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DREDGEPACK®

INSTALLATION MANUAL FOR TRAILING SUCTION HOPPER DREDGE WITH SEATOOLS SYSTEM

Revision A, May 2025

HYPACK
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INSTALLATION MANUAL FOR TRAILING SUCTION HOPPER DREDGES USING SEATOOLS SYSTEM

Thank you for your purchase of this Trailing Suction Hopper Dredge (TSHD) System. Every effort has been made to ensure this system is ready for installation directly from the case in which it has been shipped to you. All components have been bench tested for complete functionality of the system. It is our desire to provide you with the best system possible and to fully support all aspects of your new HYPACK TSHD System.

The purpose of this manual is to guide you in the installation of the DREDGEPACK® system for Trailing Suction Hopper Dredges using the Seatools system. Due to the complexity of the installation, please follow the steps described in this guide. If you have questions, please contact HYPACK Technical Support at help@hypack.com or +1 (860) 635-1500.

The installation of all equipment is the sole responsibility of the client or the reseller. HYPACK personnel may recommend device placement for the best configuration, but it is up to the installer to make sure that the sensors and interface boxes are set up in a safe and effective manner.

Best Regards,
The HYPACK Technical Support Team
help@hypack.com
+1 (860) 635-1500

TABLE OF CONTENTS

Revision History

DATE	REVISION	CHANGE DESCRIPTION
August-06-2024	N/A	Initial release
May 28, 2025	A	Added Minimum Installation Required Checklist

Minimum Installation Required Checklist

Use this checklist to ensure your equipment has been installed prior to the arrival of the HYPACK On-site Support Technician to help maximize the time available for interfacing, calibration, and training.

Hopper Dredges with Seatools System - Minimum Installation Required:

The HYPACK On-site Support Technician will be in charge of the final connection of the cables.

- ☐ GNSS antennas welded on top of the bridge in accordance with the installation manual.
- ☐ GNSS cables run properly inside the bridge with proper cable pass through or isolation.
- ☐ Welded plates for the inclinometers/rotation sensor in accordance with the installation manual.
- ☐ Inclinometers cables run from the inclinometer/rotation sensor to the main interface box.
- ☐ Installation of the main interface box.
- ☐ Power supply for the main interface box.
- ☐ Network cable run from the main interface box to the bridge.
- ☐ Video cables connect the monitors to the computer.
- ☐ Power supply ready for connecting the GNSS and computer.

Sonar Systems - Minimum Installation Required:

- ☐ Transducer Installation:
  - Sonar system installed (single beam, multibeam, sub-bottom, side scan, magnetometer).
  - Installed locations: Sea chest, moon pool, side/bow mount, towed.
  - Ensure proper cable routing.

- ☐ Positioning Device Installation:
  - GPS or inertial system installed.
  - Antennas and IMU mounted securely.
  - Ensure proper cable routing.

- ☐ Motion and Heading Device Installation:
  - MRU, IMU, or AHRS installed.
  - Antennas and motion device mounted securely.
  - Ensure proper cable routing.

- ☐ LiDAR Installation:
  - Mounting bracket securely installed.
  - Ensure proper cable routing.

- ☐ Offsets Measured: Pre-measure offsets from the Boat Reference Point, if possible.
- ☐ Photo Documentation: If assistance is needed, please provide pictures taken inside and outside of the boat so we can provide our recommendations prior to arrival.

I. Safety Precautions

General Safety Precautions:

- Conduct a thorough risk assessment before starting the installation.
- Ensure that all personnel involved are properly trained in handling equipment and working at heights.
- Use appropriate personal protective equipment (PPE) such as helmets, gloves, safety goggles, and harnesses.
- Communicate clearly with all team members about their roles, the potential hazards, and the safety protocols to be followed.

Working at Heights:

- Use appropriate fall protection equipment such as safety harnesses, lanyards, and anchor points.

Running Cables:

- Plan cable routes to avoid trip hazards.
- Use cable trays, conduits, or cable ties to secure and organize cables.
- Ensure that cables are properly labeled for easy identification and maintenance in the future.
- Follow electrical safety standards and regulations when working with power cables.

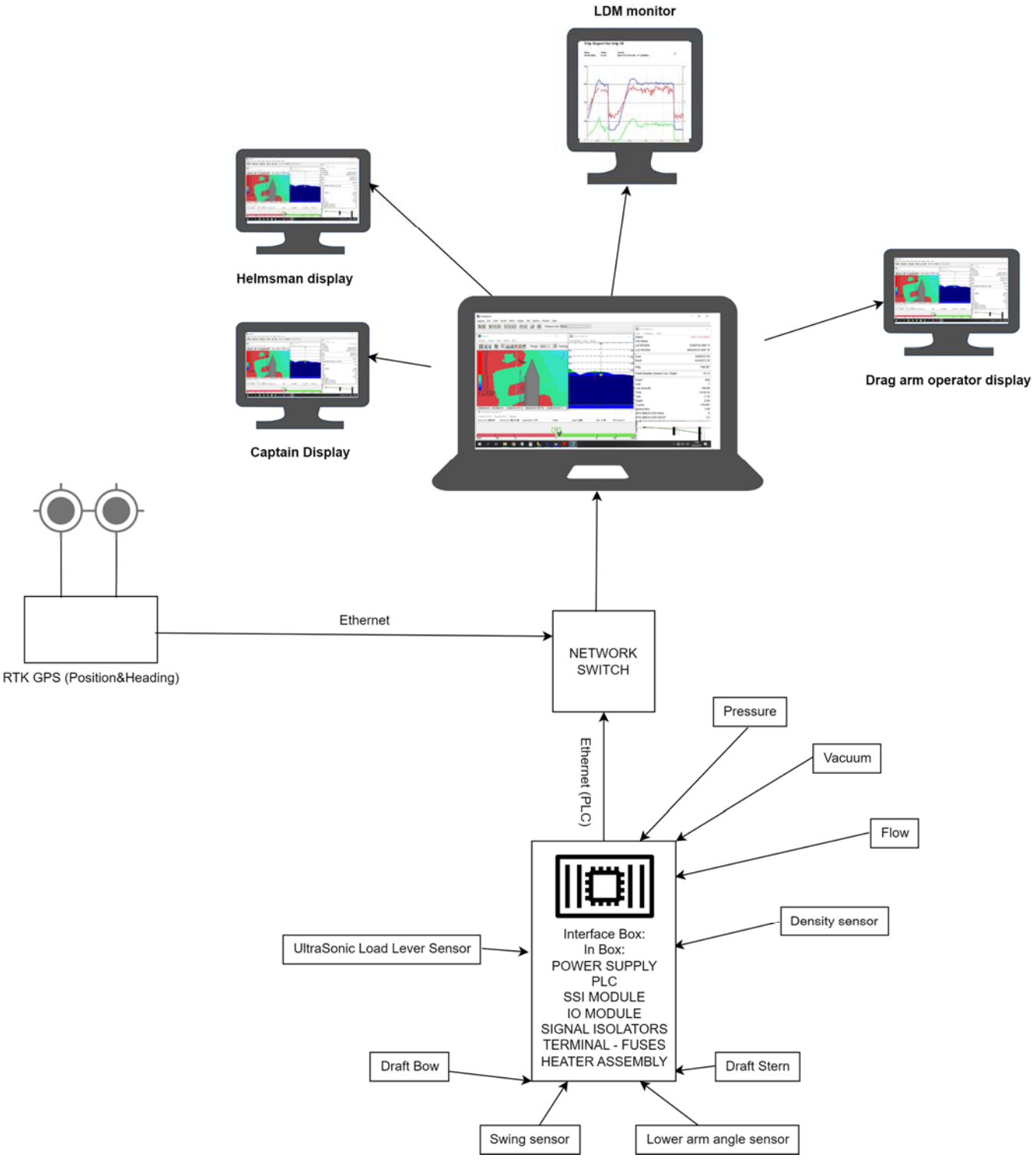
Welding Metal Plates:

- Provide proper ventilation in the welding area to prevent exposure to fumes and gases. Use welding screens or curtains to shield nearby workers from the welding arc.
- Train personnel in safe welding practices and the proper use of welding equipment.
- Inspect all ladders, scaffolds, and elevated work platforms before use.
- Secure tools and materials to prevent them from falling and causing injuries to workers below.

II. Equipment Overview

Each DREDGEPACK® system for trailing suction hopper dredges (TSHD) is individually designed to fit the customer's needs. The following sensors are required for the correct operation of the TSHD System with DREDGEPACK®. There are some optional sensors presented that are needed only in special cases. When you receive your equipment, please verify it is complete. If you have any questions, please let us know.

The following diagram illustrates the most common setup for this system:



A. Dual Antenna GNSS Receiver: This device is used to determine the position and heading of the dredge. The main antenna is used to calculate positions and elevations (RTK tides). The receiver uses the secondary antenna to calculate the dredge heading. This solution includes two antennas, the GNSS receiver, and the cables.

B. Inclinometer Set: These devices are used to calculate the angle of the arm. We provide a set of two inclinometers for each drag arm. The inclinometer has a stainless-steel case designed to withstand harsh operating conditions. An additional mounting plate must be used to attach the sensor to the arm.

C. Pressure Sensors: These sensors use water pressure to measure forward and aft draft. Two sensors are included with this solution.

D. Rotation Sensor: This sensor is used to calculate the final position of the drag head. It is installed above the gimbal in the upper segment.

E. Main Interface Box: The main interface box receives signals from sensors and directs them to the computer running DREDGEPACK®. The enclosure is IP66 rated.

F. Ultrasonic Sensors: These sensors are used to determine the amount of material in the hopper. Two are included with the system.

G. Pitch and Roll: The system includes a pitch and roll sensor to measure the dynamics on the dredge to perform a proper calculation for the draft, arm position, and arm depth. The sensor includes the interface and cable.

III. Installation Instructions

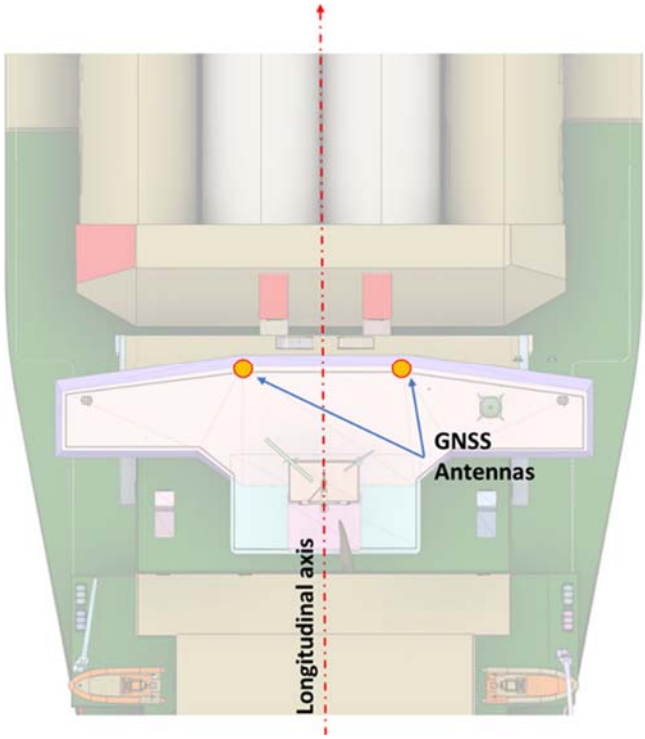
A. Dual Antenna GNSS Receiver

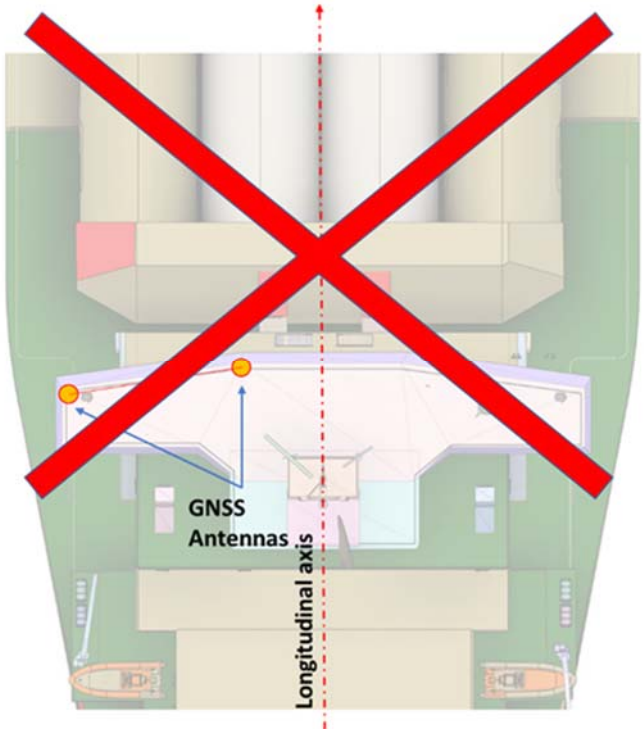
DREDGEPACK® requires dredge position and heading. The best method to obtain this data is to use a dual antenna GNSS receiver.

- Dredge Position: The main antenna can be used for calculating the position and elevation of the dredge. For increased performance, the GNSS receiver can be upgraded to have low uncertainty using RTK (Real Time Kinematic) calculations and should be combined with a source of corrections (RTCM or CMR). Necessary antennas, cables and interfaces are included in the package. We can also provide a radio modem and RTK base station upon request.

- Dredge Heading: We offer a GNSS receiver that can calculate the heading using the secondary antenna.

For better satellite coverage, we recommend installing the GNSS antennas on top of the bridge free of obstacles. To avoid measuring complicated offsets, install the antennas perpendicular to the longitudinal axis of the dredge, as shown in the following images. We suggest installing them equidistant to the longitudinal axis of the dredge.



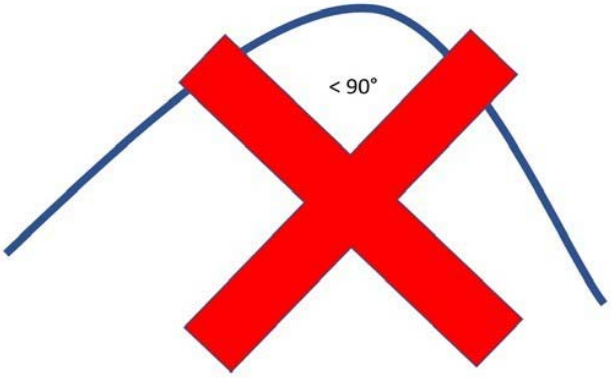


WARNING: WHEN INSTALLING THE ANTENNAS, AVOID PLACING THEM ARBITRARILY. THIS WOULD REQUIRE ADDITIONAL MEASUREMENTS AND CALCULATIONS TO OBTAIN THE YAW OFFSET.

The antennas require a 5/8-11 UNC bolt or threaded rod.

WARNING: DO NOT WELD THE SCREW WITH THE ANTENNAS SCREWED IN. THIS COULD CAUSE SERIOUS DAMAGE TO THE ANTENNA.

Either antenna can be assigned as the main antenna. It is important to identify the cable of the main antenna because it must be connected to Port 1 of the GNSS receiver. You will need to run the cables inside the bridge. The installation could last longer if a proper pass through and insulation is installed before running the antennas to the bridge.

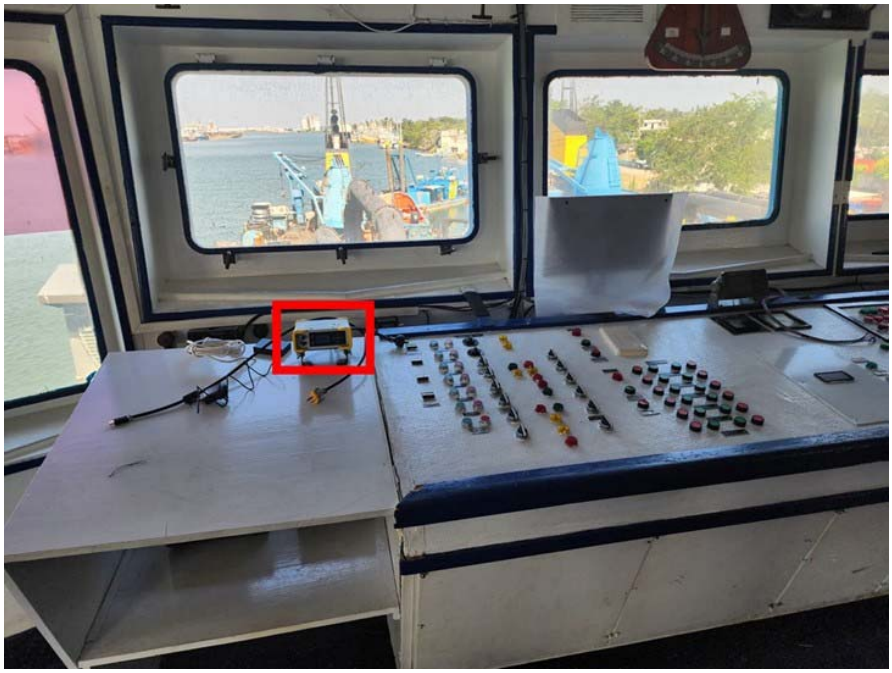


WARNING: AVOID BENDING THE ANTENNA CABLES MORE THAN 90 DEGREES DURING INSTALLATION. THIS COULD BREAK THE INTERNAL CORES IN THE CABLE.

The GNSS receiver can be placed anywhere in the bridge because the connection to the computer uses a network cable (UTP CAT5E or CAT6). We recommend placing the GNSS receiver as close as possible to the PC.

It is beneficial to identify a place on the bridge to house the computer and receiver before the installation to avoid moving the equipment in the future. In some cases, a stand for the PC is necessary to provide a better view for the operator.

The GNSS receiver, bubbler system, and computer come with a power adapter that converts AC voltage to DC voltage. It is necessary to have an outlet that delivers 110VAC~120VAC or 220VAC~240VAC. Additionally, we recommend installing a UPS (universal power supply) to prevent damage to the equipment.

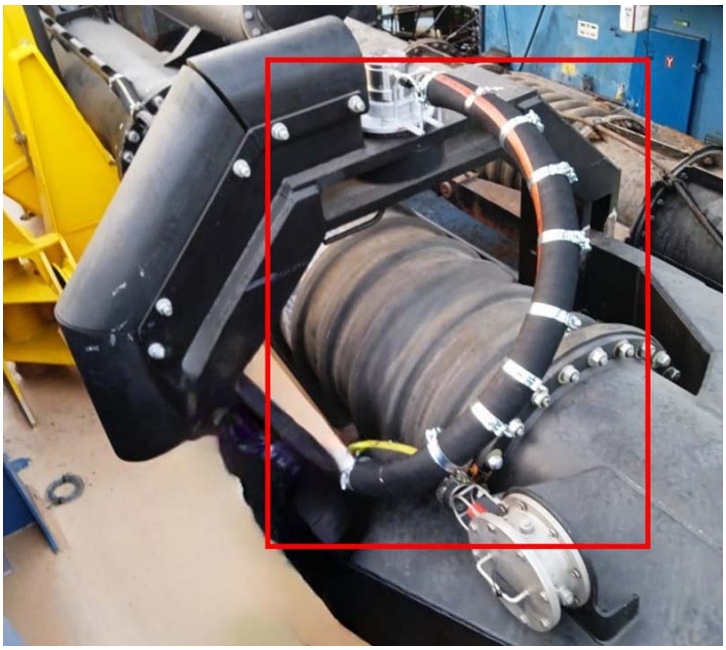


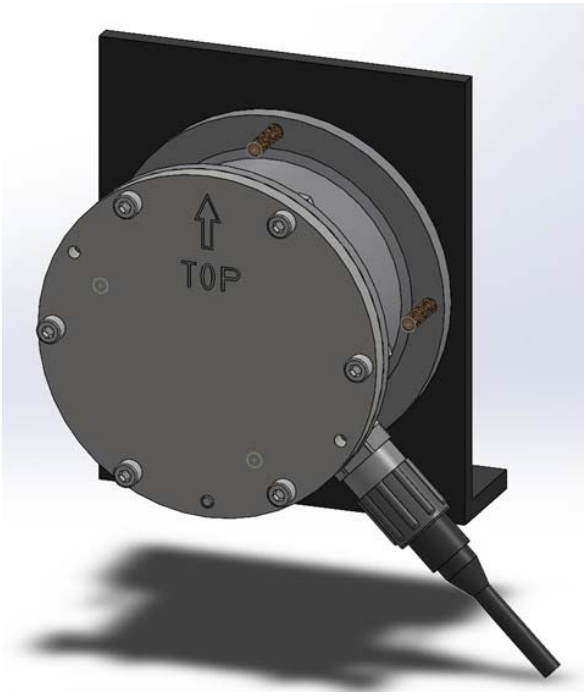
B. Arm Inclinometers

For each inclinometer, it is necessary to weld a plate for them to sit flat on. It is recommended to use four M8 stainless-steel bolts and lock nuts. Use bolts with springs and washers.

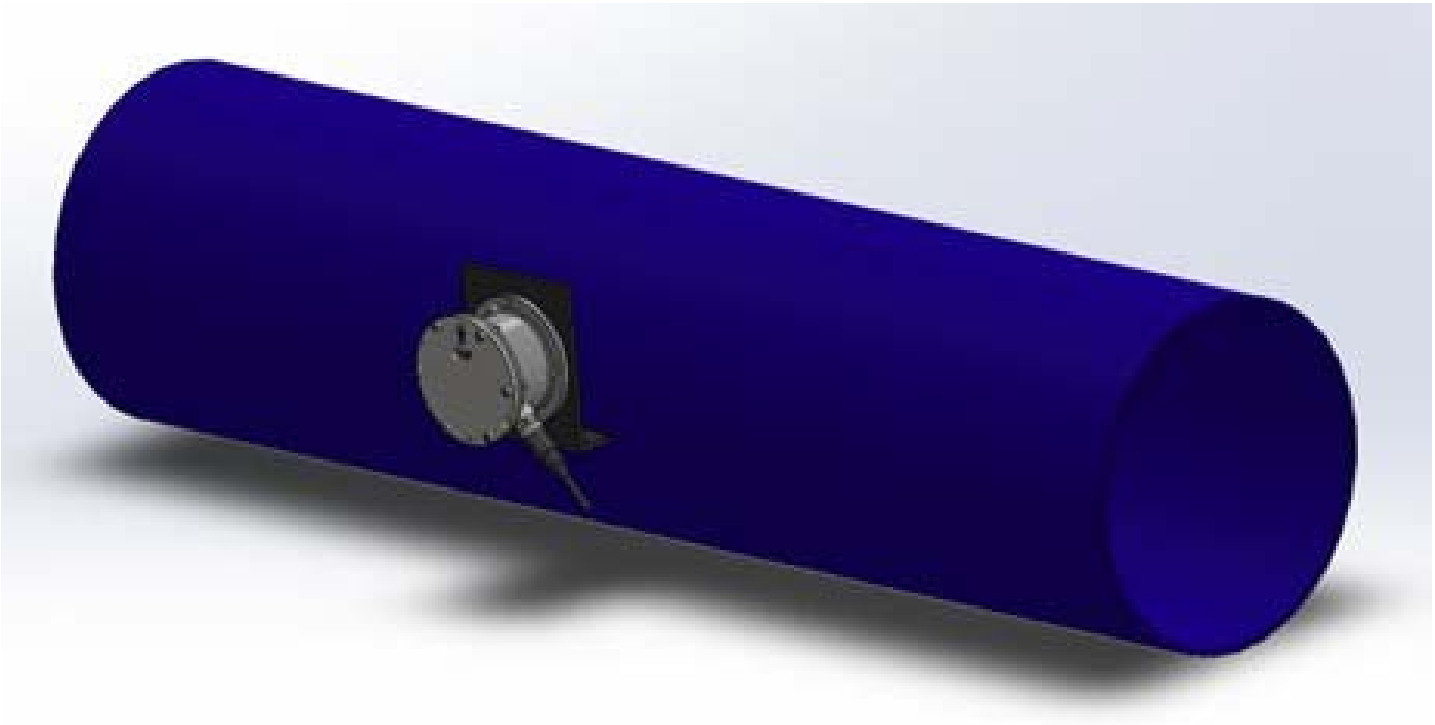
The inclinometer should be installed with the 'Top' sign pointing upwards when the drag arm is in the rest position. The arrow should point perpendicular to the pipe.

To protect the cable from breaking, it is recommended to run the cables through a protective hose such as a hydraulic hose.



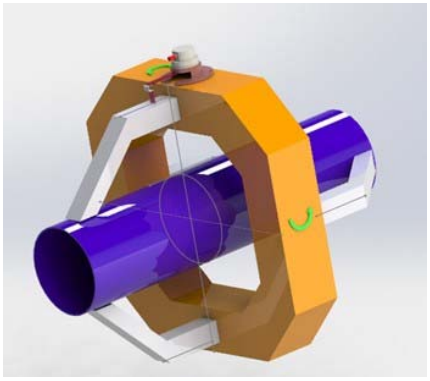


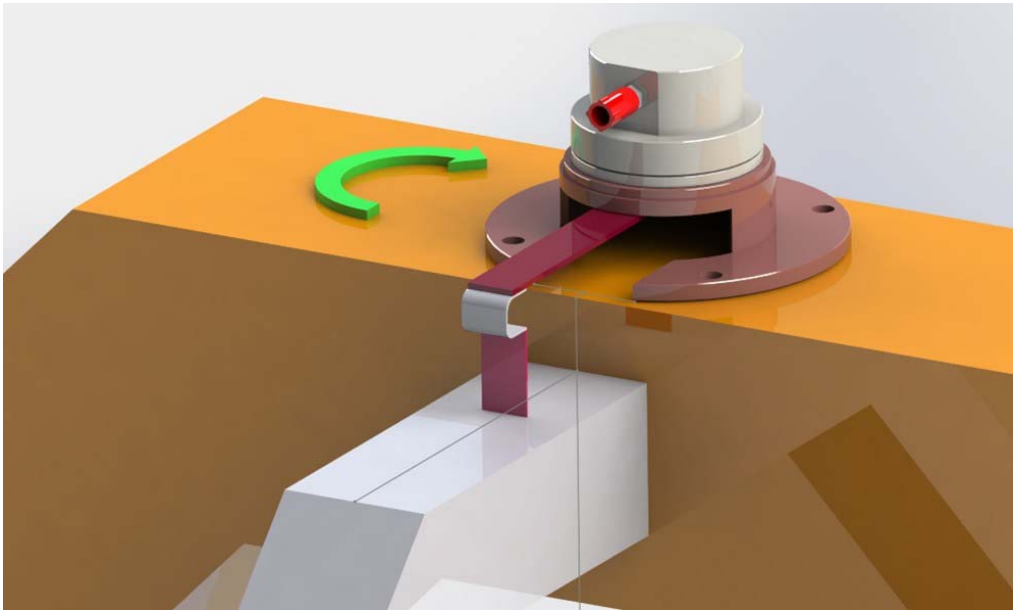
WARNING: DO NOT WELD THE PLATE OR BOLTS WITH THE INCLINOMETER ATTACHED. THIS COULD DAMAGE THE INTERNAL ELECTRONICS.

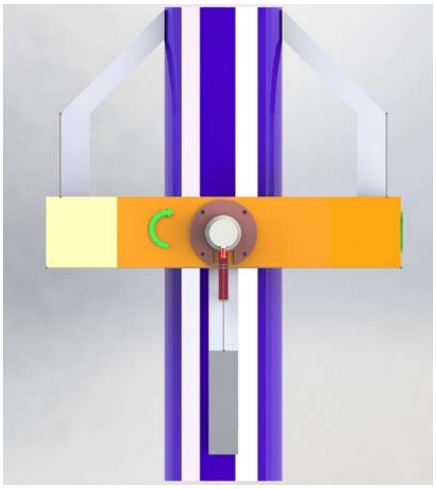


C. Arm Swing Sensor

This sensor is installed on the gimbal. We provide an extra straight arm to use for attaching the two moving parts. It is very important to align the rotation sensor with the axis of the drag arm. You can compensate for mis-alignment in the driver, but for simplicity this is not recommended.







D. Pressure Sensors

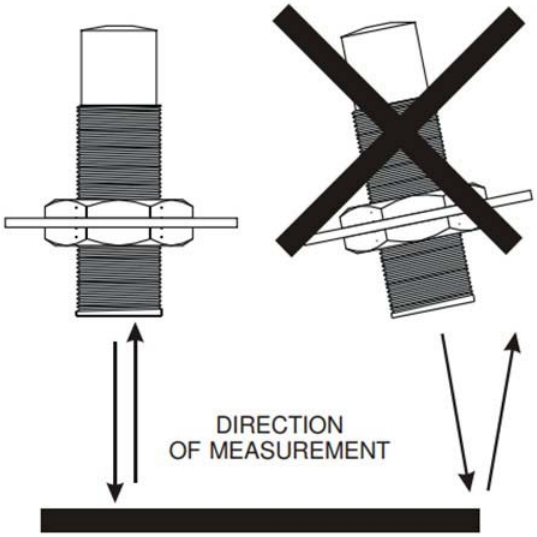
Pressure sensors must be submerged to function properly. They should be installed as close to the keel as possible.

The sensor comes with a vented junction box. The sensors read the pressure differential, so this box should be stored at atmospheric pressure.

C. Ultrasonic Sensors

To best measure the material in the hopper, there must be one sensor installed forward, and one aft. It is recommended that they be installed opposite each other and aligned with the dredge's longitudinal axis. Avoid installing them both on the same side of that axis, as that will result in incorrect volume calculations.

Mount the sensors at least 20cm (7 in) away from the inner walls of the hopper. They should be installed perpendicular to the target surface. The sensors have a 12 degree beam.



D. Interface Boxes

The interface boxes connect to the switch via ethernet. They can be installed a maximum of 300ft (100m) from the switch, as performance degrades with longer cables. Since a dredge is a noisy environment, it is best to use a shielded UTP cable that protects the internal pairs from electromagnetic interference. To increase the reliability of the connection, it is recommended to use a UTP cable rated for outdoor use.

E. Cables

In some cases, it is necessary to enlarge the cable. The following table describes how many cores each cable has:

CABLE	NUMBER OF CORES
Inclinometer	3
Rotation Sensor	6
Pressure Sensor	2
Ultrasonic Sensor	3

Shielded cables are preferred to protect the signals from any interference. A dredge is a noisy environment and the signals need to travel long distances, making shielded cables an important part of ensuring signal quality.

For this system it is necessary to run two cables, one per ultrasonic sensor, to the main interface box. The cable can be 24-26 AWG. Each cable needs to have three cores: Two for power and one for sending the 4–20 mA signal.

IV. Maintenance and Care

- Regular cleaning: Wipe down the GNSS receiver, cables, and antennas with a soft, dry cloth to remove dust, dirt, and debris. This can help prevent damage and ensure proper functionality.
- Cable inspection: Check the cables for any signs of wear, fraying, or damage. Replace any damaged cables to prevent signal loss or data errors.
- Antenna alignment: Periodically check the alignment of the GPS antennas to ensure they are oriented correctly for optimal signal reception.
- Environmental protection: Protect the GPS receiver, cables, and antennas from extreme temperatures, moisture, and physical impact to prevent damage.

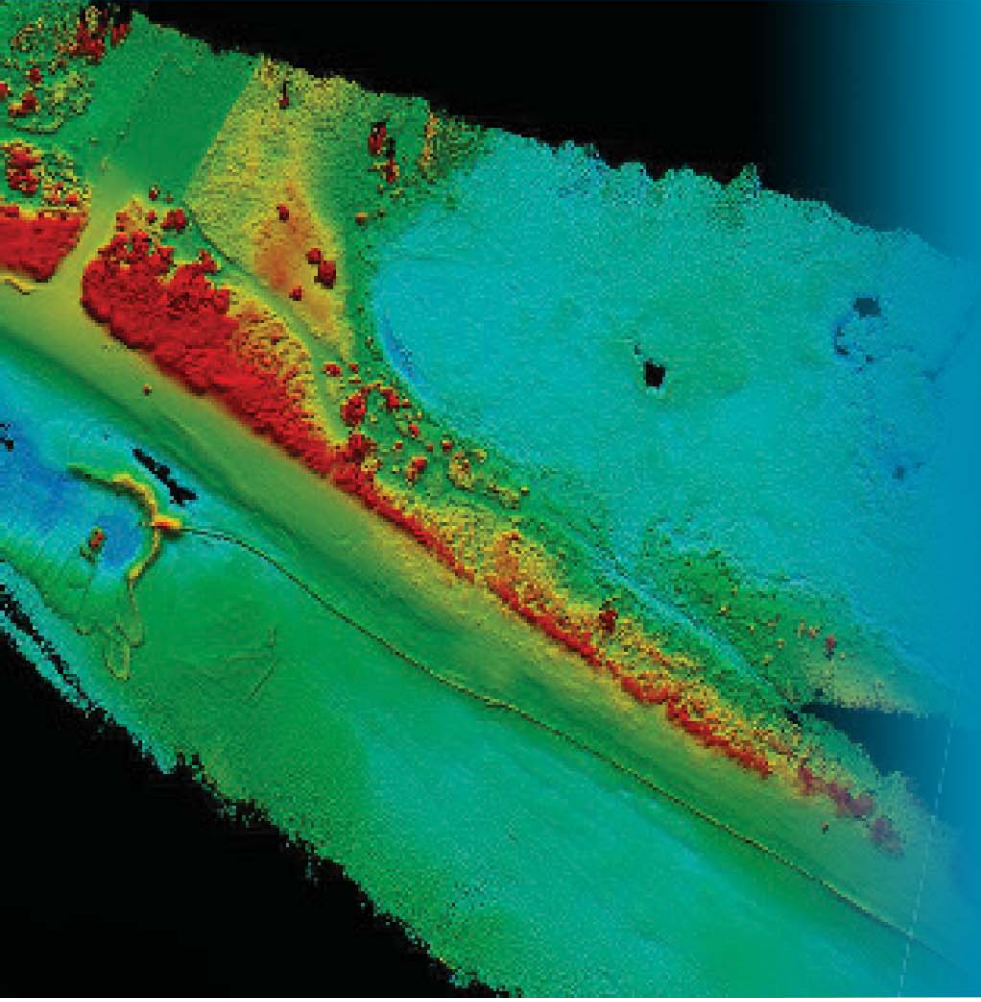
V. FAQ

Q: Does the user need to open the boxes when they are delivered?

A: Yes. Verify that all the equipment was received by checking if everything requested is included in the box. We also recommend carefully putting all accessories and cables back in the box to avoid any issues during the installation and integration procedures.

Q: Can the installer call support for additional instructions?

A: Yes. HYPACK can provide additional details in order to perform the best installation possible. Call +1 (860) 635 - 1500 or send an email to help@hypack.com.



Why Choose HYPACK

- Simple and intuitive to use
- Industry-leading software solutions
- Interfaces with a variety of sensors
- Unparalleled technical support

HYPACK – A Xylem brand has been a world leader in software development for the hydrographic and dredging industry since 1984. Our software is one of the most widely used hydrographic software packages in the world, with more than 10,000 users in over 140 countries.

Our commitment to the industry, and partnership with manufacturers, allows us to provide a solution for all your surveying needs; from a simple area to the most complex project, our software solution can help.

Our suite of software packages will provide you the tools needed to design your survey or dredging operation, collect your data, apply corrections to soundings, remove outliers and invalid points, plot field sheets, and export data to CAD. It also allows you to compute volume quantities, generate contours, create side-scan mosaics and create/update electronic charts. Our hundreds of sensor inputs provide the connection for positioning GNSS and inertial systems, single beam and multibeam echosounders, side scan and sub-bottom sonars, magnetometers, velocity sensors, and more. Whether you are collecting hydrographic survey data, environmental data, or just positioning your vessel in an engineering project, the software will provide the tools needed.

Our mission is not just to provide the tools needed for surveying applications, but to educate and train folks that need to do survey work.

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