HEFRING MARINE

USER MANUAL

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Introduction

Hefring Marine is an Intelligent Marine Assistance System (IMAS) uses intelligent proprietary processing to determine a vessel's optimal speed, where the system automatically varies its guidance to reflect prevailing sea and weather conditions in real time. Speed is optimized for safety, where the system guides for the highest attainable speed that will not exceed threshold g-force impacts, and fuel efficiency, where the system finds the optimum speed range to maintain given the conditions, i.e., a dynamic cruising speed range. The information is presented as guidance to the operator on an intuitive screen interface, which can be displayed in most popular multi-function displays. The system also displays real-time impacts and shocks monitored.

All data is recorded to and presented in the Admin Console, a fleet management desktop portal that allows for live monitoring of the entire fleet, provides insightful analysis and profiles for into each trip, vessel and operator, logs all historical trips automatically, produces automated insights as well as manual reporting, condition-adaptive route planning and guidance, vessel usage and condition monitoring, and operating and maintenance alerts.

The solution helps to ensure duty of care, reduce human errors, improve safety and operator behaviour, aid training and personnel development, and reduce fuel consumption and carbon footprint, and extend vessel lifecycle.

This document is a user manual and installation guide for the on-board system.

HEFRING
MARINE
Map
Dashboard
Trips
Vessels
Captains
Users
Companies
Active vessels: 1
Pinned trips: 0
Latest trips
7h 25m
12.6 nml
2
12 °C
NW 5 kn
Safety
1.4
Impacts (g)
29
Knots
40%
Safety Quality
30
Safety Speed
Peak impact: 5.3 g
Red impacts: 3

System Overview

Control Unit

The Control Unit is the central computing module of the system and handles data collection, data processing, presentation of data to a user interface and display, and uploading of data to the cloud, or the HM Console.

Specifications:

Type:	-	Embedded system computer
Dimensions:	-	Enclosure: L217 x W188 x H87 mm
Connectors:	-	9-36VDC (max 1.5A @ 12V)
	-	CAN Bus M12 to Sensor Unit(s)
	-	NMEA2000 / Raymarine SeaTalk Primary data: GPS and speed Secondary: all other available data
	-	2x LAN / Ethernet To connect to selected multi-function displays and onboard modems where available
	-	HDMI
	-	2x USB
	-	SIM slot
Antennas:	-	2x LTE Cellular
	-	Wi-Fi
Construction:	-	IP67 enclosure rating
	-	Anti-vibration chassis

Setup alternatives:

- **Display:** The system offers several options for displaying the on-board user interface. The system can be connected to most latest Garmin, Simrad, Raymarine and Furuno plotters, any HDMI display or a non-HDMI display using an HDMI-composite video converter. If the system is connected to the boat's own cellular modem, the user interface can be viewed on any browser-enabled device connected on the local network.
- **Cellular connectivity:** The system is provided with a cellular modem and antenna. It can also be connected to an on-board cellular modem via ethernet cable to make use of the boat's own internet connection.
- **GNSS/GPS:** The system receives location and speed data via NMEA2000. If NMEA 0183 is available instead of NMEA2000, the system can be connected to the NMEA 0183 network using a standard NMEA 0183 to NMEA2000 multiplexer or gateway.

Sensor Unit

The Hefring Marine system comes with one or two Sensor Units.

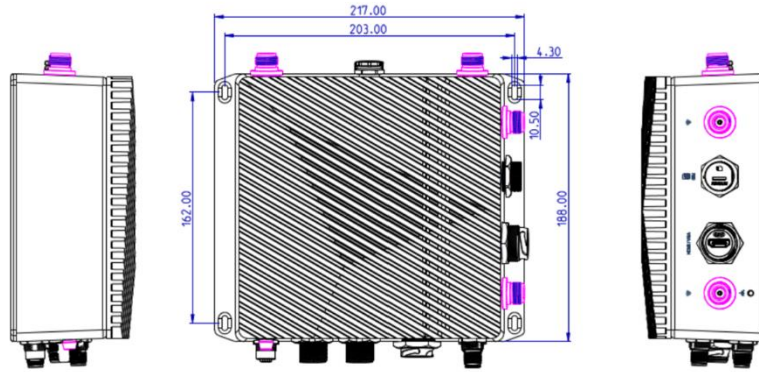
Specifications:

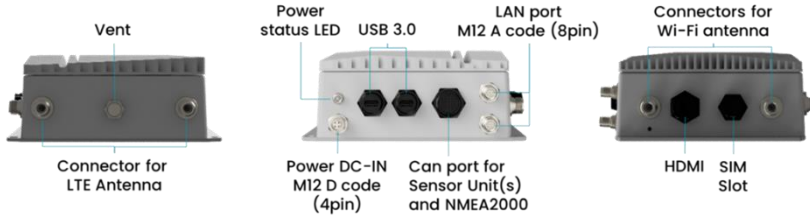
Type:	-	Inertial measurement unit
Dimensions:	-	L45 x W50 x H24 mm
Mounting:	-	Center-to-center between mounts: L45 x W39 mm Mounting hole: 4x⌀3 mm
Sensors:	-	Accelerometer (+/- 16g)
	-	Dual gyroscopes
	-	Magnetometer
Port:	-	CAN-bus M12 8 pin male port for cable connection to Control Unit
Signal processing:	-	Proprietary Hefring Marine rigid body filter
Construction:	-	IP67 enclosure rating

Dual Sensor Unit setup: The Hefring Marine system can be provided with a single or dual Sensor Unit configuration. While a single Sensor Unit setup is sufficient on most boat sizes, a dual configuration may be needed on larger vessels where monitored motions might vary significantly depending on placement in the vessel, or where different types of motion data and analysis are required. This may include using one sensor to monitor crew and another to monitor structural integrity.

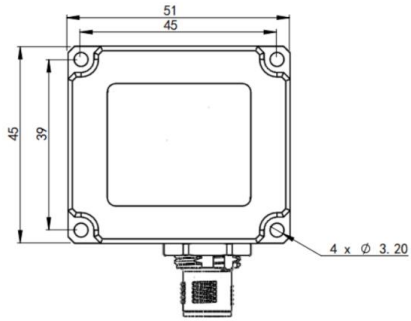
Dimensions and System Details

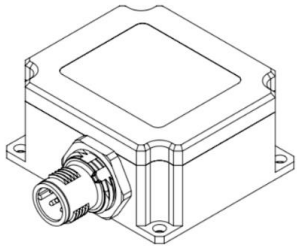
Control Unit

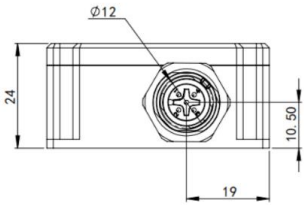


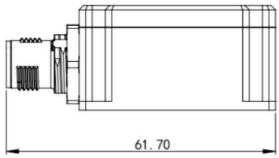


Sensor Unit





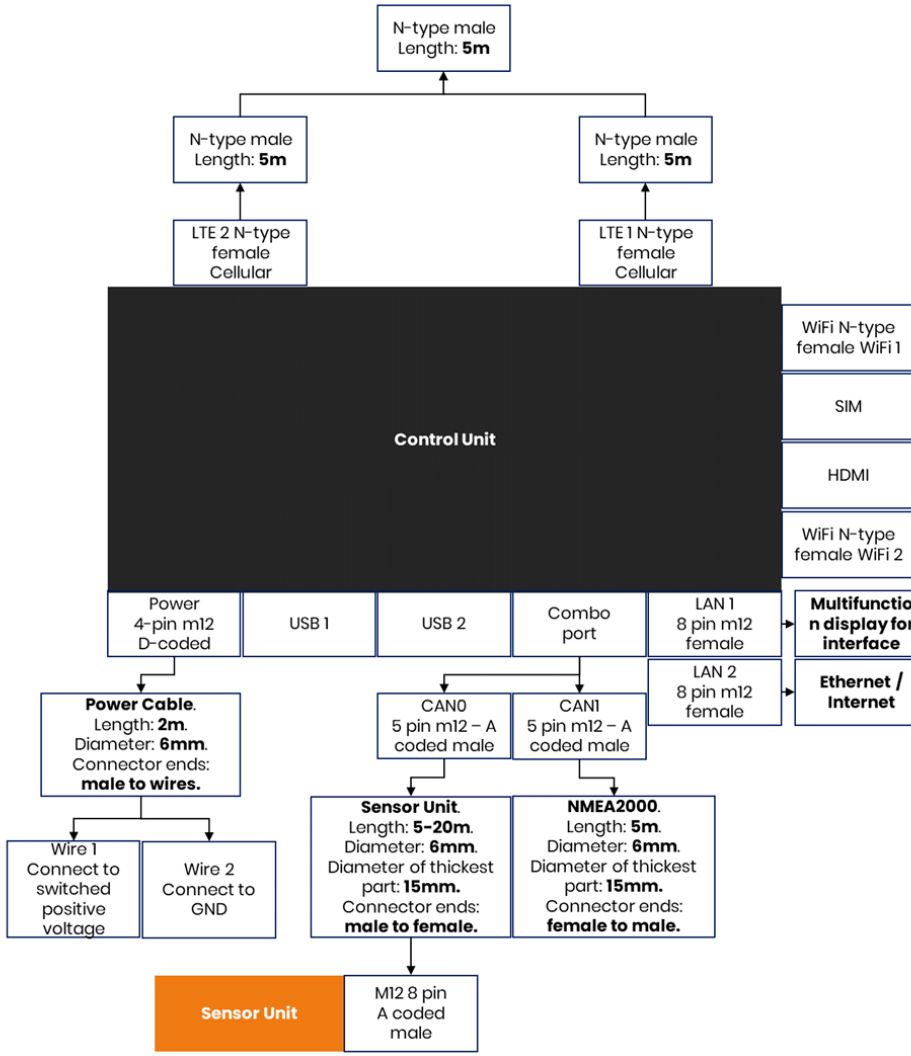




Can port connector
for M12 cable to Control Unit

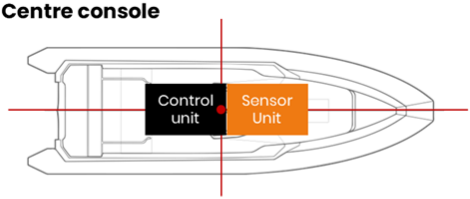
Installation Guidelines

System Ports and Connections

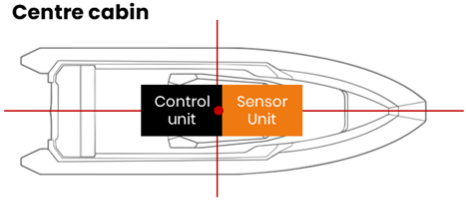


Standard Sensor Unit placement

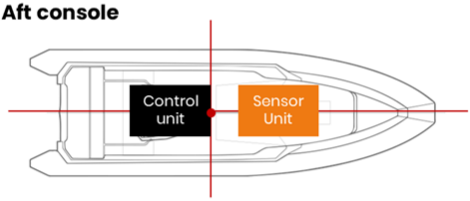
Centre console



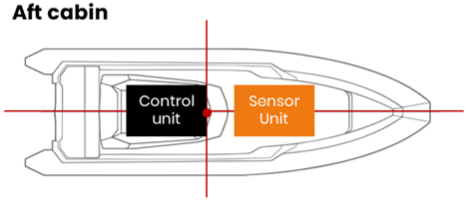
Centre cabin



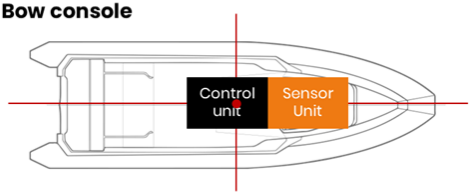
Aft console



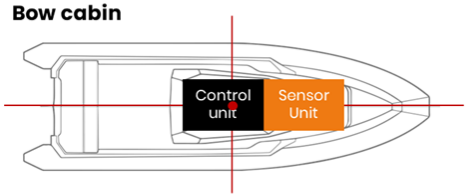
Aft cabin



Bow console



Bow cabin



Unit Positioning

Control unit

Where the console or cabin is situated centrally or near the aft, install behind Sensor Unit, in or around the console or cabin .

Where the console or cabin is situated toward the bow, install in the console or helm.

There is no sensor in the Control Unit, so it does not need to sit in the centerline of the ship like the Sensor Unit but can instead be installed where it can be conveniently mounted.

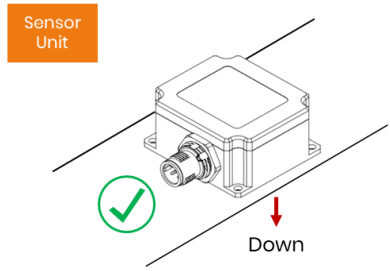
Sensor Unit

The rule of thumb is to mount the Sensor Unit on the hull by the front-most seating position. This may be by the helm position or toward the bow.

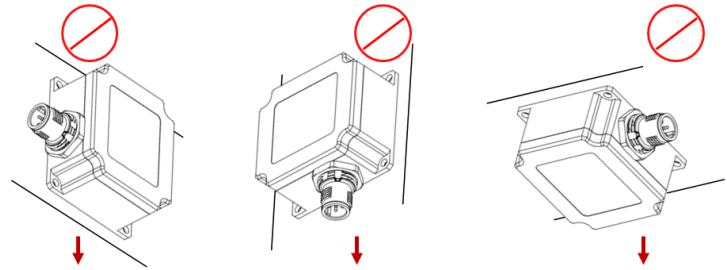
Where the console or cabin is situated centrally or near the aft, install in the front-most seating position or toward the bow.

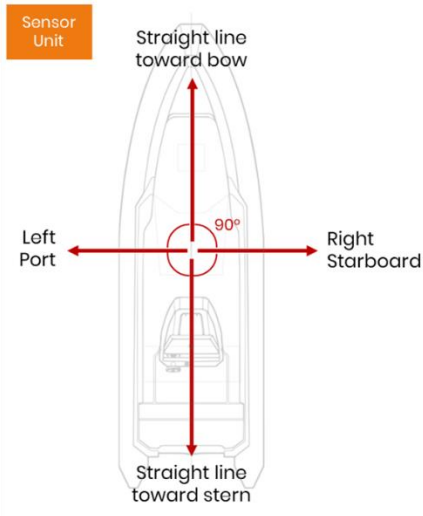
Where the console or cabin is situated toward the bow, install in the console or helm.

Sensor Unit alignment



Position the Sensor Unit(s) so that they sit horizontally on an even surface directly on or as near to the deck of the vessel as possible. Avoid placing the units in a way where they are slanted, rotated or in a vertical position. Also avoid placing on top of any material that may dampen or increase monitored impacts and vibrations.





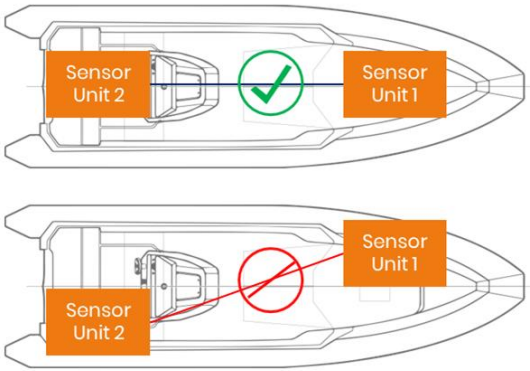
The accelerometer in the Sensor Unit is sensitive to high-frequency vibrations, which if monitored may influence and distort data from the actual movements of the vessel. While the Sensor Unit tries to eliminate these signals, make sure that the Sensor Unit is not placed on any surface that can vibrate independently of the vessel itself. Also avoid placing the Sensor Unit on any material

that may dampen the vibrations and impacts experienced. For best results,

place the Sensor Unit directly onto the deck structure, or as close to it as possible.

For best results, ensure that the sensor is correctly aligned. See the figure on the left. The cable port on the Sensor Unit should face backward toward the stern of the vessel and the opposite side toward the bow.

Alignment of dual Sensor Units



For a single or dual Sensor Unit setup, try to mount along the centerline of the vessel.

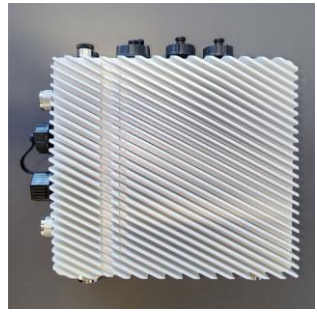
To the extent possible, position the units so that they follow a straight line along the middle of the vessel from one another.

Avoid placing the units diagonally across the vessel.

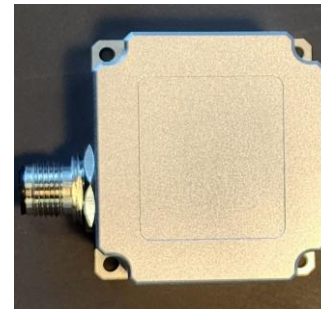
Installation Process

Review the packing list in the Appendix below and ensure that all components are included. Depending on the exact configuration ordered, the list might vary slightly.

Control Unit



Sensor Unit



LTE Stick Antennas

LTE Antenna Hat

Combo cable (used for sensor and NMEA2000)

Ethernet converter cable

Sensor cable (8 pin)

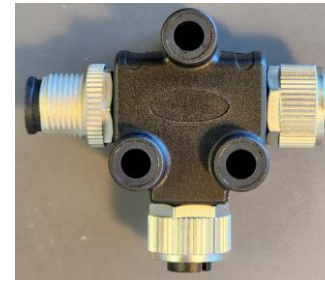
NMEA2000 cable (5 pin)

Power cable – 4 pin D-coded to Jack

Power cable – Jack to wires

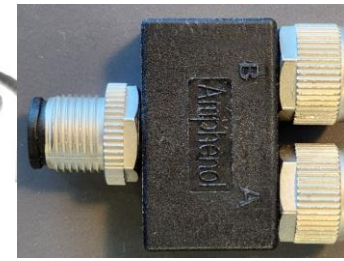
HDMI cable

T-Piece for NMEA 2000



Ethernet cable (if requested)

Sensor Unit T-piece (for dual sensor systems)



Initial Setup

When setting up the system, ensure that you have a good mounting place for the Control Unit. The control unit should ideally be screwed or bolted down; 4mm bolts or screws should be used to fasten the system down.

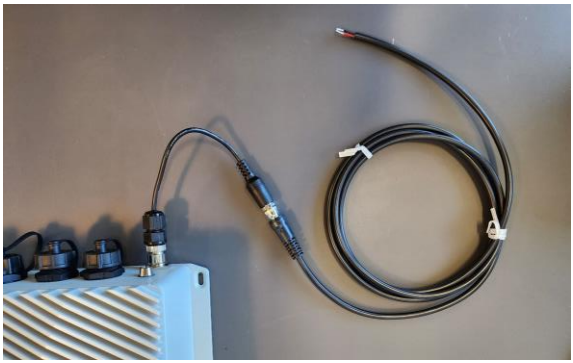
IMPORTANT! When connecting the ethernet port from the control unit, DO NOT UNDER ANY CIRCUMSTANCES CONNECT THE 8-PIN MALE TO RJ45 CONVERTER CABLE TO THE 8-PIN FEMALE COMBO CABLE. Connecting ethernet to the combo cable WILL CAUSE PERMANANT DAMAGE TO ANY CONNECTED ETHERNET PORT ON AN MFD/ROUTER/COMPUTER.

IMPORTANT! The Control Unit is GROUNDED TO ITS OWN CHASSIS. If your vessel is constructed from aluminium, carbon fibre, steel, or any conductive material, USE THE RUBBER STANDOFFS WHEN MOUNTING THE CONTROL UNIT to ensure that the Control Unit ground is not transferred to the vessel structure, as that WILL CAUSE A GROUND FAULT.

1. Find a good place for the control unit to stay, preferably close to power and a display, and not more than 5m from the NMEA 2000 connection. Keep in mind that if you use the smaller white antennas, the unit takes up more space.
2. Find a good place to mount the sensor. This should be close to the centreline of the vessel (though not required) and close to where the frontmost person might be stationed (towards the bow of the vessel). It is necessary to securely mount it on a surface that will not dampen impacts (soft materials and foam are examples of surfaces that are bad to mount on). An example of a good place would be the deck, metal plates, or any hard, rigid surface.
3. Determine a way to connect to power. Two options are available: connect using the jack connector (any 9-36 VDC source that can deliver at least 20–30W should be fine), connect the jack connector to the jack-to-wires cable, and connect the two wires directly to power (should be 9-36 VDC with a 5A fuse). **Wait until the setup is finished and then connect the power/turn it on.**

Option 1: DC jack connector

Option 2: Connect the DC jack to wires, make sure to tighten the connection well.



4. Connect the combo cable to the combo port (circled in the picture below). The combo cable should have two connectors on one end: 8-pin sensor connector and 5-pin NMEA2000 connector.

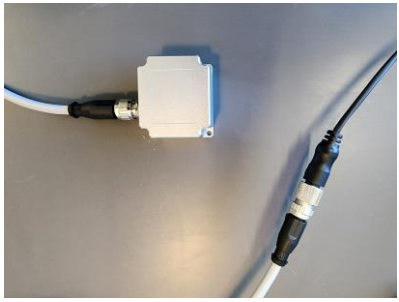
Start by removing the cover of the combo port (you should be able to twist it off).

Then align the combo cable and connect it to the combo port (be careful not to use excessive force).

The combo port connection should look like this if done correctly.

5. Connect the sensor to the combo cable using the sensor cable.

   Make sure to tighten the connections to ensure an IP67 seal. In the below picture to the left, you can see which port you should connect the sensor cable to.



   For a dual Sensor Unit setup, connect the t-piece to the Sensor Unit port on the Control Unit. Then connect the two Sensor Unit cables on both ends of the t-piece. Connect the Sensor Units on the other ends of the cables.

6. Connect NMEA2000 to the combo cable.

   You should start by checking for an available connection on the NMEA2000 backbone. If there is no available connection, you will need to add a T-piece to the backbone and connect to the added connection.

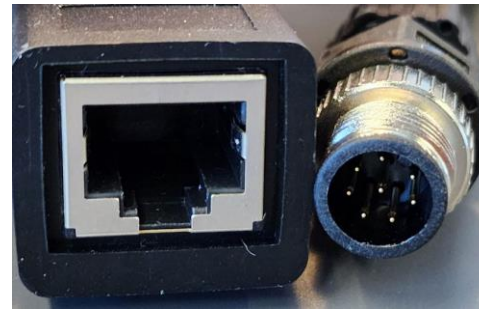
NMEA 2000 Cable connections

T-piece

While adding a T-piece to the backbone, make sure the terminal resistors stay on each end. After adding a T-piece to a backbone to create a new connection, it should look like the picture below.

7. Connect the ethernet to a compatible MFD or to a router.

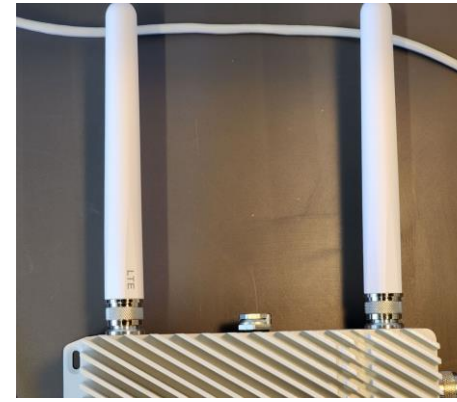
   If you want to display the interface on a compatible MFD or a computer, you should connect to the Ethernet port of the control unit. An 8-pin to RJ45 cable is included, and the ports can be seen in the picture here.



   To connect to an HTML5-enabled multifunction display (check your model and type), connect an ethernet cable to the LAN 1 port on the Control Unit. Connect the other end of the ethernet cable to the LAN port on the multifunction display. The Hefring Marine icon should appear in the display. For Garmin plotters, this will be under the OneHelm option. In Simrad and Raymarine, the icon will appear on the main icon screen.

8. If you want to use a regular display, then connect to the HDMI port. HDMI to a DVI converter is also possible.

9. Connect the antennas



If the system is not placed in an area surrounded by steel or wires, it should be fine to use the included white antennas. To connect them, simply screw them onto the N-type connectors marked "LTE." If the system has an unstable connection using the white antennas, a black screw mount antenna with a 5m cable is also included. The black antenna should be mounted in a place close to a window, outside or other favourable position.

If using a modem on board, connect an ethernet cable to the LAN 2 port on the Control Unit on one end and to the on-board network switch/router on the other end.

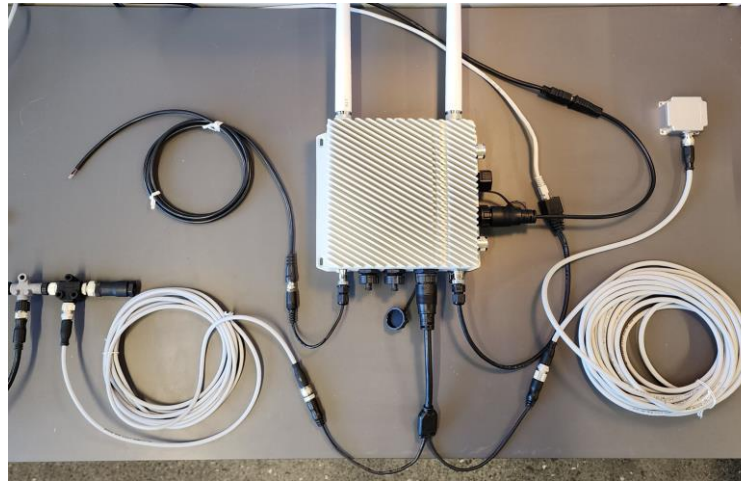
If connected to an on-board modem for internet, the interface will be accessible on any browser-enabled devices connected on the same local network. Using your handheld device or laptop, simply go to http://hefring.local in your browser and the interface will appear.

10. Using the USB ports

    IF APPICABLE. If your system has been provided with any auxiliary devices or a flash drive, connect it to a USB port. Any additional functionality will be subject to the nature of the auxiliary device. If applicable, see Appendix for descriptions of auxiliary devices.

11. Mount the system securely and turn on the power.

    At this point, we recommend properly mounting the system and turning on the power. The setup should approximately look like the picture below; it might look a little bit different depending on the exact configuration chosen.



Testing and troubleshooting

1. If the LED status light on the Control Unit glows green when power has been fed to the system, then it has been activated and is running.
    a. If the LED status light does not appear, check the power connections and revisit the steps in point 8 above.
2. If the interface appears on your multifunction display or HDMI screen, then the Control System has been properly connected to power and the display.
    a. If the interface does not appear in your display, check the power and display connections again. If you are using a multifunction display, ensure that it is an HTML5 compatible model. If you are using an HDMI screen, check the cable.
3. Follow the instructions in "System Activation and Use" to register the system and link it to a vessel. Once registration is completed, the main gauge screen will appear. If the icon in the top right corner of the main gauge screen turns green and shows the status "Connected", then the system has been properly connected to the sensor and is up and running.
    a. If the icon remains red and "Disconnected", check the cable connection to the Sensor Unit. If you have a dual Sensor Unit set up, make sure to check that the t-piece is properly connected.
4. For any other issues or if problems persist, see the "Support" section below.

System Activation and Use

Starting up the on-board system

After installation, switch on the vessel's electrical system and/or engines to provide power to the system. For the registration step, please ensure that the system is connected to a display. When the system is activated for the first time, the display will show a registration code, which will be used in the next step of the activation process.

Registering the system and linking to a vessel

1. Navigate to console.hefringmarine.com and start by creating an account. If you already have an account, skip this step by signing in.
2. To create an account, click on "Sign up". Enter the applicable information requested until you have completed the sign-up process. This may have been completed for you by the Hefring support team. If so, move to step 3.
3. Once you have created an account and signed in, go to the page "Vessels" in the left-hand pane. Press the "+" button in the top right corner of the screen to add a new vessel. Enter the requested information about the vessel where the system is installed.
4. Under the "System Settings" section of the vessel creation page, you are asked about "Impact Limit (g force)" and "Safety Speed Limit (knots)", where Safety Speed guidance speed calculated by the system.
    a. The "Impact Limit (g-force)" will by default be set to 3g. This implies that the system will set this limit as a

threshold. Hefring ehf. recommends not exceeding this maximum impact value for general purpose use. However, the value can be increased or decreased to better suit your operating profile as needed.

b. The "Safety Speed Limit (knots)" is the speed limit for the vessel, over which all actual speed is considered to be in excess of the specified Safety speed limit. The system will automatically vary its speed guidance as below the Safety Speed Limit value. By default, this value is set to 30 knots, but it can be changed to a higher or lower value as needed.
c. Other items for auxiliary components, such as specifying "Button box" names, are not required unless your system came with those components, such as comfort-level buttons.

5. Once you have entered all applicable values, press "Create". Your new vessel should now appear in the vessel list. Navigate to the " ⋮ " button on the right of the side of the vessel row, then press Link " 🔗 ".
6. When powering on your on-board system for the first time, you are presented with a registration code. Type this code into the "Registration Code" field under "Link Vessel". Then press "Link". Your vessel should now be linked to the onboard system and configured with the specifications and settings inserted during the vessel creation process.

After completing registration

After completing the registration process, the on-board system will not show the registration code again. When the system is powered on after registration is completed, it will start by showing a logo splash screen, followed by a disclaimer. If you have an interactive display, you can click Agree on the disclaimer. Otherwise, the disclaimer will disappear once the counter reaches zero. Your use of the system following the disclaimer screen indicates your acceptance of the disclaimer terms. After the disclaimer screen, the system will display the digital gauge screen. This is the main screen for the system's functionality and remains active during all trips. This intuitive screen provides real time information and guidance to aid safe and comfortable operation of the vessel.

The left gauge shows the instantaneous impact g-forces experienced, both with gauge motions and as a value at the centre of the dial. At the bottom of the gauge is a dial that counts the number of impacts recorded above the Impact Limit, which is by default set to 3g.

In the centre of the screen is an intuitive speedometer, which displays actual vessel Speed-over-Ground (SOG) at the

bottom of the gauge compared to the dynamic and varying Safety Speed at the centre of the gauge, where the Safety Speed is the calculated safest and most comfortable speed at any given time, based prevailing impacts, weather and sea conditions. While the Safety Speed is continuously adapted to account for conditions, the Safety Speed is configured in the HM Console platform, as described above.

On the right side of the screen is a trip information gauge, showing trip duration, the Beaufort Sea-state, temperature, wind speed, and wind direction.

Using the HM Console

The HM Console can be accessed at console.hefringmarine.com.

The **Console** page displays a live feed from all active vessel trips. The **Trips** page shows a log of all past trips. By selecting a trip from the list, you are taken to a trip report with insights and analysis. The trip data can be downloaded from this report page. The **Vessels** page contains all registered vessels and whether they are paired to a system. Each vessel has a statistics page that can be accessed by clicking on the vessel's row in the table. Under **Users** you can add new users of the console and system. Each user can be given a specific role, where fleet managers have access to all

information. A user with a Captain role can be assigned to a trip under the **Trips** page. **Profile**, **Settings** and **Sign out** are found on the bottom of the left-hand pane**.** You can change the account owner's information under **Profile** and **Settings** allows you to access site configurations and billing.

Software updates

The onboard system may be updated as improvements are made to the embedded software. Software updates are pushed out automatically and the system will install them when powered on and connected to internet. Software updates to the onboard system require no actions on part of the user. However, if you believe a software update has resulted in reduced performance, please share your feedback with us by contacting the email address provided in the Support section below.

Support

If you require assistance or run into problems and require additional support, please send us an email at support@hefringmarine.com. Please include the name of your organization or company and a brief summary of your issue in your email's subject line.

Appendix

Packing List

- ☐ 1x User manual
- ☐ 1x Control Unit, main system computer
- ☐ 1x Sensor Unit, inertial measurements sensor (IMU)
- ☐ 1x Combo port cable
- ☐ 1x Power cable, M12 to DC jack
- ☐ 1x Power cable, DC jack to wires
- ☐ 2x LTE Stick Antennas
- ☐ 1x LTE Antenna hat (optional instead of Stick Antennas)
- ☐ 2x WiFi Antenna (optional, requires configuration)
- ☐ 1x Sensor cable (M12 8-pin, A-coded, male to female) 10m
- ☐ 1x NMEA2000 cable (M12 5-pin, A-coded, male to female) 5m
- ☐ 2x Ethernet converter (M12 8-pin to RJ45)
- ☐ 1x NMEA2000 T-piece
- ☐ 1x IP67 HDMI cable
- ☐ 4x 4mm Rubber standoffs

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