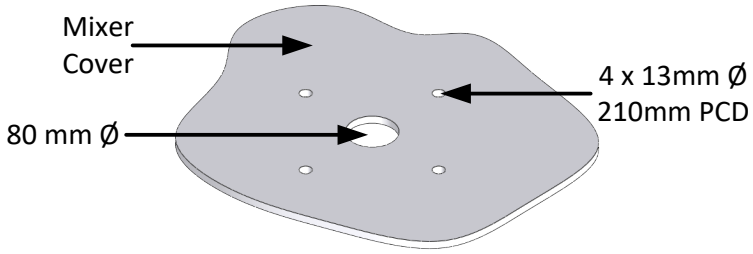


Figure 34: Mixer cover prepared for the Rotating Connector

- Mount the Fixing Plate using the Mounting Studs on the mixer cover ensuring that the three Fixing Plate Captive Bolts are installed and the nuts are tightened to hold them in place (Figure 35).

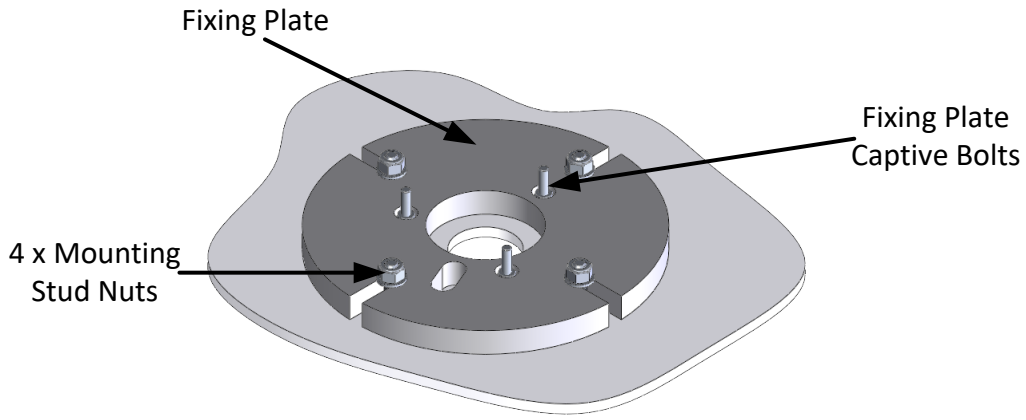


Figure 35: Fixing Plate mounted on the mixer (Captive Bolts installed)

- Ensure that the three Bearing Housing Captive Bolts are installed and the nuts are tightened to hold them in place (Figure 36).

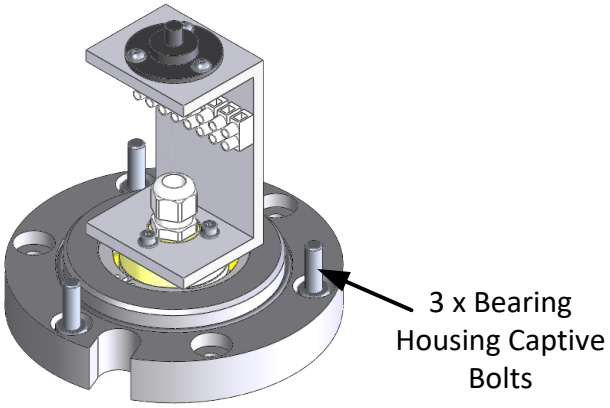


Figure 36: Bearing Housing with Captive Bolts installed

- Mount the Bearing Housing on top of the Fixing Plate, positioning the Slip Ring Sub-assembly over the hole. Secure by tightening the nuts on the three Fixing Plate Captive Bolts (Figure 37).

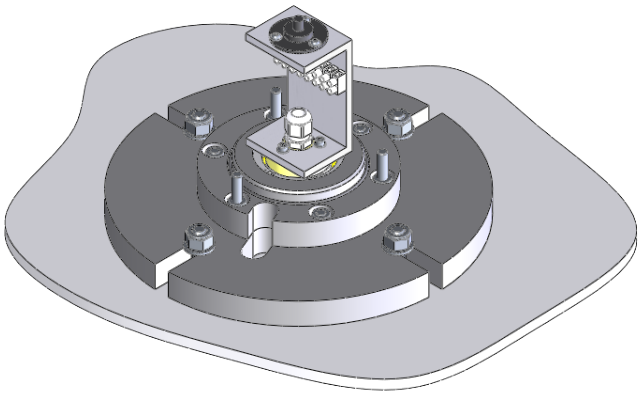


Figure 37: Bearing Housing mounted on Fixing Plate

- Attached the protective rubber hose over the Threaded Hose Adapter and secure using a jubilee clip.

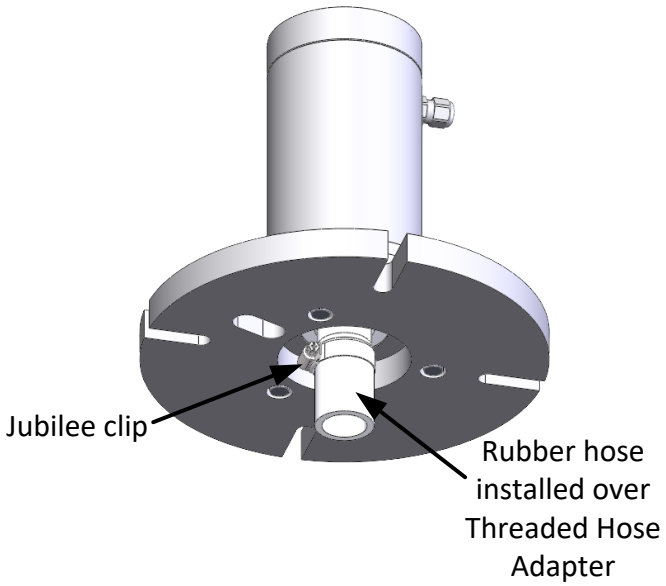
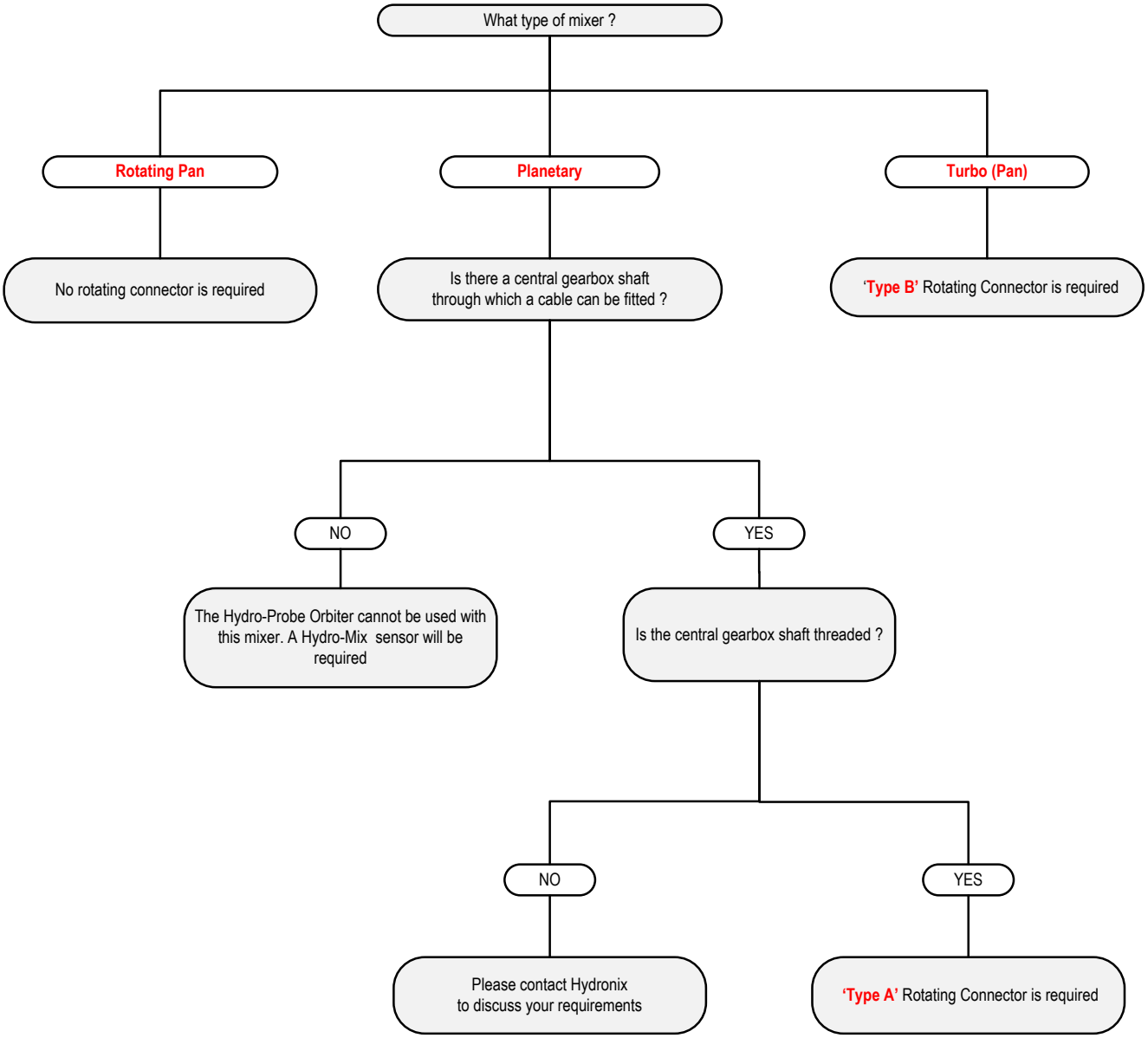


Figure 38: Rubber hose and jubilee clip (shown with the Housing installed)

For electrical connection details see Electrical Installation Guide HD0678

Chapter 2 Selection Chart for the Rotating Connector



Technical Specifications

1.1 Construction

Body: Stainless steel (AISI 304)

Sensing Arm ORAB2C: Hardened stainless steel with ceramic sensing face

1.2 Penetration of Field

Approximately 75 – 100 mm dependent upon material.

1.3 Range of Moisture

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

1.4 Operating Temperature Range

ORBA2C - 0 – 40º C

ORBA1C - 0 – 60ºC

ORBA1-HT - 0 – 100ºC

The sensor will not measure in frozen material.

1.5 Power Supply Voltage

+15v to 30v DC. 1A minimum required for sensor start up (nominal operating power is 4W).

1.6 Analogue Output

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

1.7 Measurement Modes

Mode F, Mode V, Mode E

1.8 Brix Measurement Output

No

1.9 Digital (serial) Communications

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

1.10 Digital Inputs/Output

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).

1.11 Connections

1.11.1 Sensor Cable

- Six pairs twisted (12 cores total) screened (shielded) cable with 22 AWG, 0.35mm^2 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.

1.12 Grounding

The sensor body is connected to the cable shield. Ensure the following:

- Equipotential bonding of all exposed metalwork.
- In areas of high lightning risk, correct and adequate protection should be used.
- 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
HD0682	Hydro-Com User Guide
HD0455	Hydro-Control Installation Guide
HD0679	Hydronix Moisture Sensor Configuration and Calibration Guide

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