



# Europe



## FiXed piloting unit

Installation and Operation Manual

[www.jrc-world.com](http://www.jrc-world.com)

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## Preface

In accordance with Advisory A-32-2022 issued on October 5, 2022, the Panama Canal authority (ACP) specifies a new positioning system requirement for transiting Neopanamax vessels beginning October 2023.

The FiXed piloting unit of JRC Europe is a navigation and piloting solution designed primarily for Neopanamax vessels transiting the Panama Canal. The FiXed piloting unit of JRC Europe is approved and certified by the Panama Canal authority.

- Thoroughly read this manual before installing or operating the equipment.
- We recommend keeping this manual nearby the equipment to ensure ready access to it.

## Revision History

| Revision No. | Date       | Description    | Author    |
|--------------|------------|----------------|-----------|
| 1.0          | 15-12-2023 | First revision | J. Kreeft |
|              |            |                |           |
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|              |            |                |           |

## Glossary

The glossary contains a list of abbreviations and a list of definitions.

### Abbreviations

Abbreviations used in this manual are explained in the table below.

| Abbreviation | Description                        |
|--------------|------------------------------------|
| AIS          | Automatic Identification System    |
| ACP          | Panama Canal authority             |
| AtoN         | Aid to Navigation                  |
| DC           | Direct Current                     |
| DGNSS        | Differential GNSS                  |
| GNSS         | Global Navigation Satellite System |
| EMI          | Electromagnetic interference       |
| IMU          | Inertial Measurement Unit          |
| PPU          | Portable Piloting Unit             |
| RTK          | Real Time Kinematics               |
| SOLAS        | Safety of Life at Sea              |
| SSID         | Service Set Identifier             |
| UHF          | Ultra High Frequency               |
| UPS          | Uninterruptible Power Supply       |
| VHF          | Very High Frequency                |
| WLAN         | Wireless Local Area Network        |

### Definitions

Standard definitions used in this manual are explained in the table below.

| Definition                            | Description   |
|---------------------------------------|---|
| AIS (Automatic Identification System) | A tracking system for ships and small craft and it identifies, locates and exchanges data with nearby vessels, ground stations and satellites by way of VHF radio transmission of digital data.   |
| AIS class A                           | AIS class as referred to in the SOLAS convention for: vessels of 300 gross tonnage and upwards engaged on international voyages, vessels of 500 gross tonnage and upwards not engaged on international voyages, and passenger ships irrespective of size. |
| AIS class B                           | AIS class as referred to in the SOLAS convention for use on non-SOLAS vessels. These can include domestic commercial vessels and pleasure craft.  |
| AIS AtoN                              | An AIS AtoN is a AtoN promulgated by an authorized service provider using AIS Message 21 'Aids to navigation report' that is portrayed on devices or systems (e.g. ECDIS, radar or INS).  |
| AIS base station                      | An onshore AIS unit that monitors traffic in the waterways.   |
| Dead reckoning                        | An old maritime term used to describe navigating by using known initial position, the vessel's velocity vector (speed and direction), and how long that velocity has been maintained, to determine the vessel's new position.                             |

| Definition                    | Description  |
|-------------------------------|--|
| Differential GNSS (DGNSS)     | A kind of GNSS augmentation system based on an enhancement to primary GNSS constellation(s) information by the use of a network of ground-based reference stations which enable the broadcasting of differential information to the user to improve the accuracy of his position. There are several DGNSS techniques, such as the classical DGNSS (or DGPS), and the Real Time Kinematics (RTK). |
| GNSS receiver                 | A device that receives and digitally processes the signals from a navigation satellite constellation in order to provide position, velocity and time (of the receiver).  |
| Neopanamax                    | A term for the size limits for vessels travelling through the Panama Canal. Panama vessels are divided into following vessels categories:<br>- Panamax length: 965 ft (294,1m) beam: 106 ft (32,3 m)<br>- Neopanamax length: 1201 ft (366 m) beam: 161 ft (49 m)   |
| Non-Portable Piloting Unit    | A stand alone unit installed on the bridge of the vessel with external antennas. The unit shares GNSS based position with centimetre precision, speed, course, heading, rate of turn and AIS targets data (all data must be real time) via Wi-Fi to a tablet application used by the pilots.   |
| Portable Piloting Unit        | A portable, computer-based system that a pilot brings onboard a vessel to use as a decision-support tool for navigating in confined waters.  |
| RTK (Real Time Kinematics)    | RTK positioning is a satellite navigation technology used to increase the precision of position data obtained from satellite positioning systems.  |
| SSID (Service Set Identifier) | A sequence of characters that uniquely names a Wi-Fi network. An SSID is sometimes referred to as a network name.  |

## Safety Information

The signal words DANGER, WARNING and CAUTION used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as follows:



**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.



**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



**NOTICE**

Indicates information considered important but not related to injury. It is typically used to prevent damage to equipment or property.

To safely operate this system, the following DANGERS, WARNINGS, and CAUTIONS must be adhered to. Failure to comply with the precautions or with specific dangers, warnings, and cautions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. ALPHATRON MARINE assumes no liability for the customer's failure to comply with these requirements.



**WARNING**

DO NOT DISASSEMBLE OR MODIFY THE EQUIPMENT. OTHERWISE, IT MAY CAUSE A FIRE, OR YOU MAY SUFFER AN ELECTRICAL SHOCK.



**WARNING**

IMMEDIATELY TURN OFF THE POWER AND DISCONNECT THE POWER SUPPLY CABLE IF THE EQUIPMENT IS GENERATING ANY SMOKE OR ODOUR OR IS OVERHEATED. IMMEDIATELY INFORM YOUR LOCAL SERVICE AGENT OF THE SYMPTOM TO HAVE IT REPAIRED. PROLONGED EQUIPMENT OPERATION UNDER SUCH A CONDITION CAN CAUSE A FIRE OR ELECTRIC SHOCK.



**WARNING**

DO NOT PLACE A CONTAINER CONTAINING LIQUID ON THE EQUIPMENT. OTHERWISE, IT MAY CAUSE A FIRE, OR YOU MAY SUFFER AN ELECTRICAL SHOCK IF KNOCKED OVER.



**WARNING**

WHEN UNPLUGGING THE INSTRUMENT, BE SURE TO REMOVE THE CORD TERMINAL CORRECTLY. IF THE CORD IS PULLED, THE CORD MAY GET DAMAGED RESULTING IN A FIRE OR AN ELECTRICAL SHOCK.



## Warranty

To not to adversely affect the warranty, the following notices must be adhered to.



**NOTICE**

Operating personnel must not remove equipment covers. Only personnel trained and certified by ALPHATRON MARINE must make component replacement and internal adjustment.

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**NOTICE**

Do not disassemble or modify the equipment. Failure to observe this instruction may cause equipment failure, and it will void the warranty.

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**NOTICE**

Any modification to this equipment without prior written permission from ALPHATRON MARINE will void the warranty.

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**NOTICE**

Installation of this product shall only be done by a certified installation company approved by either ALPHATRON MARINE or by an official ALPHATRON MARINE distributor. Acting otherwise will void the warranty.

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**NOTICE**

This product contains no operator serviceable parts. Service and repair shall only be carried out by personnel trained and certified by ALPHATRON MARINE.

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**NOTICE**

When cleaning the surface, do not use any organic solvent such as thinner or benzene. Otherwise, the paint and markings on the surface may get damaged. For cleaning the surface, remove the dust and debris and wipe with a clean dry cloth.

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**NOTICE**

Do not place a container containing liquid on the equipment. The equipment can be damaged if knocked over.

## 1 Introduction

The FiXed piloting unit of JRC Europe enables the pilot to monitor the vessel's movements in constrained waterways more accurately, providing real-time data to the pilot's tablet, and as a result, minimizing the time and complexity involved in lengthy pilotage procedures.

The FiXed piloting unit of JRC Europe is compatible with navigation and piloting software from Alphantron Marine and other parties.



### **NOTICE**

Effective on October 1, 2023, all vessels with a beam of 109 feet (Neopanamax vessel) or more transiting the Panama Canal will be required to have a non-portable piloting unit with RTK for submeter accuracy on board. This measure is expected to improve the efficiency of the waterway by eliminating the delays associated with the installation of PPU's. The FiXed piloting unit of JRC Europe is approved and certified by the Panama Canal authority.

## 2 Intended use

The FiXed piloting unit of JRC Europe is to be used by a pilot to monitor the vessel's movements in constrained waterways more accurately, minimizing the time and complexity involved in lengthy pilotage procedures.

### 3 General description

The FiXed piloting unit of JRC Europe is equipped with the latest technologies. Once the unit is installed and powered, it will provide the required communication with the pilot's tablet via wireless network. The unit ensures a stable and long-range connection in all conning positions during the transit through specific canals (e.g. the Panama Canal). The unit is able to operate autonomous for at least 5 hours without power from the vessel in case of a blackout.

#### 3.1 System overview

Figure 1 shows a schematic example of the system.

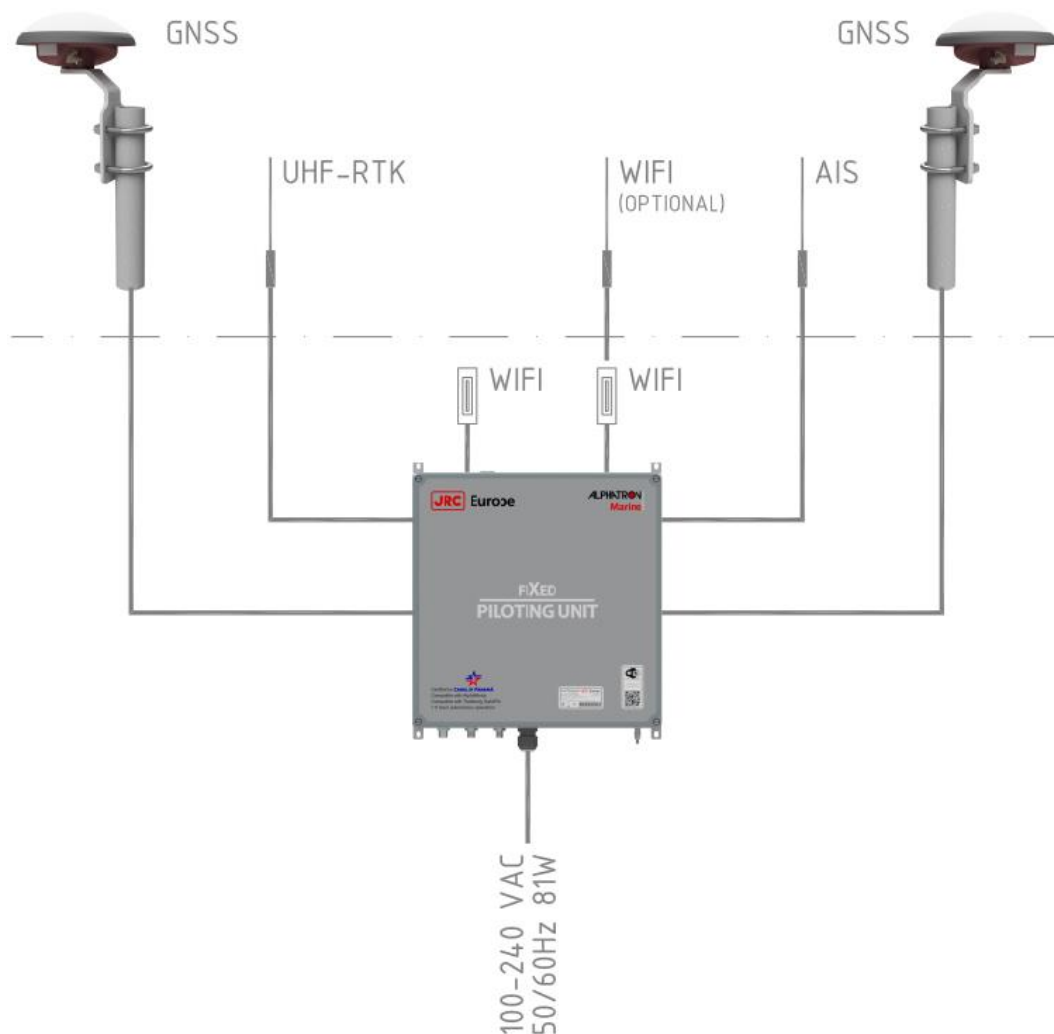


Figure 1: System overview

As shown in Figure 1, the FiXed piloting unit is connected to power, antennas, and a tablet (via Wi-Fi). For more information on the FiXed piloting unit and antennas, refer to the subsequent sections.

NOTE: The FiXed piloting unit comes with GNSS, UHF, VHF, and Wi-Fi antennas. The FiXed piloting unit does not come with cables, an outdoor Wi-Fi antenna, or tablet with a pilot software application.

### 3.2 FiXed piloting unit



Figure 2: FiXed piloting unit

The FiXed piloting unit of JRC Europe houses the following components in a sturdy enclosure:

- AIS receiver
- GNSS receivers
- IMU
- UHF receiver
- UPS system
- Wi-Fi router

#### 3.2.1 AIS receiver

The AIS receiver picks up signals - with VHF antenna - emitted by nearby AIS transponders. It receives transmissions from AIS class A transceivers, AIS class B transceivers, AIS AtoNs and AIS base stations.

#### 3.2.2 GNSS receivers

Two GNSS receivers are used for positioning and heading, where one GNSS receiver is setup as Master (Base) and the other as Slave (Rover), to determine real-time true heading and an attitude vector (i.e. high-precision vessel positioning).

#### 3.2.3 IMU

The high-precision IMU provides heading, rate of turn, and dead reckoning when GNSS signals are obstructed.

#### 3.2.4 UHF receiver

The UHF receiver picks up UHF data signals (includes GNSS corrections) - with UHF antenna - transmitted by the Panama Canal DGNS fixed base stations.

#### 3.2.5 UPS system

The UPS system which consists of a UPS control unit, battery module, and the power supply unit.

The UPS is always charged, so that it has sufficient capacity in case of a blackout. In the event of a main supply failure (drop of the DC input voltage) the system switches instantly to battery operation.

### 3.2.6 Wi-Fi router

The Wi-Fi router interconnects the internal components and provides Wi-Fi connectivity.

The system communicates through Wi-Fi with the pilot's tablet and the software, using a unique unit ID, providing the relevant navigation data.

### 3.3 Antennas

The FiXed piloting unit of JRC Europe comes with two GNSS antennas, one UHF antenna, one VHF antenna, and two indoor Wi-Fi antennas. All antennas are designed for high-end applications where maximum range and durability are important.

#### 3.3.1 GNSS antennas



Figure 3: GNSS antenna

The FiXed piloting unit of JRC Europe comes standard with two high-precision GNSS antennas and mounting material. The GNSS antennas have the latest technology and high gain over the full GNSS spectrum. The antenna has a height of approx. 7,6 cm and width of 16,2 cm. For more information, refer to the Alphanon datasheet or contact your dealer.

#### 3.3.2 UHF antenna



Figure 4: UHF antenna

The FiXed piloting unit of JRC Europe comes standard with a high quality UHF antenna for RTK.

It is designed for high-end applications where maximum range and durability are important. The antenna is a 3 dB fibre glass antenna with a height of approx. 0,9 m. For more information, refer to the Alphanon UHF085-03N datasheet or contact your dealer.

### 3.3.3 VHF antenna



Figure 5: VHF antenna

The FiXed piloting unit of JRC Europe comes standard with a high quality VHF antenna for AIS.

The antenna is a 3 dB fibre glass antenna with a height of approx. 1,3 m. For more information, refer to the Alphasron VHF126-03N datasheet or contact your dealer.

### 3.3.4 Wi-Fi antennas



Figure 6: Indoor Wi-Fi antenna

The FiXed piloting unit of JRC Europe comes standard with two indoor Wi-Fi antennas.

The indoor Wi-Fi antenna is designed to cover both 2.4 and 5.0 GHz Wi-Fi bands. It has an unobtrusive design and can be mounted easily on vertical surfaces (no ground plane needed). For more information, refer to the Alphasron WLN003-00MA datasheet or contact your dealer.





**Figure 7: Outdoor Wi-Fi antenna**

If required, an outdoor antenna can be installed. It will replace one of the two indoor antennas.

The outdoor Wi-Fi antenna is designed to cover both 2.4 and 5.0 GHz Wi-Fi bands. The antenna has a height of approx. 0,6 m. For more information, refer to the Alpatron WLN055-09N datasheet or contact your dealer.

## 4 Installation

The FiXed piloting unit of JRC Europe is easy to install and maintain. This chapter describes the installation of the FiXed piloting unit.

### 4.1 Initial inspection

The FiXed piloting unit of JRC Europe shall be inspected before installation as described in this section.

Inspect the shipping cartons - of each component - immediately upon receipt for evidence of damage during transport. If the shipping carton is severely damaged or water stained, request the carrier's agent to be present when opening the carton. Save the carton and packing material for future use.



#### CAUTION

To avoid hazardous electric shock, do not perform electrical tests if there is any sign of shipping damage to the FiXed piloting unit.

Check that the contents of the shipment are as listed in the enclosed packing list. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your dealer.

After you unpack the system do as follows:

- Inspect each component thoroughly for hidden damaged or loose components or fittings.
- Check for loose or missing hardware.
- Fasten any loose hardware.

### 4.2 Installing the system



#### NOTICE

The FiXed piloting unit must be installed in accordance with this manual. Acting otherwise will void the warranty.

The FiXed piloting unit is installed as a standalone system and is typically installed in the wheelhouse or in the bridge. Refer to the project specifications, connection diagram (see Appendix E), and installation drawings for the details.

For information on cables and wiring of the system, refer to section 4.2.4 on page 10. For information, on how-to configure the system, refer to section 4.3 on page 11.

#### 4.2.1 General installation requirements

- The FiXed piloting unit must be placed indoors. For information on environmental requirements, refer to the technical specifications.
- The FiXed piloting unit must be installed in 0, 90, 180, or 270 degrees relative to centreline of the vessel.
- GNSS antennas to be placed outside high on the vessel.

- GNSS antenna's need to be installed with at least 4 m separation ditch between each other. It is recommended to use as much distance as possible. It doesn't matter if the antennas are installed in line, either in a fore aft orientation or athwartships.
- Obstructions between the GNSS antennas shall be avoided.
- GNSS / VHF / UHF antennas must be installed in a location without interference from other equipment's or vessel infrastructures.
- The FiXed piloting unit must be installed in a fixed place and free from vibrations.
- A Wi-Fi configuration QR code sticker must be placed near the main pilot plug.

#### 4.2.2 Power requirements

The FiXed piloting unit operates on 100 – 240 Vac 50/60 Hz.

#### 4.2.3 Grounding availability



**NOTICE**

Propagation and reception of electromagnetic energy may cause unwanted effects such as electromagnetic interference (EMI) or even physical damage in operational equipment.

Use a suitable location for connecting the FiXed piloting unit to vessel ground (hull). The FiXed piloting unit has a grounding screw. Connect the grounding bolt to the vessel's ground with a low impedance connection.

Grounding aims to reduce emissions or divert EMI.

#### 4.2.4 Connecting the system



Figure 8: Location of connections

Electrical installation shall be performed according to the project specifications and installation drawings (cable diagrams and connection diagrams).

Note that cables are typically installed, finished, and connected by an electrical subcontractor.

All antennas are connected to the FiXed piloting unit via type-N connectors. The indoor Wi-Fi antennas require the included adapters (N-male to SMA-female). The GNSS antennas require a TNC Male Connector.

NOTE: GNSS-1 shall be used for the GNSS (heading) antenna for Master (Base). GNSS-2 shall be used for the GNSS (position) antenna for Slave (Rover).

### 4.3 Commissioning and testing

This section provides the information required for commissioning and testing of the system. Commissioning and testing include setting various parameters and performing functional checks of the equipment. Results can be recorded in the Commissioning checklist (see Appendix G).

#### Preparation

1. Before starting with commissioning and testing:
  - a. Get a good understanding of the system.
  - b. Get the correct documentation (including but not limited to; cable diagrams, connection diagrams, supplier documentation).
  - c. Verify that the unit and antennas are connected according to documentation.
  - d. Verify that the cables are installed as required per documentation. Antenna cable restrictions apply according to the respective specifications of the cables used. Appendix F gives a theoretical overview of signals and attenuation with the relevant cables. If in doubt, consult the manufacturer of the cable used.
  - e. Verify that the FiXed piloting unit is installed in a 0, 90, 180, or 270 degrees relative to centreline of the vessel. Other orientations are not yet supported. They may be supported at a later stage, for which a firmware update is required.
  - f. Verify availability of power supply.
  - g. Record the following information needed to configure the system:
    - i. Record the distance (X, Y, and Z position) from GNSS (heading) antenna for Master (Base) to GNSS (position) antenna for Slave (Rover).

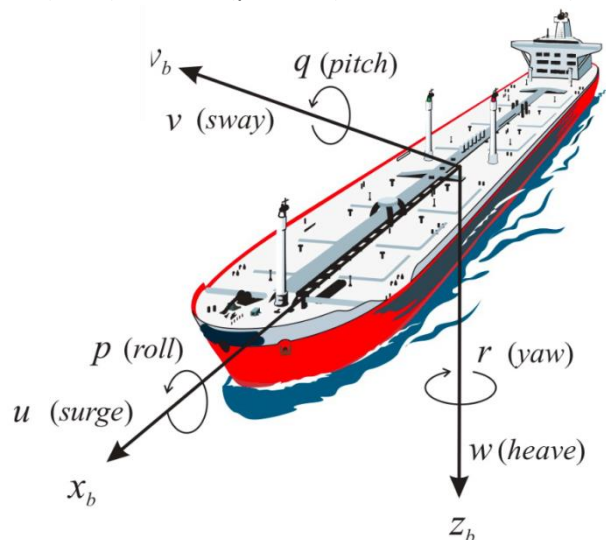


Figure 9: Coordinate system and reference axes for a vessel

- ii. Record the orientation of the FiXed piloting unit (X, Y, and Z angle ( $\theta$ )) with respect to the vessel (see figures below).

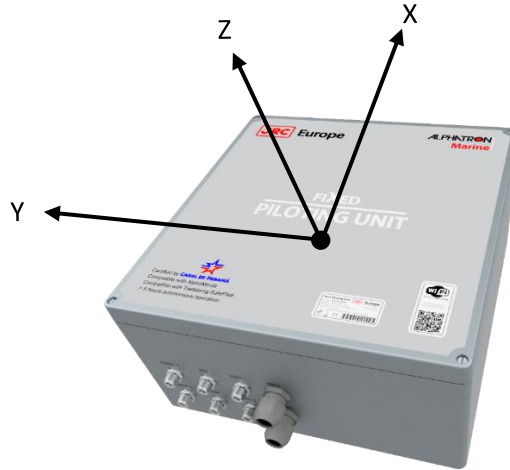


Figure 10: References axes for the FiXed piloting unit

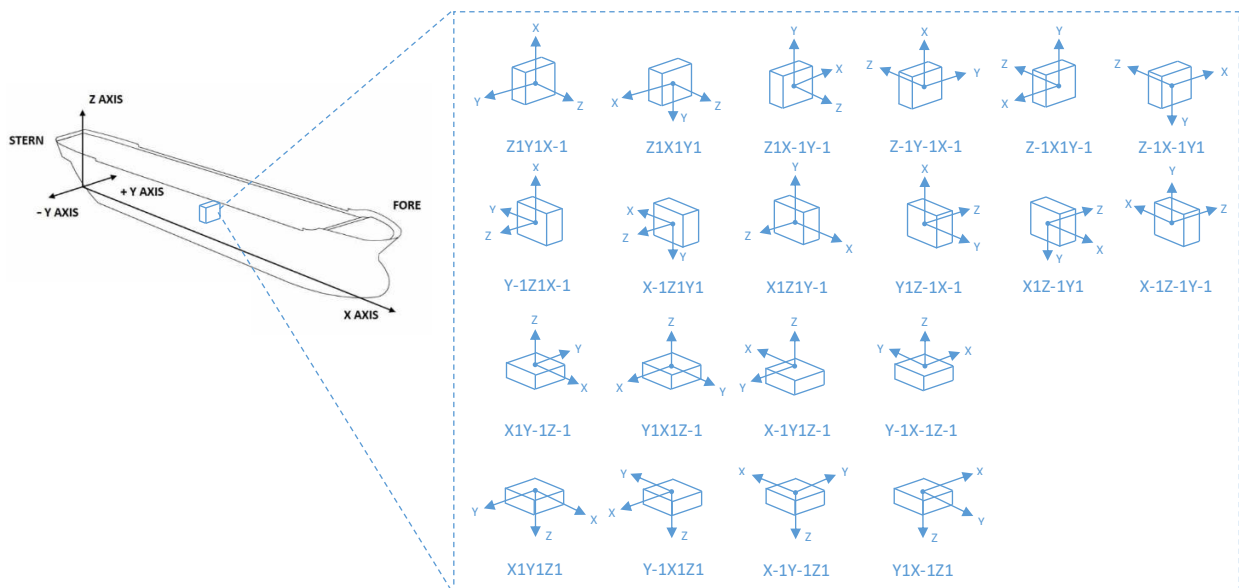


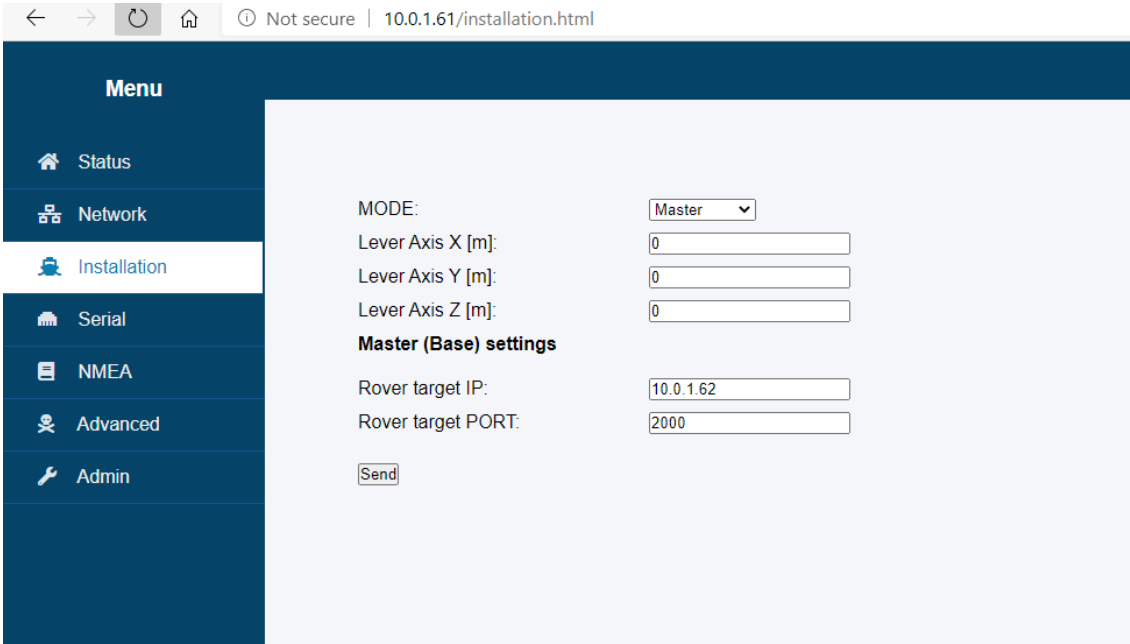
Figure 11: Orientation of the FiXed piloting unit relative to the vessel

2. Before power on, verify that the following conditions are met:
  - a. All components of the system available and installed correctly.
  - b. All components of the system are secured.
  - c. Power and data connections checked.
  - d. Grounding connection checked.
  - e. Cable glands are tightened.
  - f. Cables are secured and undamaged.
  - g. Shielding is connected in accordance with wiring instructions and sleeved where required.

## Initial setup and dock trial

NOTE: The FiXed piloting unit is preconfigured. Only a limited set of parameters shall be set during commissioning.

1. Power on the system.
2. Check Wi-Fi related items:
  - a. Verify that the Wi-Fi SSID is not hidden.
  - b. Check Wi-Fi signal strength at all conning positions. Signal strength must be  $> -70$  dBm at all conning positions.
3. Connect to Wi-Fi.
4. Go to the webpage <http://10.0.1.65/index.jsp>.
5. Since https uses a self-signed certificate, you will get a warning. However it is safe to proceed, so click on Advanced.
6. Log in with the username 'admin', and password '12345678'.
7. Open the **Installation** page
8. Select 'Master' and configure the parameters as follows:
  - a. **Lever Axis X [m]**: Enter the distance between the GNSS antennas over the X-axis (i.e. X position of the GNSS antenna for Master (Base) minus X position of the GNSS antenna for Slave (Rover)). Use the coordinate system and reference axes for a vessel as shown in Figure 9 on page 11.
  - b. **Lever Axis Y [m]**: Enter the distance between the GNSS antennas over the Y-axis (i.e. Y position of the GNSS antenna for Master (Base) minus Y position of the GNSS antenna for Slave (Rover)).
  - c. **Lever Axis Z [m]**: Not used. Reserved for future development.
  - d. **Rover target IP**: Pre-set value. DO NOT CHANGE.
  - e. **Rover target PORT**: Pre-set value. DO NOT CHANGE.



The screenshot shows a web browser window with the address bar displaying "Not secure | 10.0.1.61/installation.html". The page has a dark blue sidebar menu with the following items: Status, Network, Installation (highlighted), Serial, NMEA, Advanced, and Admin. The main content area is white and contains the following settings:

|                                     |           |
|-------------------------------------|-----------|
| MODE:                               | Master    |
| Lever Axis X [m]:                   | 0         |
| Lever Axis Y [m]:                   | 0         |
| Lever Axis Z [m]:                   | 0         |
| <b>Master (Base) settings</b>       |           |
| Rover target IP:                    | 10.0.1.62 |
| Rover target PORT:                  | 2000      |
| <input type="button" value="Send"/> |           |

Figure 12: GNSS receiver – Installation page - Master (Base) settings

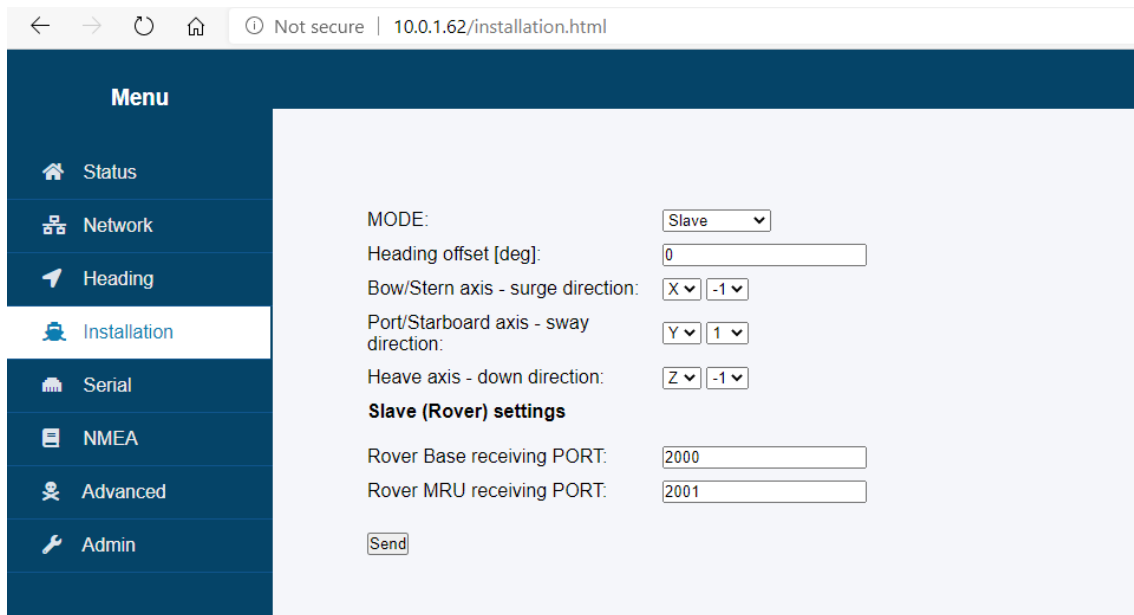


Figure 13: GNSS receiver – Installation page - Slave (Rover) settings

9. Select 'Slave' and configure the parameters as follows:
  - a. **Bow/Stern axis – surge direction:** Select the correct values, refer to Figure 11 on page 12.  
Example: For orientation X-1Y1Z-1, the entered values shall be X-1.
  - b. **Port/Starboard axis – sway direction:** Select the correct values.  
Example: For orientation X-1Y1Z-1, the entered values shall be Y1.
  - c. **Heave axis – down direction:** Select the correct values.  
Example: For orientation X-1Y1Z-1, the entered values shall be Z-1.
  - d. **Heading offset [deg]:** Enter the heading offset between True HDT and RelPos NED HDT. RelPos NED HDT can be found on the **Heading** page, see Figure 14 on page 15.
  - e. **Rover Base receiving PORT:** Pre-set value. DO NOT CHANGE.
  - f. **Rover MRU receiving PORT:** Pre-set value. DO NOT CHANGE.

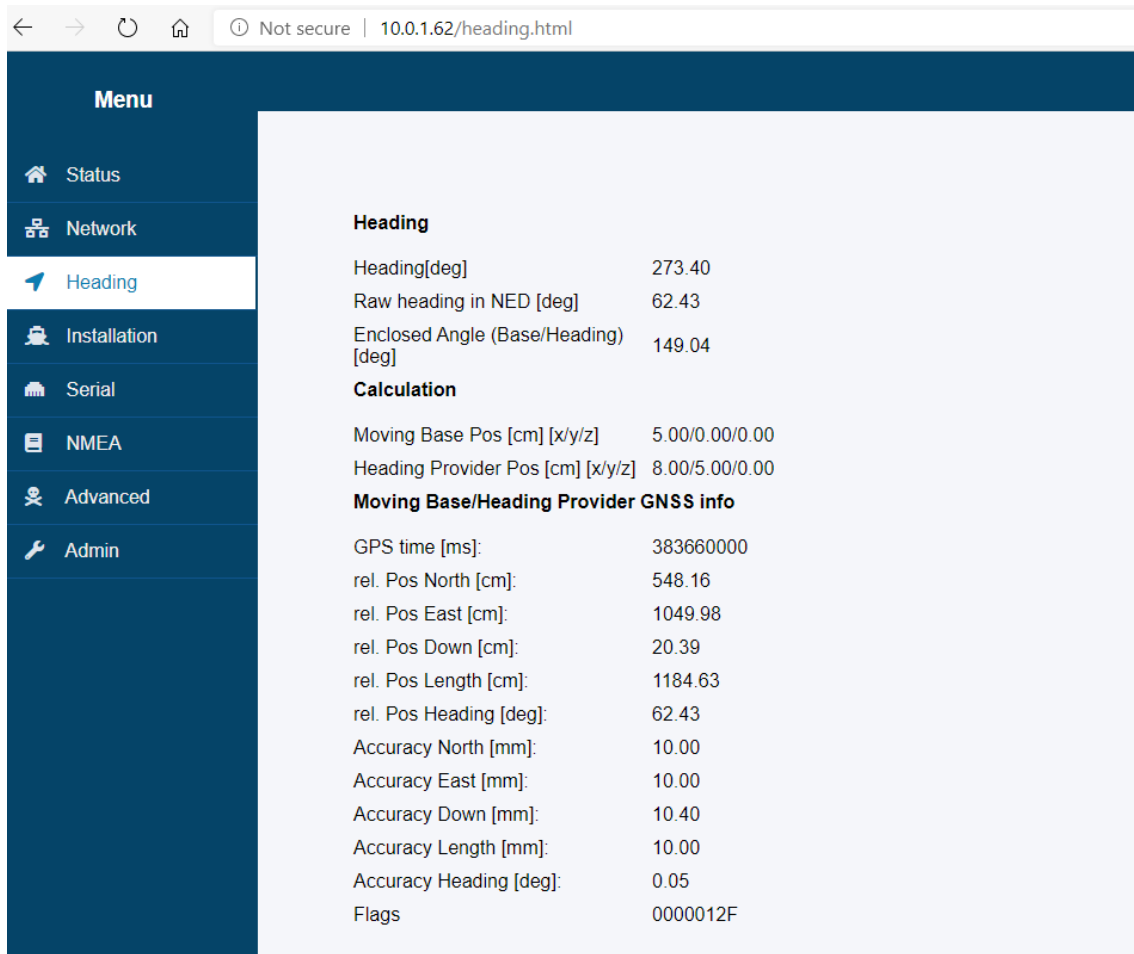


Figure 14: GNSS receiver – Heading page

10. Check if data is received correctly (see Figure 14).
11. Verify that data is received at all conning positions.
12. Test the actual Wi-Fi communication at all conning positions.
13. If a pilot software application (e.g. Safepilot for iOS) is available, configure the application according to its manual and verify correct functioning of the application.

**Sea trial, if applicable**

1. Perform various manoeuvres with the vessel and verify correct functioning of the pilot software application and received data.
2. Verify correct functioning of the pilot software application and received data at all conning positions.



## 5 Operation

Figure 15 shows the location of the power button (1) and QR-code (2).



Figure 15: Location of QR code and power button

The power button is used to turn the system ON or OFF. The power button also has a visual indicator which shows the state of the system (see Figure 16 on page 17).

The QR-code is used for a seamless and easy connection. It contains information; a unique ID, SSID, and password.

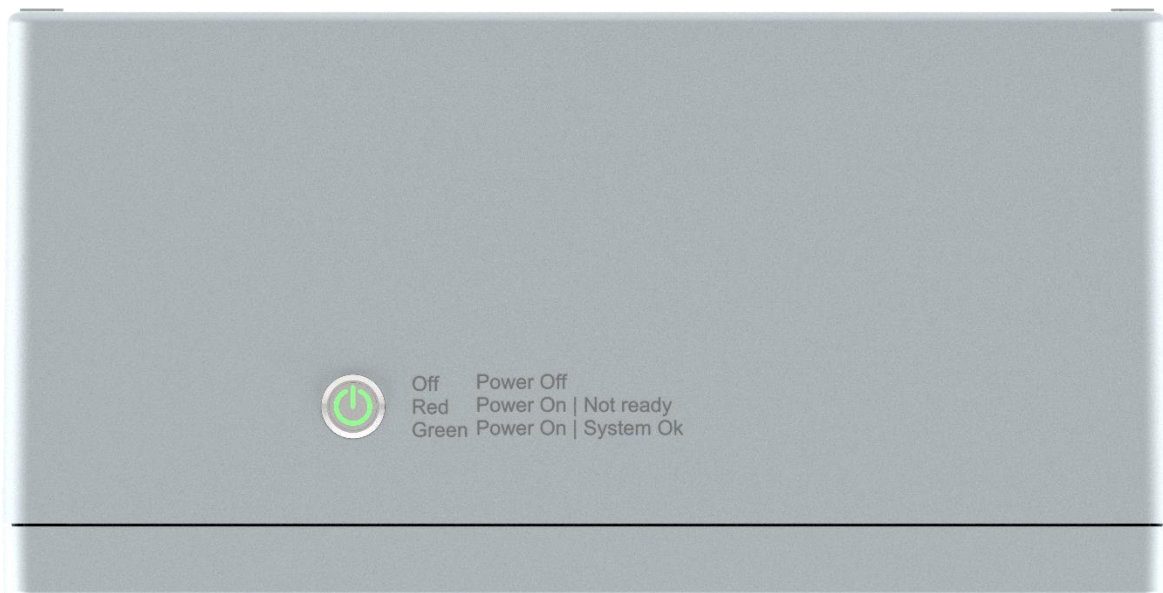


Figure 16: Power button

Figure 16 shows the power button and a short description of its indicator.

## 5.1 Procedures

This section describes all procedures for the FiXed piloting unit.

### 5.1.1 How to turn the system ON



**NOTICE**

The FiXed piloting unit must be operational when at the Panama Canal anchorage or water ways.

1. Push the power button to turn the system on.
2. Verify that the system is ready for operation. The power button LED must be green.

### 5.1.2 How to connect to the system

1. Scan the QR code with the tablet to connect with the FiXed piloting unit.
2. Open the pilot software application (e.g. Safepilot for iOS) on the tablet.
3. Verify that the application is working correctly. The application should now receive data from the FiXed piloting unit.

### 5.1.3 How to turn the system OFF

1. Push the power button to turn the system off.

## 6 Troubleshooting (end-user)

**WARNING**

DO NOT DISASSEMBLE OR MODIFY THE EQUIPMENT. OTHERWISE, IT MAY CAUSE A FIRE, OR YOU MAY SUFFER AN ELECTRICAL SHOCK.

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**WARNING**

IMMEDIATELY TURN OFF THE POWER AND DISCONNECT THE POWER SUPPLY CABLE IF THE EQUIPMENT IS GENERATING ANY SMOKE OR ODOUR OR IS OVERHEATED. IMMEDIATELY INFORM YOUR LOCAL SERVICE AGENT OF THE SYMPTOM TO HAVE IT REPAIRED. PROLONGED EQUIPMENT OPERATION UNDER SUCH A CONDITION CAN CAUSE A FIRE OR ELECTRIC SHOCK.

**NOTICE**

If the guidance given below does not rectify the problem you are experiencing, please contact your dealer for further assistance.

Check the pilot software application (e.g. Safepilot) for alarm messages. Solutions for potential issues are explained below.

**Not receiving data from the FiXed piloting unit.**

1. Check presence of Wi-Fi SSID.
2. If the Wi-Fi SSID is visible, reboot the system.
3. Check the connections.
4. Check the status of the battery.

**Disruption due to main power failure**

Once the mains supply has been restored, the system switches back to normal operation and the battery is fully recharged by the integrated charger. No action required.

**Power supply check**

Check for the availability of power on the enclosure. The power button has an indicator.

**No AIS data**

Check there are vessels equipped with AIS transceivers in your area, and check the VHF antenna is correctly installed and connected.

## Appendices

## Appendix A: Specifications

| Box Contents upon Delivery   |  |
|--|--|
| FiXed piloting unit (G-022206), which includes 2x GNSS antennas with mast/rail mount, 2x indoor Wi-Fi antennas incl. adapters, 1x UHF antenna with mast/rail mount, and 1x VHF antenna with mast/rail mount. |  |

| Physical Dimensions (Enclosure) |  |
|---------------------------------|--|
| Dimensions (WxHxD)              | 400 x 425 x 207 mm<br>(15.8 x 16.8 x 8.2") |
| Weight                          | 20 kg (44.1 lbs)                           |

| Power Specifications |                      |
|----------------------|----------------------|
| Power supply         | 100-240 Vac 50/60 Hz |
| Power consumption    | 75 W                 |

| Operating Conditions  |                            |
|-----------------------|----------------------------|
| Operating temperature | -5°C to +55°C <sup>1</sup> |
| Operating humidity    | Up to 95%                  |
| Storage temperature   | -20°C to +60°C             |
| Storage humidity      | Up to 95%                  |
| Compass safe distance | 50 cm                      |
| IP-rating             | IP66                       |

| Data output    |  |
|----------------|--|
| NMEA output    | GGA, VTG, HDT, ROT, GSA, GSV, VDM                |
| Data Protocol  | Compatible with SafePilot                        |
| PTMSX messages | Contain unique vendor ID and unique equipment ID |

| Miscellaneous  |                                   |
|----------------|-----------------------------------|
| Battery backup | > 5 hours of autonomous operation |
| ON/OFF button  | with visual indicator             |

| Input/Output Signals |   |
|----------------------|---|
| WLAN                 | 2 x N- Connector – Wi-Fi communication:<br>Standard:<br>• 2x Indoor antenna<br>Optional:<br>• 1x Indoor antenna<br>• 1x Outdoor antenna |
| UHF                  | 1 x N- Connector – UHF DGNSS correction reception   |
| VHF                  | 1 x N- Connector - AIS reception  |
| GNSS                 | 2 x N- Connector - GNSS reception   |

| Optional Accessories                      |          |
|---|----------|
| Alphatron Outdoor WLAN antenna WLN055-09N | G-022235 |
| AlphaMINDS Docking bundle                 | G-009374 |

| Accessories  |          |
|--|----------|
| 2x GNSS High-Precision Multi-band RTK antenna                  | G-022813 |
| 2x Alphatron Antenna mast / rail mount Bracket 1"-14NF         | G-002428 |
| 2x Alphatron Antenna mast/rail mount SS G1"-11 for VHF and UHF | G-020515 |
| 1x Alphatron Antenna VHF126-03N                                | G-002405 |
| 1x Alphatron Antenna UHF085-03N                                | G-002424 |
| 2x Alphatron Indoor Wi-Fi Antenna WLN003-00MA                  | G-022234 |
| 1x Alphatron Outdoor Wi-Fi Antenna                             | G-022235 |
| 2x Cable Adapter N-SMA   | G-010713 |

(Continued on next page)

<sup>1</sup> Although the test conditions provide for a maximum operation temperature of 55°C, continuous operation of all electronic components should, if possible, take place at ambient temperature of 25°C. This is necessary for a long life and low service costs.

| GNSS Receiver                   |   |
|---------------------------------|---|
| Received signals (184-channels) | GPS L1C/A L2C, GLONASS L1OF L2OF, Galileo E1B/C E5b, BeiDou B1I B2I, QZSS L1C/A L1S L2C, SBAS L1C/A |
| Nav. update rate                | RTK 8Hz (up to 20 Hz <sup>2</sup> )   |
| Position accuracy <sup>3</sup>  | RTK 0,05 m + 1 ppm CEP  |
| Convergence time <sup>2</sup>   | RTK < 10 sec  |
| Anti-jamming                    | Active CW detection and removal onboard band pass filter  |
| Anti-spoofing                   | Advanced anti-spoofing algorithms   |

| IMU (Inertial Measurement Unit) |                   |
|---------------------------------|-------------------|
| Gyro Bias Instability           | ≤ 1.1°/hr         |
| Angular Random Walk             | ≤ 0.08°/√hr       |
| 6 Degree OF Freedom             | Triple gyroscopes |

| UHF Antenna |               |
|-------------|---------------|
| Frequency   | 445 - 470 MHz |
| VSWR        | < 1.5         |
| Gain        | 3 dB          |

| Wi-Fi Indoor antenna |                                      |
|----------------------|--------------------------------------|
| Frequency            | 2400 - 2495 MHz<br>4910 - 5925 MHz   |
| VSWR                 | Low Band < 2.0:1<br>High Band <1.5:1 |
| Gain                 | 0 dBd                                |

| GNSS Antenna   |  |
|----------------|--|
| Constellations | GPS/QZSS-L1/L2/L5, QZSS-L6, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b/E6, BeiDou-B1/B2/B2a/B3, NavIC-L5+ L-band correction services |
| LNA Gain       | 37 dB min.   |
| Noise Figure   | 1.8 dB typ. @ 25 °C  |
| VSWR           | < 1.5:1 typ.   1.8:1 max.  |

| WLAN                      |  |
|---------------------------|--|
| Standard                  | IEEE 802.11b/g/n   |
| Security                  | WPA/WPA2, WPA-PSK, Support Open System, Shared KeyWEP  |
| Firewall                  | Includes SPI, Anti-DoS Attack, Filtering Multicast, Ping package, Access Control List (ACL), NAT, PAT, DMZ |
| Maximum number of clients | User defined (at most 128)   |

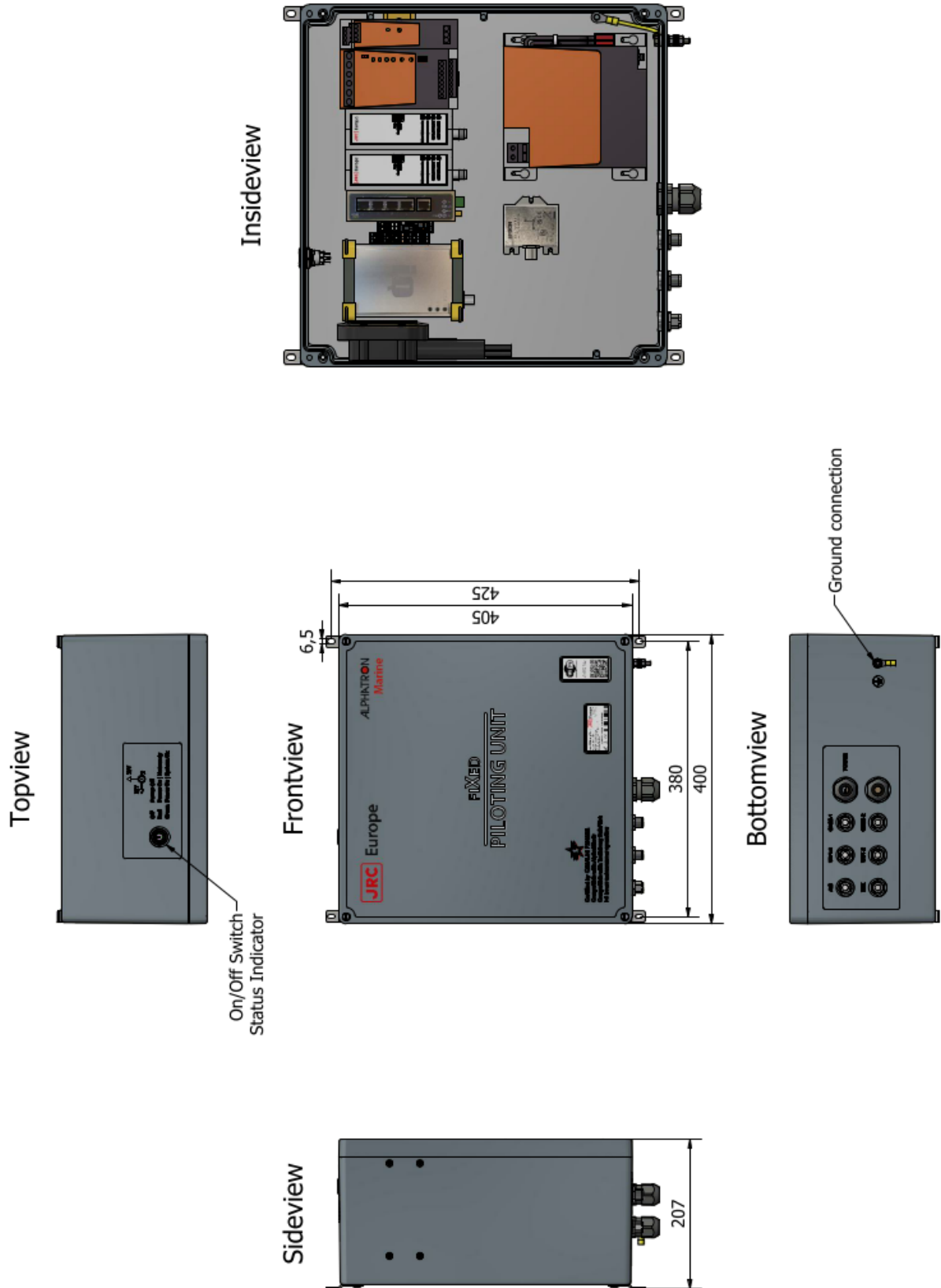
| VHF Antenna |                 |
|-------------|-----------------|
| Frequency   | 146 - 162.5 MHz |
| VSWR        | < 1.5           |
| Gain        | 3 dB            |

| Wi-Fi Outdoor antenna |                                    |
|-----------------------|------------------------------------|
| Frequency             | 2400 - 2495 MHz<br>4910 - 5925 MHz |
| VSWR                  | < 2.0:1                            |
| Gain                  | 9 dB                               |

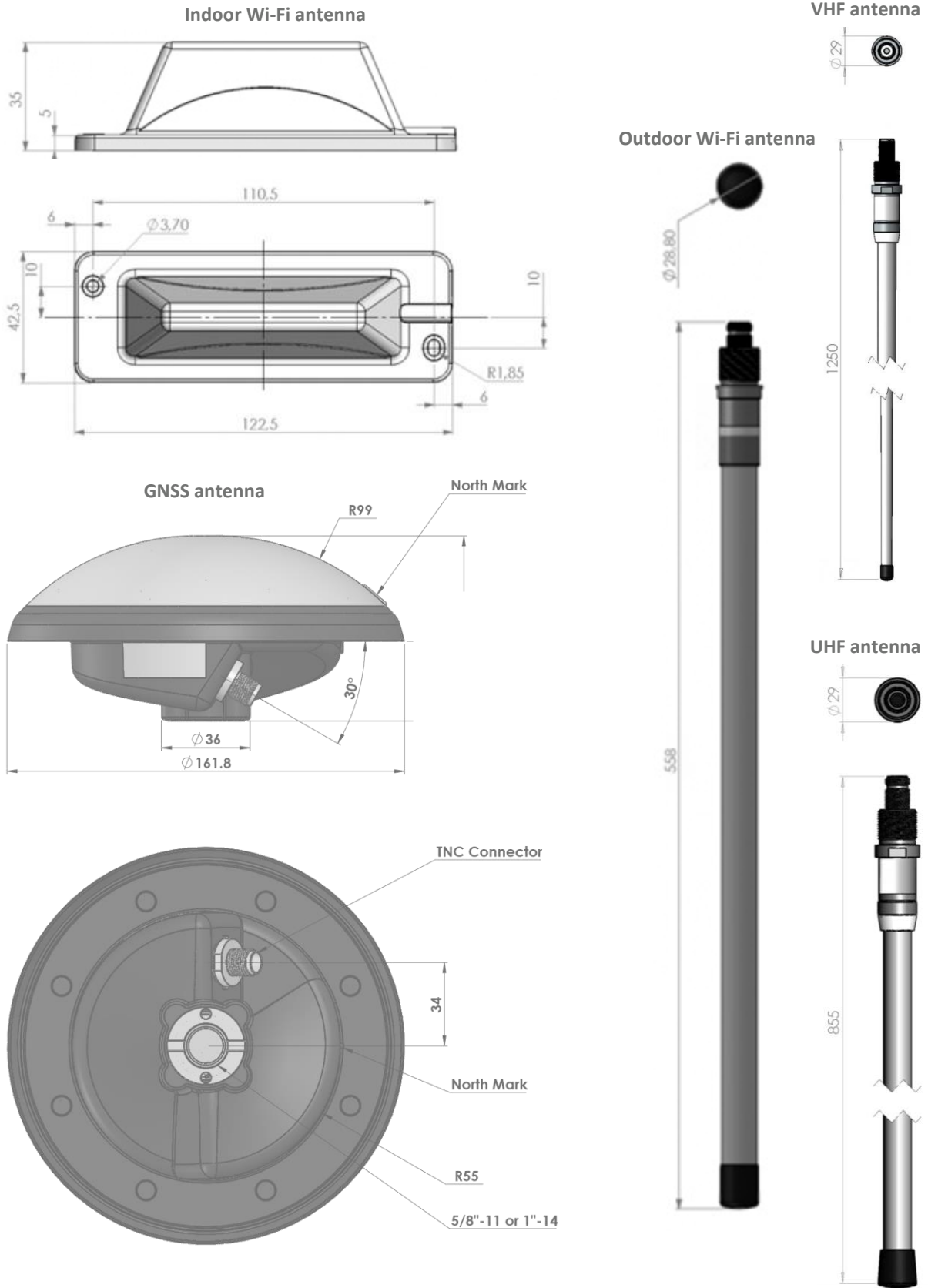
<sup>2</sup> The highest navigation rate can limit the number of supported constellations.

<sup>3</sup> Depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility, and geometry.

Appendix B: Outline drawing - FiXed piloting unit

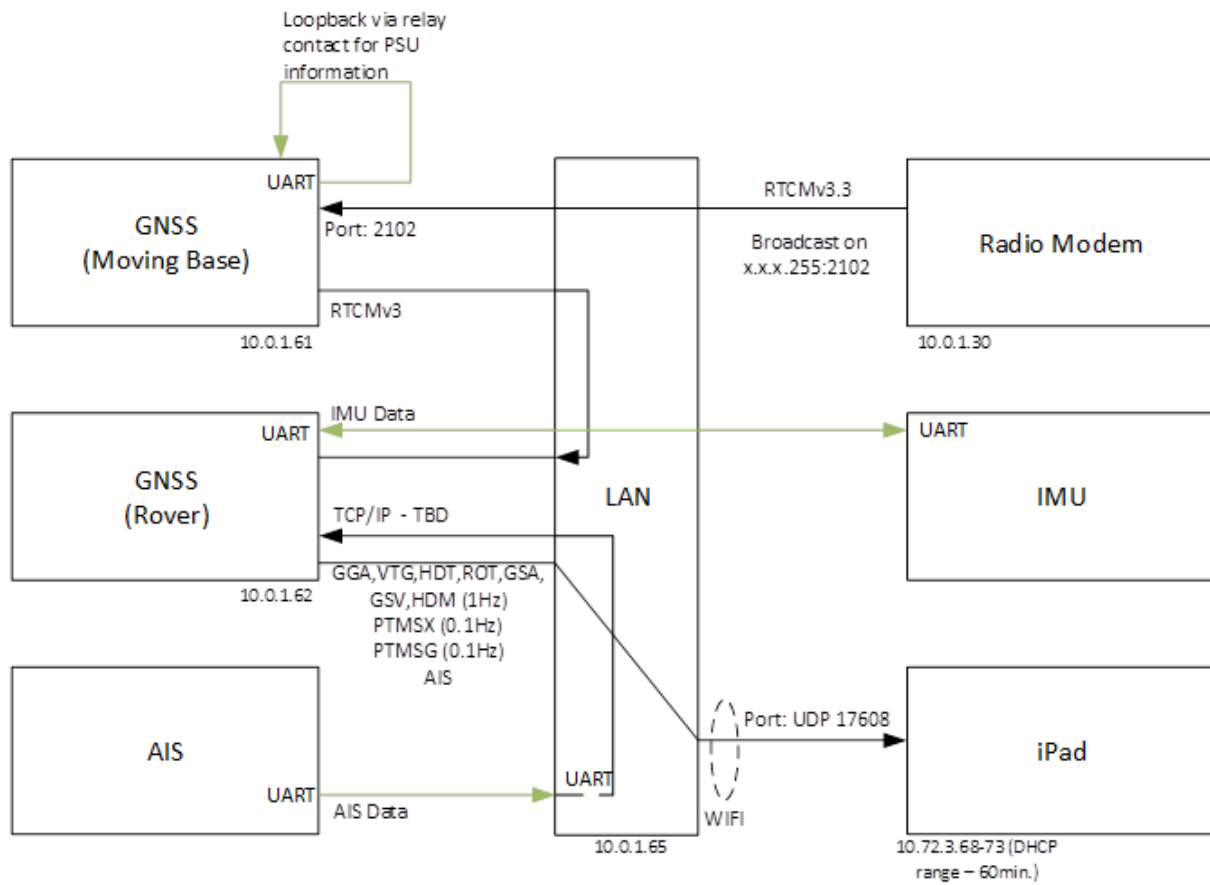


Appendix C: Outline drawings - Antennas

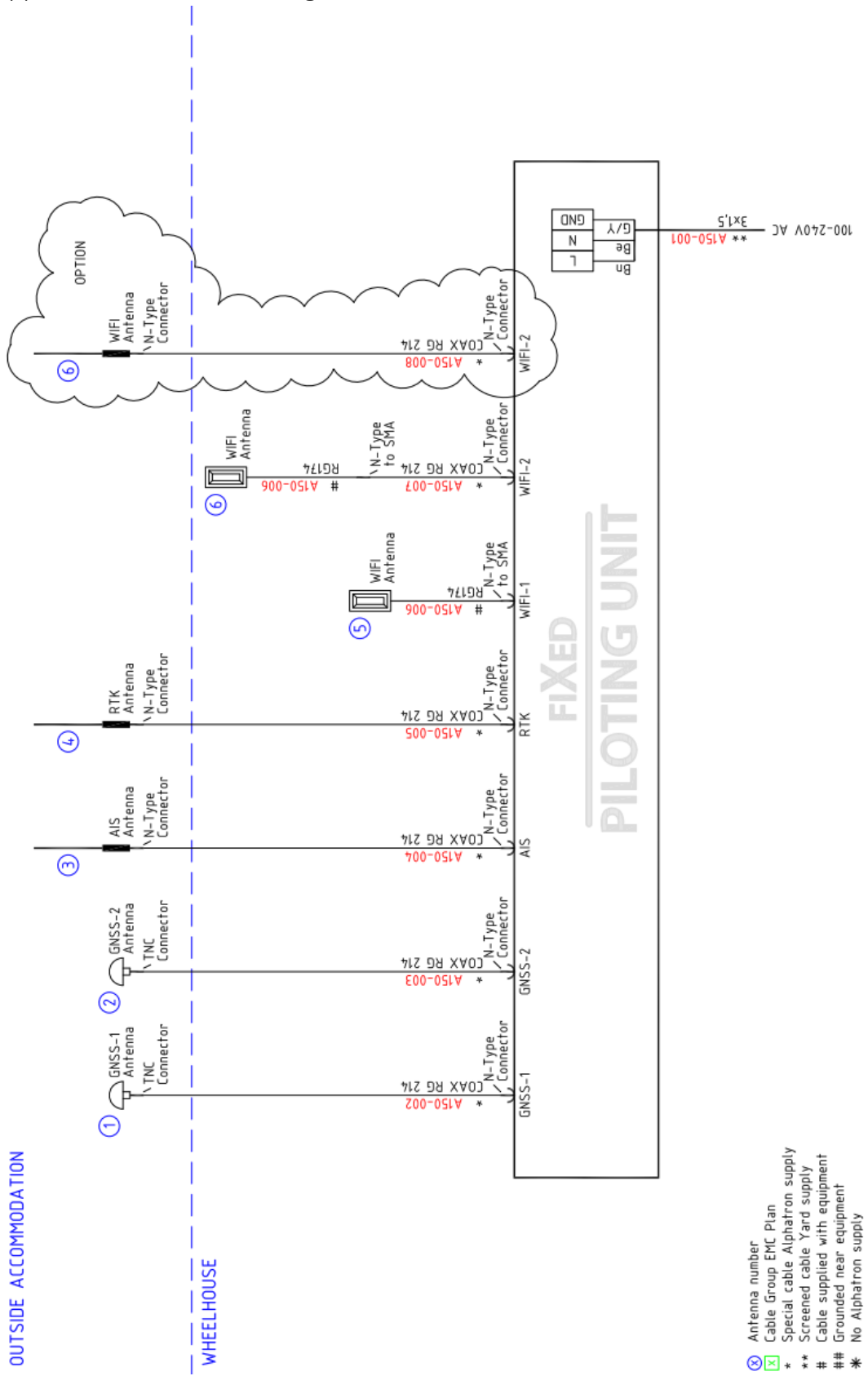




Appendix D: Block diagram



Appendix E: Connection diagram



- ⊗ Antenna number
- ⊠ Cable Group EMC Plan
- \* Special cable Alphatron supply
- \*\* Screened cable Yard supply
- # Cable supplied with equipment
- ## Grounded near equipment
- \* No Alphatron supply

## Appendix F: Attenuation table

| Signal purpose: |        | AIS                        |                  | UHF         | Wi-Fi   |
|-----------------|--------|----------------------------|------------------|-------------|---------|
| Frequency:      |        | 161.975 MHz<br>162.025 MHz |                  | 454.325 MHz | 2.4 GHz |
| Cable:          | Length |                            | Attenuation (dB) |             |         |
|                 | m.     | ft.                        |                  |             |         |
| RG-214          | 3      | 9,84                       | 0,3              | 0,6         | 1,5     |
|                 | 5      | 16,40                      | 0,5              | 1           | 2,5     |
|                 | 10     | 32,81                      | 1,1              | 1,9         | 4,9     |
|                 | 15     | 49,21                      | 1,6              | 2,8         | 7,3     |
|                 | 20     | 65,62                      | 2,1              | 3,7         | 9,7     |
|                 | 30     | 98,43                      | 3,1              | 5,5         | 14,5    |
|                 | 40     | 131,23                     | 4,2              | 7,3         | 19,3    |
|                 | 50     | 164,04                     | 5,2              | 9,2         | 24,1    |
|                 | 60     | 196,85                     | 6,3              | 11          | 28,9    |
|                 | 70     | 229,66                     | 7,3              | 12,8        | 33,7    |
|                 | 80     | 262,47                     | 8,3              | 14,6        | 38,5    |
|                 | 90     | 295,28                     | 9,4              | 16,4        | 43,3    |
| 100             | 328,08 | 10,4                       | 18,3             | 48,1        |         |
| LMR-400         | 3      | 9,84                       | 0,2              | 0,3         | 0,8     |
|                 | 5      | 16,40                      | 0,3              | 0,5         | 1,3     |
|                 | 10     | 32,81                      | 0,6              | 1           | 2,5     |
|                 | 15     | 49,21                      | 0,9              | 1,5         | 3,7     |
|                 | 20     | 65,62                      | 1,2              | 2           | 4,9     |
|                 | 30     | 98,43                      | 1,8              | 3           | 7,3     |
|                 | 40     | 131,23                     | 2,4              | 4           | 9,7     |
|                 | 50     | 164,04                     | 2,9              | 5           | 12,2    |
|                 | 60     | 196,85                     | 3,5              | 6           | 14,6    |
|                 | 70     | 229,66                     | 4,1              | 7           | 17      |
|                 | 80     | 262,47                     | 4,7              | 8           | 19,4    |
|                 | 90     | 295,28                     | 5,3              | 9           | 21,8    |
| 100             | 328,08 | 5,9                        | 10               | 24,2        |         |

**Note:**

- The above values are theoretical values, calculated based on nominal values.
- This calculation does not take into account losses between connectors, poor connections (crimp/solder) and other issues that can cause attenuation.
- The Fixed Piloting Unit is integrated in one enclosure with N connectors (female bulkhead) for connecting the external antennas such as VHF, UHF, GNSS and Wi-Fi. The restrictions therefore apply to the antenna cable according to the respective specifications of the cables used. However, if in any doubt, consult the manufacturer of the cable used.

## Appendix G: Commissioning checklist

| <b>Item group</b>        | <b>Item</b>                            | <b>Result</b> |
|--------------------------|--|---------------|
| Place and date           | Place of installation                  | .....         |
|                          | Date of installation                   | .....         |
| Basic vessel information | Vessel name                            | .....         |
|                          | Vessel type                            | .....         |
|                          | Vessel owner (operator)                | .....         |
|                          | Call sign                              | .....         |
|                          | MMSI                                   | .....         |
| System configuration     | SSID of the FiXed piloting unit        | .....         |
|                          | Unique ID of the FiXed piloting unit   | .....         |
|                          |  | X: .....      |
|                          | Lever Axis [m]                         | Y: .....      |
|                          |  | Z: .....      |
|                          |  | .....         |
|                          | Orientation of the FiXed piloting unit | .....         |
| Heading offset [deg]     | .....                                  |               |

All over the world,  
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