HENSOLDT
Detect and Protect.

Manta NEO X-Band
Solid State Sensor Handbook

HBK-2300-9 Issue 2

DOCUMENT HISTORY

Issue number	Release date	Details
1	December 2023	• Initial Release
2	**March 2024**	• **Transmitted power levels updated**

When planning any aspect of the installation, commissioning, operation, maintenance or risk analysis (RADHAZ) of the system(s) described in this handbook, it is the responsibility of the individual carrying out the required task to ensure they are working from the latest issue/ revision of the relevant system(s) handbooks.

Where translated, the original English version of this document will remain the definitive document and should be referred to in any situation of doubt, confusion or conflict.

Specifications are subject to change without notice.

Printed copies of this document are unmaintained.

This publication supersedes all previous versions.

1 Contents

2 Health & Safety

When working on HENSOLDT UK equipment, operators, engineers and agents must work within the health and safety guidelines noted in this handbook and as issued by their respective employer or as stated by site regulations, shipyard or vessel owner.

Risk assessments of a working area must be undertaken prior to commencement of any work and must be regularly reviewed.

HAZARDS

The equipment is constructed so that access to high voltages may only be gained after having used a tool, such as a spanner or screwdriver. Warning labels are prominently displayed both within the equipment and on protective covers.

WARNING: ELECTRICAL HAZARDS

Some equipment does not have safety interlocks fitted.

Lethal single phase AC and DC voltages may be present when units are open and exposed.

Before accessing any internal parts, ALL power sources to the equipment must be fully isolated; this must include the isolation of any UPS supported supplies to the system.

WARNING: HIGH VOLTAGES

This product contains high voltages.

Do NOT remove any covers or otherwise attempt to access internal components, unless specifically instructed in this document.

WARNING: SWITCH OFF POWER SUPPLY

Ensure all power supplies are switched OFF before starting to install this product.
Do NOT connect or disconnect the equipment with the power switched ON, unless instructed in this document.

ANTENNA ROTATION WARNING

WARNING: RADAR SENSOR SAFETY

Before rotating the radar sensor, ensure all personnel are clear.

EQUIPMENT ACCESS

NOTICE: ACCESS TO EQUIPMENT

To meet with electrical safety recommendations, all equipment should be situated in a restricted area where access is only available to authorised personnel.
Persons entering the restricted area should be aware of the dangers that are present when the system is operational which include rotating equipment, radiation hazards and where applicable, working at heights.

RADIATION HAZARDS

RADHAZ WARNINGS

Avoid exposure to the main beam of a stationary radar antenna.

Avoid standing closer than 2 metres from the central front face of the antenna.

Users of cardiac pacemakers should be aware of the possibility that radio frequency transmissions can damage some devices or cause irregularities in their operation. Anyone using such devices should understand the risks present before exposure.

The radar sensor transmits electromagnetic energy at microwave frequencies which can be harmful, particularly to the eyes.

Do NOT look at the sensor from close range. Ensure personnel are clear of the sensor when it is powered on.

TRANSMITTED POWER DENSITY LEVELS

ANTENNA	Range Within Which the Power Density Exceeds the Following:	
	10 W/m²	100 W/m²
Rotating	34 cm or less from the radar scanner	A power density level of 100 W/m² does not occur at any point.

50 W/m² does not occur due to the low power device being used.

WORKING ALOFT

CAUTION: SAFETY ALOFT
When working aloft or near any radar sensors, moving or RF radiating equipment, ALL power sources to the platform and equipment must be fully isolated. Prior to working aloft, all AC supply breakers supplying power to the system must be switched OFF and locked. Ensure someone in authority or at ground level knows of your intentions and ensure that suitable clear warnings are in place. Ensure all means of access aloft are secure and beware of wet or slippery ladder rungs and working areas. All working at height health & safety requirements and procedures including the inspection and use of personal protective equipment (PPE) such as approved safety harnesses and gloves, must be adhered to at all times as required by your employer, site regulations, shipyard and / or vessel.

CAUTION: SAFETY CORDON
When working aloft a safety cordon must be established and managed below the working area(s).

CAUTION: DROP HAZARDS
When working aloft, all tools, Line Replacement Units (LRU's) and any loose items must be safely stowed or secured so that they cannot present a drop hazard.

CAUTION: WEATHER HAZARDS
When weather conditions are poor, a full risk assessment must be carried prior to working aloft as defined by an individual's employer or shipborne safety procedures. Poor weather conditions can include but are not restricted to high winds, heavy rain, snow, ice or if access is required at sea, risk of vessel pitch and roll.

ANTI-STATIC HANDLING

Certain semiconductor devices used in the equipment are liable to damage due to static voltage. Persons removing sub-units from equipment containing these devices must be earthed by a wrist strap and a resistor at the labelled point provided on/ within the equipment.

Observe the following precautions when handling these devices in their un-terminated state, or sub-units containing these devices:

- Soldering irons used during authorised repair operations must be low voltage types with earthed tips and isolated from the mains voltage by a double insulated transformer.
- Outer clothing worn must be unable to generate static charges.
- Printed circuit boards fitted with these devices must be stored and transported in anti-static containers.
- Fit new devices in a special antistatic safe handling area.

Fully isolate and mechanically disconnect all sources of AC before attaching ESD protective wrist straps to the various points in the system.

RoHS STATEMENT

For details on RoHS statements please contact HENSOLDT UK; contact details can be found in at the end of this handbook.

END OF LIFE DISPOSAL

When the equipment detailed in this handbook has reached the end of its serviceable life, the various parts that make up the system must be disposed of in accordance with the WEEE Directive.

The Waste Electrical and Electronic Equipment (WEEE) Directive requires the recycling of waste electrical and electronic equipment. Whilst the WEEE Directive does not apply to some HENSOLDT UK products, we support its policy and ask you to be aware of how to dispose of this product.

GROUNDING/ EARTH POINTS

All parts of the system must be fully and correctly connected to a proven earth point prior to connecting any source of AC or DC power.

The system must never be switched ON or operated with an earthing point disconnected.

Connection:	The equipment grounded via the cables/ connectors provided with the equipment.
Conductivity tests:	During installation and maintenance, the earth connections must be tested for conductivity using a high current impedance meter such as a Megger or similar.

WARNING

The system must NOT be operated or have power switched ON with Earth/ Grounding points disconnected.

SERVICING AND REPAIR

Service and equipment repair must only be undertaken by an authorised service agent/ engineer. Un-authorised repair or servicing of equipment during the warranty period may invalidate the warranty status of the equipment.

LIFTING EQUIPMENT

- All health and safety requirements must be checked and observed at all times when lifting *any* equipment. All appropriate personal protective equipment (PPE) must be worn.
- Where special equipment such as cranes hoists and jigs are required, consideration must be given to the authority to use such equipment.
- During lifting, a safety zone shall be established beneath the lifting area around any cranes or platforms. Safety personnel must ensure that persons do not encroach on the area of work.
- Consult with the lifting operator to obtain the best and safest method of securing lifting strops or ropes to the equipment and advise lifting operators of the areas of a system that are susceptible to damage such as antenna fascia's, swing castings etc.
- Check that the centre of gravity of the equipment cannot cause the lifting strops or ropes to slip or move.
- All straps, lifting cables or ropes must be thoroughly checked to ensure that there is no risk of the unit slipping or falling from the lifting strap or lifting equipment.

WARNING

The transceiver and antenna are heavy items that must be hoisted to the fixing position using suitable lifting equipment, a secured block and tackle or by rope strops.

During installation, the equipment being lifted must be secured and supported at all times to prevent any risk of falling or slipping.

Gearboxes must never be lifted by the antenna or swing casting.

The system must NOT be lifted with the antenna assembled onto the unit.

HENSOLDT UK cannot be held responsible for any damage that occurs to supplied or 3rd party equipment as a result of incorrect lifting procedures or handling or equipment.


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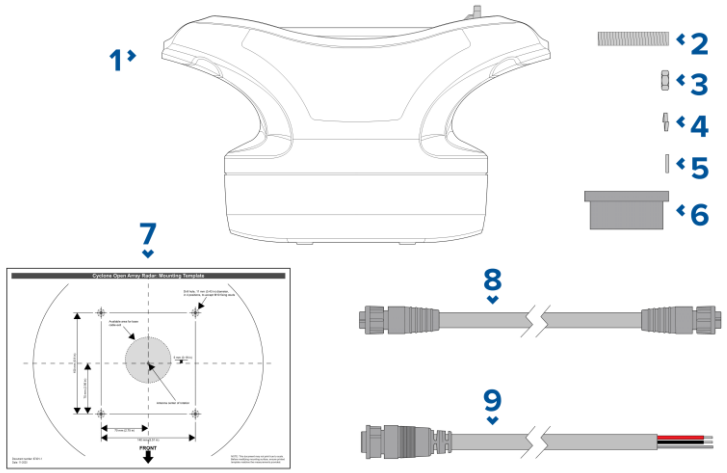
3 General Notices

3.1 Suggested tools

Item	Description
1	Power drill
2	13 mm and 17 mm Spanner
3	Drill Bit (appropriate size dependant on thickness and material of mounting surface)
4	Jigsaw
5	Pozidrive Screwdriver
6	Denzo Paste (Supplied as part of radar fitting kit)
7	50 mm Hole Saw

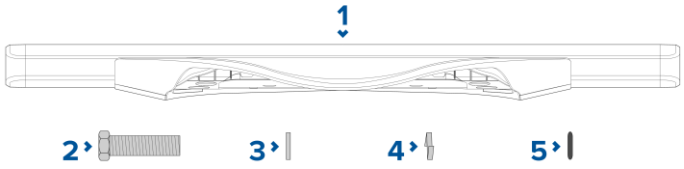
3.2 Pedestal Parts Supplied

Item	Description	Qty
1	NEO-A10 Manta NEO Solid State Sensor	1
2	M10 stud x4	4
3	M10 nut x8	8
4	M10 spring washer x4	4
5	M10 plain washer x4	4
6	Cable gasket	1
7	Mounting Template	1
8	Radar Data Cable	1
9	Power Cable	1
10	Manta NEO to RJ45 Adaptor	



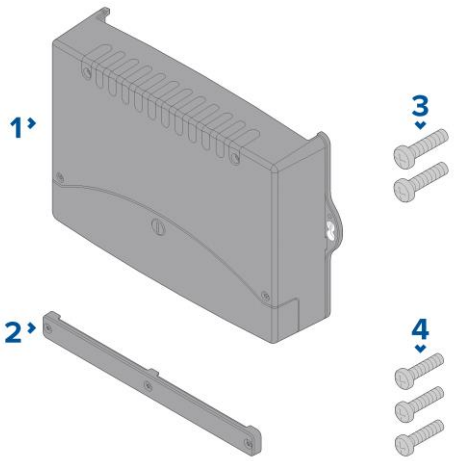
3.3 Antenna Parts Supplied

Item	Description	Qty
1	NEO-A19 Radar Antenna	1
2	M8 Hex Bolt	4
3	M8 Plain Washer	4
4	M8 Spring Washer	4
5	‘O’ Ring	4



3.4 Voltage Control Unit (VCU) Parts Supplied

Item	Description	Qty
1	NEO-A6 Voltage Control Unit	1
2	Cable Clamp	1
3	VCU Mounting Screw	2
4	Cable Clamp Mounting Screw	2



3.5 Additional handbook requirements

This publication details the installation and termination of the Manta NEO X-Band sensor.

When connecting the sensor to a HENSOLDT UK Navigation Display, reference to HBK-2300-2 will be required to commission the transceiver.

3.6 Disclaimers

WATER INGRESS

Although the waterproof rating capacity of this product exceeds that called for by the IPX6 standard, water intrusion and subsequent equipment failure may occur if the transceiver enclosure is subjected to commercial high pressure washing. HENSOLDT UK will not warrant equipment subjected to high pressure washing.

EMC INSTALLATION GUIDELINES

The system conforms to the appropriate Electromagnetic Compatibility (EMC) regulations, to minimize electromagnetic interference between equipment and minimize the effect such interference could have on the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

NOTICE

In areas of extreme EMC interference, some slight interference may be noticed on the product. Where this occurs the product and the source of the interference should be separated by a greater distance

For optimum EMC performance we recommend that wherever possible the equipment and cables connected to it are:

- At least 1 m from any equipment transmitting or cables carrying radio signals e.g., VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m.
- More than 2 m from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behaviour and data loss which can occur if the engine start does not have a separate battery.
- The cables supplied and specified for the equipment are correctly fitted and used.
- Cables are not cut or extended, unless doing so is detailed in the installation manual.

NOTICE

Where constraints on the installation prevent any of the above recommendations, always ensure the maximum possible separation between different items of electrical equipment, to provide the best conditions for EMC performance throughout the installation.

SUPPRESSION FERRITES

- Cables supplied with the equipment may be fitted with suppression ferrites. These are important for correct EMC performance.
- If a ferrite has to be removed for any purpose (e.g. installation or maintenance), it must be replaced in the original position before the product is used.
- Use only ferrites of the correct type as supplied with the cables.
- Where an installation requires multiple ferrites to be added to a cable, additional cable clips should be used to prevent stress on the connectors due to the extra weight of the cable.

3.7 Connection to Other Equipment

REQUIREMENT FOR FERRITES ON NON-HENSOLDT UK CABLES

If your equipment is to be connected to other equipment using a cable not supplied by HENSOLDT UK, a suppression ferrite MUST always be attached to the cable near the unit.

3.8 Declaration of conformity

The Radar is in compliance with the Radio Equipment Directive 2014/53/EU.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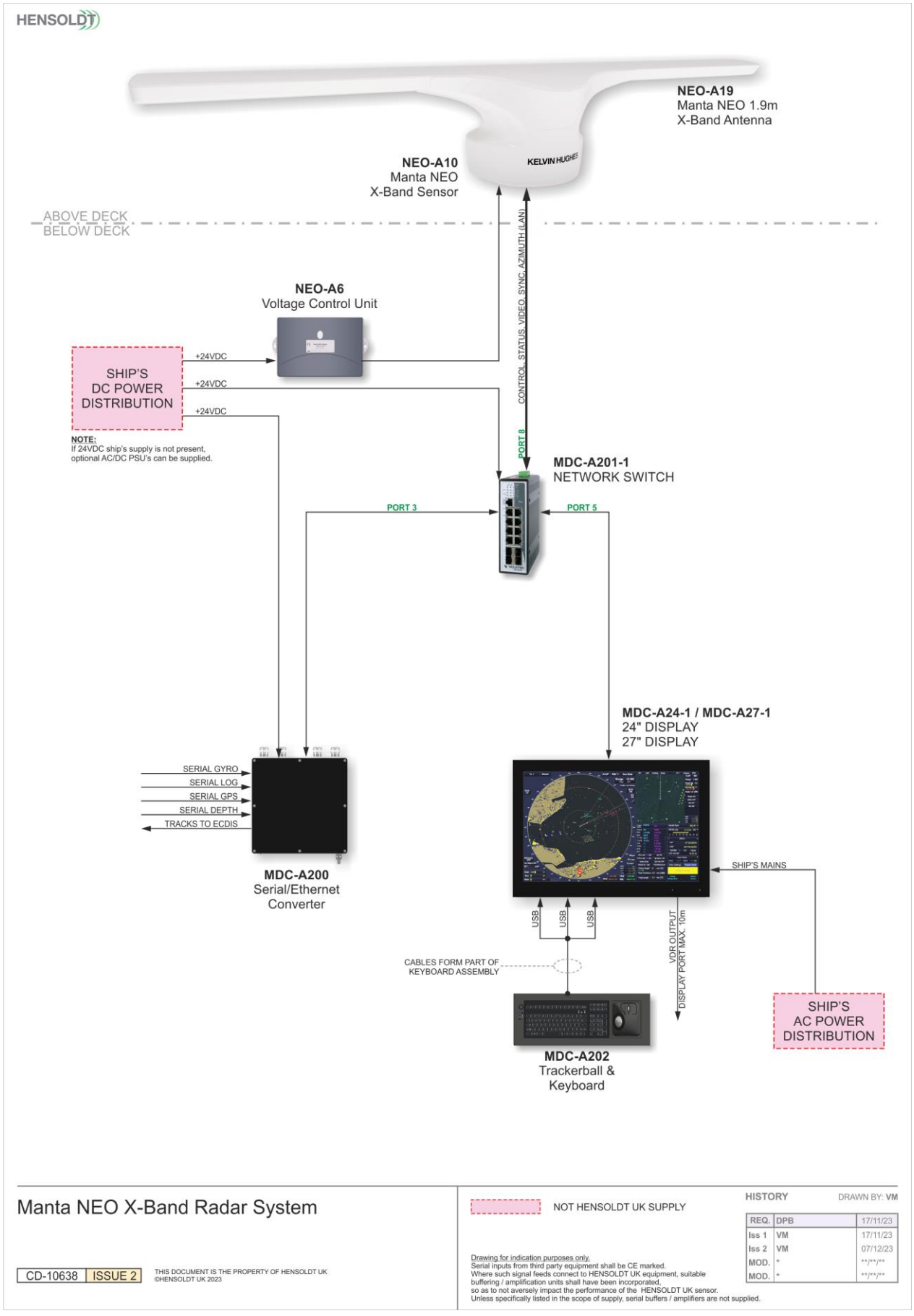
4 Typical System Diagram

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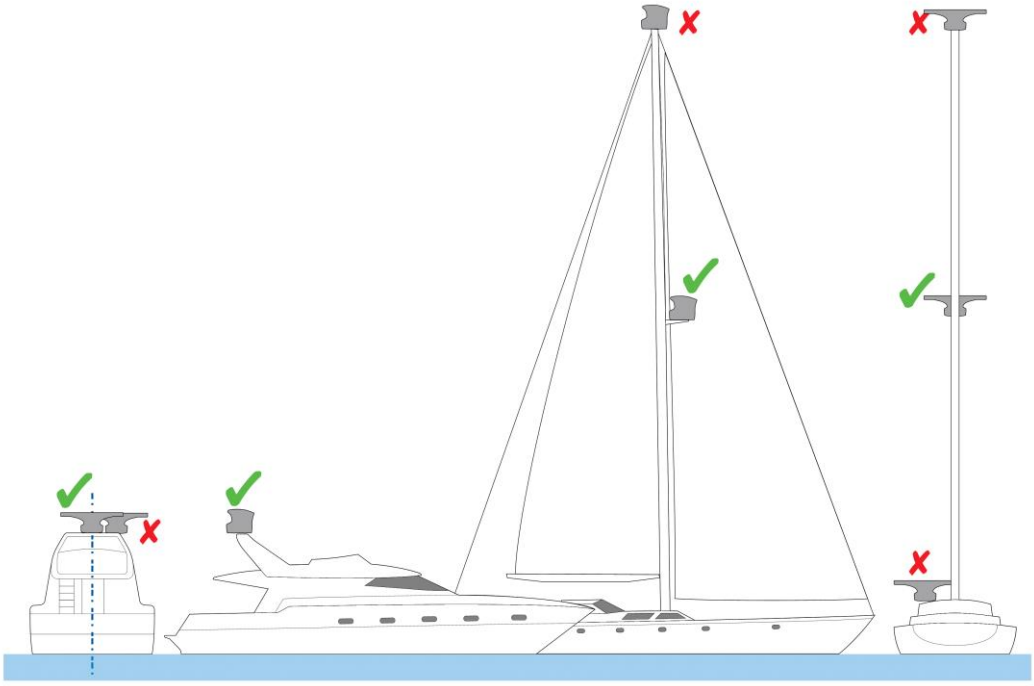
5 Mechanical installation

5.1 Potential Ignition Source

This product is NOT approved for use in hazardous/flammable atmospheres. Do NOT install in a hazardous/flammable atmosphere (such as in an engine room or near fuel tanks).

5.2 Radar Position Overview

The optimum height for the radar is a location that is high enough above the waterline to give a long range line-of-sight to the horizon, but not so high as to be adversely affected by the vessel's pitching and rolling.



The sensor must also be mounted where it is:

- Above head height.
- Easily accessible.
- As near as possible to the vessel's centreline.
- On a rigid and stable platform, capable of securely supporting the sensor under seagoing conditions.
- For GPS, ensure unobstructed view of the sky. Avoid large structures above the antenna.
- Clear of large objects such as the flybridge, large engine stacks, searchlights, horns, masts etc.
- Clear of heat and fumes.
- At least 1 m from a magnetic compass or other sensors.

5.3 Location requirements

When selecting a location for the sensor/ transceiver it is important to consider a number of factors. Additional information on the sighting and position of a radar system is available from HENSOLDT UK on request.

HORIZONTAL POSITION

The radar sensor should be positioned as near as possible to your vessels centreline.

HEIGHT

The radar sensor should normally be mounted as high as practical above the waterline.

- Mount the sensor above head height out of range of personnel, to avoid mechanical danger and minimize exposure to electromagnetic radiation.
- Radar operates at the line-of-sight, so a high mounting position gives better long range performance.
- Surrounding large objects, in the same horizontal plane, can interfere with the radar signal and can cause blind areas or shadow sectors and false targets on the radar display (see below).
- Do not mount the radar sensor so high that it is affected by the pitching and rolling of the vessel.

SHADOW AREAS AND FALSE ECHOES

Mount the radar sensor away from large structures or equipment, such as engine stacks, searchlights, horns, or masts. These objects may cause shadow areas and false echoes. For example, if you mount the radar sensor on a mast, echoes from other targets may be reflected from the mast. Wet sails may also cause shadow areas, so radar performance may be reduced in the rain. It is particularly important to avoid shadow areas near the bow. Raising or even lowering the radar sensor may help to reduce these effects.

In shadow areas beyond the obstruction there will be a reduction of the beam intensity. There may be a blind sector if the beam intensity is not sufficient to obtain an echo from an object. This may occur even at close range. For this reason, the angular width and relative bearing of any shadow area must be determined at installation. You may be able to detect shadow areas or false echoes on your multifunction display. For example, sea clutter can be used as a good indicator of blind arcs. Dark sectors on the radar display indicate possible shadowed areas. This information should be posted near the display unit and operators must be alert for targets in these blind areas.

ACCESS

The radar sensor should be easily accessible to allow maintenance to be carried out safely. Sufficient clearance must be allowed to fully open the sensor unit for maintenance and service.

MULTIPLE RADAR SENSORS

If two radar sensors are installed at different locations in a dual radar system, care should be taken to allow for the difference in position of the radars when switching between the transceivers. This is especially noticeable at short ranges on larger vessels.

To reduce possible interference between radar sensors in a dual radar system:

- Maximise the spacing between the sensors.
- If possible, locate the sensors so that they are aligned vertically, one directly above the other, with a minimum of 2 metres vertical separation.
- If the sensors cannot be aligned one directly above the other, locate each sensor the same distance from the bow your vessel. Interference is more likely if the sensors are installed one in front of the other, even when separated vertically.

CABLES

All cables should be adequately clamped and protected from physical damage and exposure to heat. Avoid running cables through bilges or doorways, or close to moving or hot objects. Where a cable passes through an exposed bulkhead or deck head, use a watertight feed-through.

MOUNTING PLATFORM

The radar sensor must be mounted on a rigid and stable platform. The platform must be capable of supporting the mass and inertia of the radar sensor under seagoing conditions. The platform should not twist (causing bearing errors) or be subjected to excessive vibration or shock.

The platform must be free-draining, to prevent the pooling of water beneath the radar sensor.
The mounting site must be clear of the following:

- Ropes.
- Standing rigging.
- Running rigging.
- Heat.
- Fumes.
- People.

MAGNETIC COMPASS

Mount the radar sensor at least 1 m away from a magnetic compass.

5.4 Compass Safe Distance

To prevent potential interference with the vessel's magnetic compasses, ensure an adequate distance is maintained from the product.

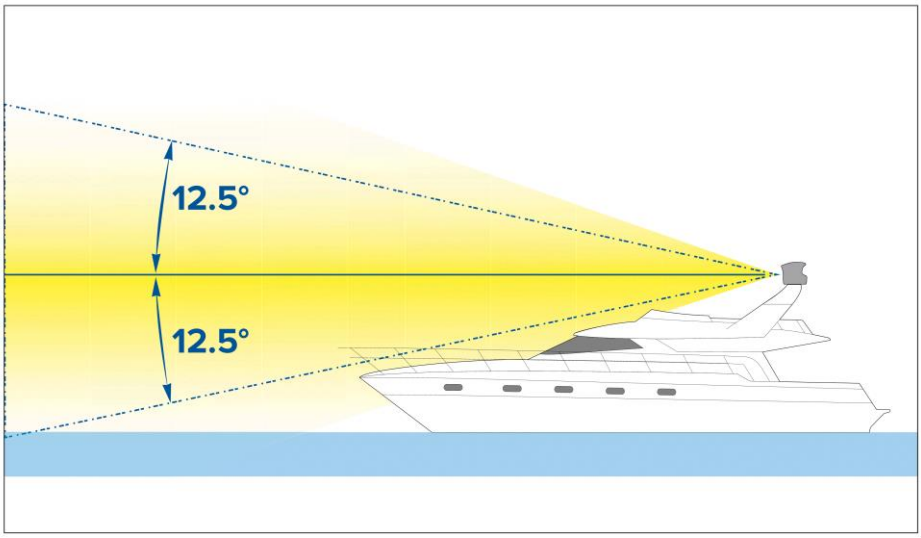
When choosing a suitable location for the product you should aim to maintain the maximum possible distance from any compasses. Typically this distance should be at least 1 m in all directions.

However, for some smaller vessels it may not be possible to locate the product this far away from a compass. In this situation, when choosing the installation location for your product, ensure that the compass is not affected by the product when it is in a powered state.

5.5 Radar Sensor Mounting Angle

Ensure the Radar sensor rotates parallel to the water line.

The Radar beam from the Radar sensor is approximately 25° wide in the vertical direction, to give good target detection even when your vessel pitches and rolls.



Planing hull vessels, and some displacement hull vessels, adopt a higher bow angle when the vessel is at cruising speed. This may raise the Radar's main radiation angle and can cause poor detection of nearby targets. It may be necessary to compensate for the bow rise to ensure optimum target detection. This can be achieved by fitting a wedge or washers between the mounting platform and the base of the Radar sensor, so that the Radar beam remains parallel to the water line when the vessel's bow rises at cruising speed.

5.6 Multiple Radar Sensors — location requirements

Important location considerations when installing multiple radar sensors on the same vessel.

- Sensors should be mounted above each other, vertically separated by at least 0.5 m. This applies to all installation locations on the vessel.
- Multiple sensors should be mounted in a way that minimizes interference between the vertical beamwidths of the 2 sensors.
- In all cases, you should aim to achieve as much physical separation as possible, to minimize any potential interference.

5.7 Voltage Control Unit - location requirements

When selecting a mounting location, it is important to consider a number of factors.

VENTILATION

- Ensure that equipment is mounted in a compartment of suitable size.
- Ensure that ventilation holes are not obstructed. Allow adequate separation of equipment.

MOUNTING SURFACE

Ensure equipment is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.

CABLES

Ensure the unit is mounted in a location which allows proper routing and connection of cables:

- Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
- Use cable supports to prevent stress on connectors.
- The maximum length of cable between the battery and the VCU should not normally exceed 6 metres. All power cable lengths should be kept as short as possible.

WATER INGRESS

The NEO-A6 VCU is splashproof, and suitable for mounting below decks only.

ELECTRICAL INTERFERENCE

Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters/receivers.

MAGNETIC COMPASS

Mount the VCU at least 3 ft (1 m) away from a magnetic compass.

POWER SUPPLY

Select a location that is as close as possible to the vessel's DC power source. This will help to keep cable runs to a minimum.

5.8 Transceiver installation

Before proceeding ensure that you have read and understood the warnings and cautions provided in Section 2 of this handbook.

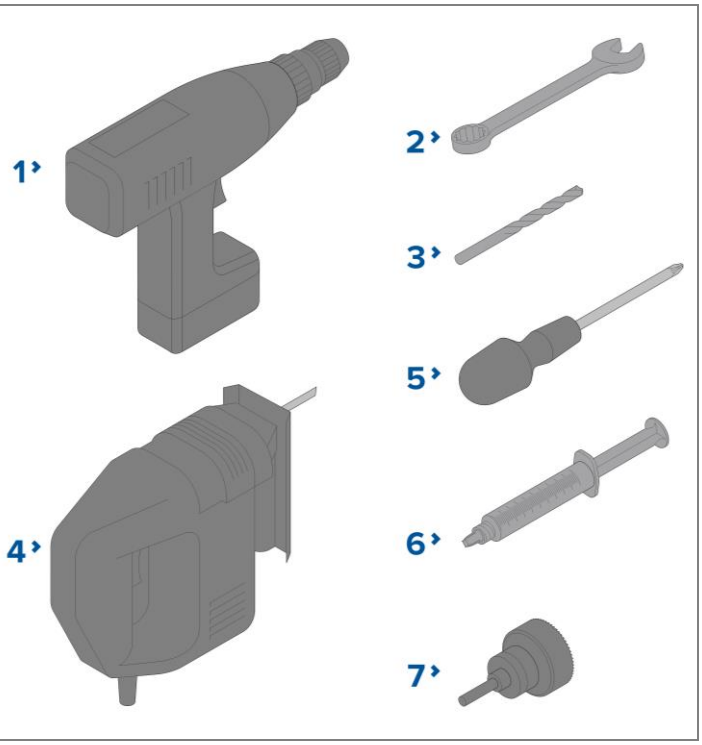
5.8.1 Schematic diagram

A schematic diagram is an essential part of planning any installation. It is also useful for any future additions or maintenance of the system. The diagram should include:

- Location of all components.
- Connectors, cable types, routes and lengths.

5.8.2 Tools Required

Item	Description
1	Power drill
2	13 mm and 17 mm Spanner
3	Drill Bit (appropriate size dependant on thickness and material of mounting surface)
4	Jigsaw
5	Pozidrive Screwdriver
6	Denzo Paste
7	50 mm Hole Saw



5.8.3 Mounting the Pedestal

Before mounting the unit, ensure that you have:

- Selected a suitable location.
- Identified the cable connections and route that the cables will take.
- Prepared suitable lifting equipment for fixing the pedestal to the mounting platform.

WEIGHTS

The pedestal weighs 16kg.
The antenna weighs 12kg (6 ft).

For safety reasons it is recommended that the unit is not fitted by one person.

WARNING

DO NOT LIFT THE TRANSCEIVER WITH THE ANTENNA FITTED

NOTICE

DO NOT connect any cables until the following steps have been completed.

Prepare suitable lifting equipment (e.g. steel cable or chain) to lift the pedestal into place in its final mounting position, prior to securing the mounting bolts. The lifting equipment must be of a suitable gauge and strength capable of bearing the pedestal's weight of 16 Kg (as a minimum), and also capable of passing through the 20 mm eyebolt hole on the pedestal. Additionally, you must also carefully consider the impact force on the lifting equipment, in the event that the pedestal falls before it is secured to the mounting surface. Do NOT attach the antenna to the pedestal prior to lifting.

CAUTION
Ensure the vents on the underside are not blocked.

1. Check the selected location.

   A clear, flat platform is required for mounting the pedestal unit.

2. Fix the supplied mounting template to the platform, using masking or self-adhesive tape.

   Ensure the mounting template is orientated correctly.

3. Using a 3mm drill bit, drill the 4 holes, as indicated on the mounting template.

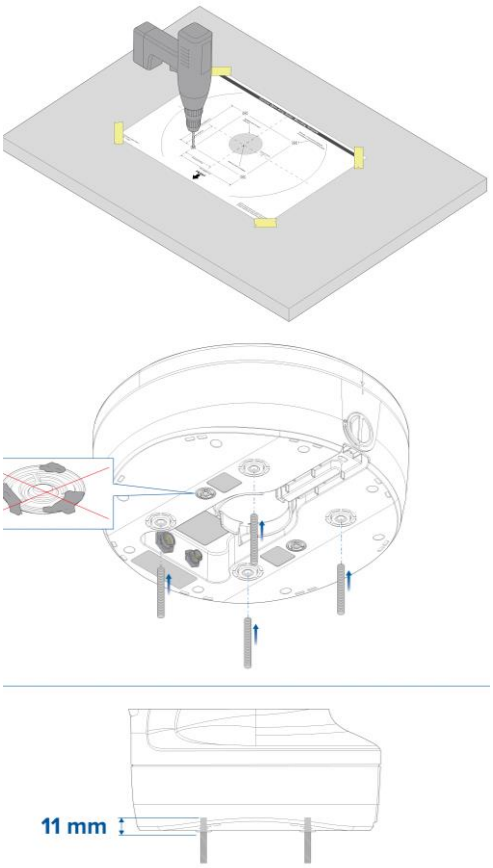
   Check that the holes have been drilled in the correct position.

4. Using an 11 mm drill bit, drill through the 4 holes.

5. If you plan to route your cables through the mounting surface, cut the cable hole out using a jigsaw.

6. Remove the mounting template.

7. The pedestal has a transit cover fitted over the open array. This cover must be left in place until the open array antenna is fitted to the pedestal.



8. Insert the studs no more than 11 mm into the holes in the pedestal base, and hand-tighten. If the supplied studs are not long enough for the mounting surface thickness, use M10 stainless steel, grade A4-70 studding of a suitable length.

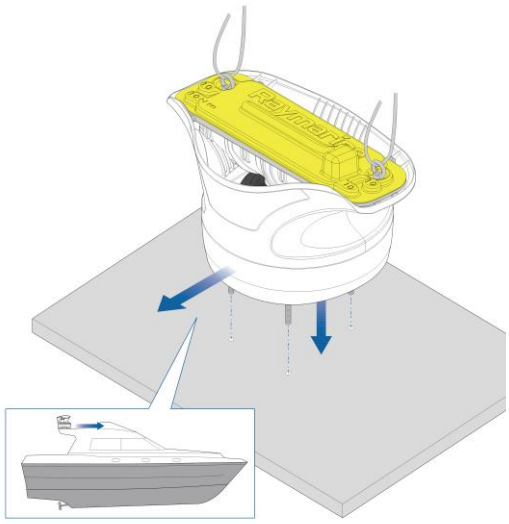
   Ensure the vents on the underside are not blocked.

9. Pass a suitable steel cable or chain through the 20 mm eyebolt holes. Once secure, lift the pedestal and test it fits correctly in its final mounting position.

   Ensure the pedestal is orientated correctly.

10. Using suitable lifting equipment (such as a rope or chain) attached to the lifting eyes; lift the pedestal up and connect the power and data cables to the connectors on the underside of the pedestal. Organise the cables in accordance with your planned cable routing and place the pedestal back into position.7.6

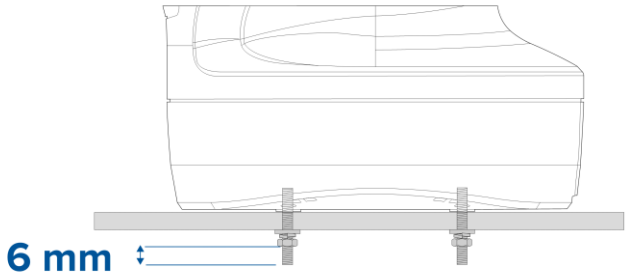
    Ensure that you refer to the relevant cable routing instructions (see section 7.6) before proceeding to the next step:

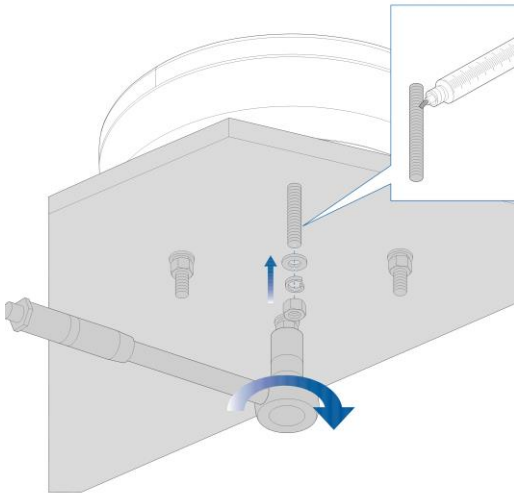


11. Grease the four metal studs with Denso paste.

12. Referring to the illustration to the bottom right, use the 4 nuts and associated washers to secure the pedestal to the platform. Tighten each nut to 30Nm torque.

13. Ensure all 4 sets of nuts and washers are used to secure the pedestal to the mounting platform. There should be no more than 6 mm of excess stud below the nut. Cut-off any excess stud.





5.9 Antenna installation

CAUTION

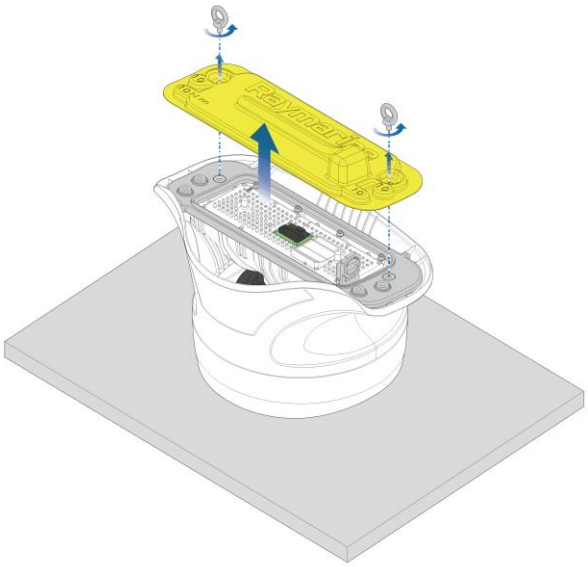
Ensure that the antenna does not come into contact with the delicate protruding coaxial pin as this is a critical component and should be treated with caution.
Follow all the instructions provided on the following page and ensure that the alignment guides are used.

Before attaching the antenna to the pedestal unit, ensure that:

- The pedestal base is securely fixed to the platform.
- Power and data cables are connected securely and routed correctly but are NOT powered.
- The pedestal power switch is in the OFF position.

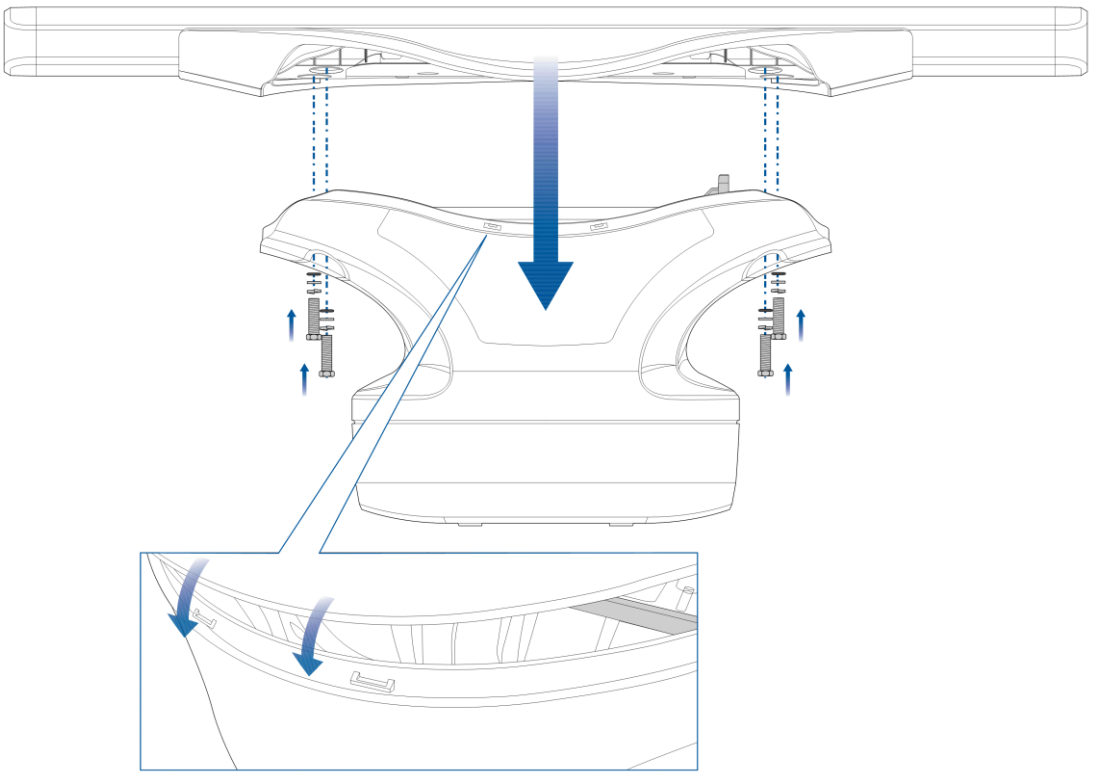
1. Unscrew the eyebolts and remove the transit cover. (See illustration on the right).

   Take care not to damage the open array's delicate contacts when removing the cover.



2. Referring to the illustration below, lower the antenna onto the pedestal, placing the front on first and clipping it in place.

3. Using the 4 hex bolts and associated washers and O rings, secure the antenna to the pedestal. Tighten each nut to 10 N m (7.4 lb ft).



5.10 Radar sensor protection — Sailing vessels

Additional considerations apply when installing the Radar sensor on a sailing vessel.

When mounting the Radar sensor unit onto the mast, check that the unit is not fouled by the sails, especially when tacking.

Depending on the type of sailing vessel and the design of the sailplan, a Radar sensor guard should be attached to the mast if the sails or rigging contact either the Radar sensor unit or the mounting bracket. Without a proper Radar guard, serious damage can result to the Radar mounting bracket and the Radar itself. In extreme cases, such damage could result in the Radar sensor unit being pulled off the mast. Therefore, it is recommended that a Radar sensor guard should be mounted additionally and separately to the Radar sensor mounting bracket.

To prevent the risk of the Radar sensor unit falling in the event that it has been damaged, the security lanyard supplied with the mast bracket MUST be secured properly to the mast and to the Radar sensor unit, according to the instructions provided with the bracket. If a safety lanyard is not supplied with the mounting bracket, contact your local dealer for appropriate parts. Do NOT attach other equipment to either the Radar sensor unit or the bracket.

HENSOLDT UK strongly recommends that you check the condition and security of the bracket mounting feet, the security lanyard(s), the Radar sensor guard, and the Radar sensor unit itself, on a yearly basis (or more frequently depending on environmental applications). Any fittings should be replaced as appropriate.

5.11 Voltage Converter Unit Installation

CAUTION

This product is NOT approved for use in hazardous/ flammable atmospheres such as in an engine room or near fuel tanks.

LOCATION

The VCU is designed to be internally bulkhead mounted on a flat vertical surface.
Refer to Section 5.7 for more information.

VENTILATION

- Ensure that equipment is mounted in a compartment of suitable size.
- Ensure that ventilation holes are not obstructed.
- Allow adequate separation between equipment.

CABLES

Ensure the unit is mounted in a location which allows proper routing and connection of cables:

- Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
- Use cable supports to prevent stress on connectors.
- The maximum length of cable between the DC power source and the VCU should not normally exceed 6m.
- All power cable lengths should be kept as short as possible.

WATER INGRESS

The VCU is splash proof and suitable for internal mounting below decks only.

ELECTRICAL INTERFACE

Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters/ receivers.

MAGNETIC COMPASS

Mount the VCU at least 3 ft (1 m) away from a magnetic compass.

POWER SUPPLY

Select a location that is as close as possible to the vessels DC power source. This will help to keep cable runs to a minimum.

INSTALLATION

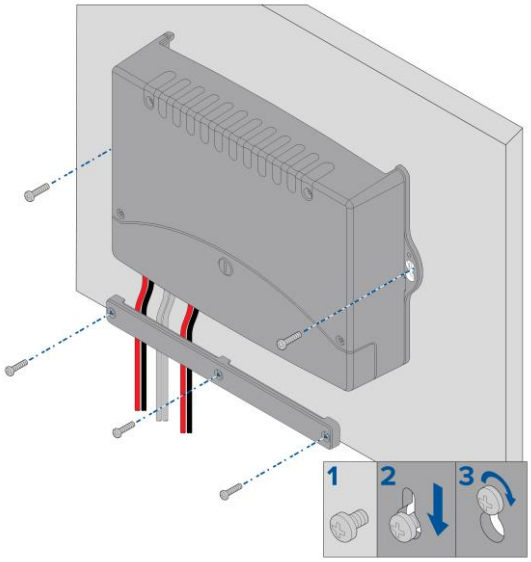
Before mounting the unit, ensure that you have:

- Selected a suitable location. The unit is designed to be internally mounted in a vertical position.
- Identified the cable connections and route that the cables will take.

NOTICE

Do NOT connect any cables to the power supply until the following steps have been completed.

1. Check the selected location for the unit. The VCU requires a clear, flat area with suitable space for routing the cables below the unit.
2. Hold the VCU in place in the required mounting location.
3. Using a pencil, mark the drilling area inside the mounting lug on each side of the VCU unit.
4. Using a 3 mm drill bit, drill a hole through the pencil marks.
5. Align the VCU mounting lugs with the drill holes.
6. Hold the VCU in place.
7. Using a suitable screwdriver, screw the self-tapping mounting screws through the mounting lug holes, into the drilled holes.
8. Connect the cables, according to the instructions provided in this handbook.
9. Hold the cable clamp in place over the cables, approximately 50 mm below the mounted VCU unit.



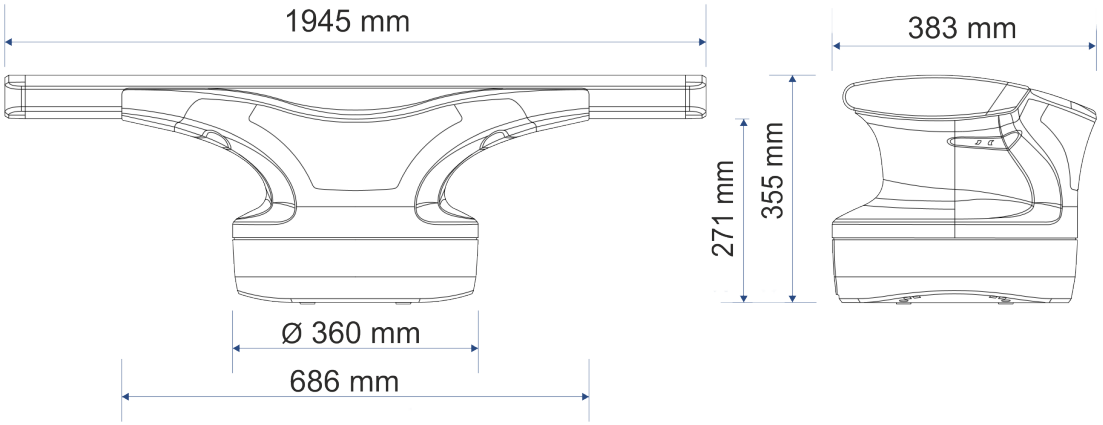
10. Using a pencil, mark the drilling area inside each mounting bracket hole.

ENSURE THE CABLES DO NOT COVER THE HOLES.

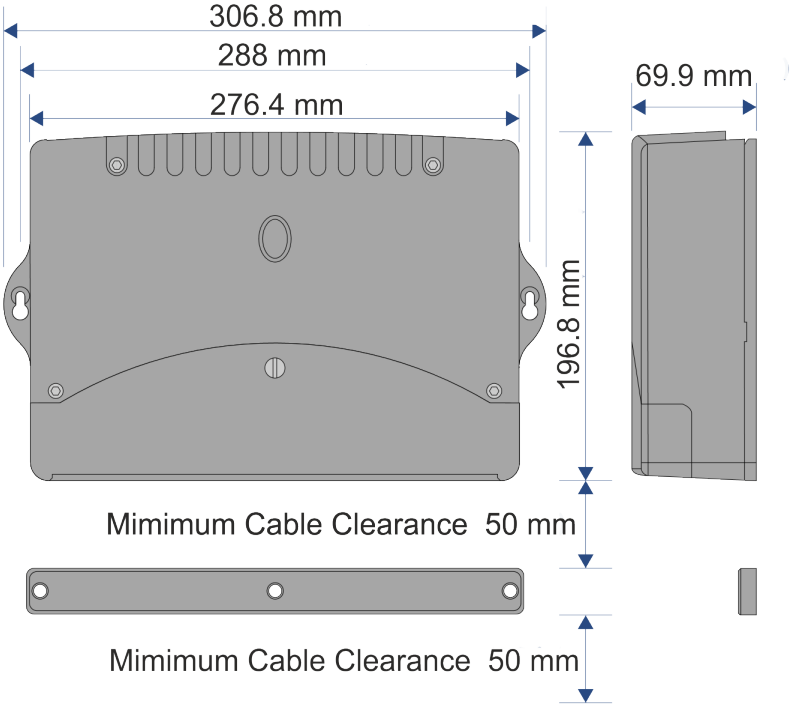
11. Using a 3mm drill bit, drill a hole through the pencil marks.
12. Hold the cable clamp in place, each hole aligned with the drill holes.
13. Using a suitable screwdriver, screw the self-tapping mounting screws through the bracket holes, into the drilled holes.

5.12 Dimensions

5.12.1 Sensor and Antenna



5.12.2 Voltage Control Unit



5.13 Compass safe distances

Voltage Control Unit: Mount at least 1.0m away from a magnetic compass.

Transceiver/ sensor unit: Mount at least 1.0m away from a magnetic compass.

5.14 DC supply

Where no ships +24VDC is available, an optional AC/ DC power supply can be supplied.

Part number MDC-A205-2; See section 11 for details.

6 Cables

6.1 General advice

CABLE TYPES & LENGTH

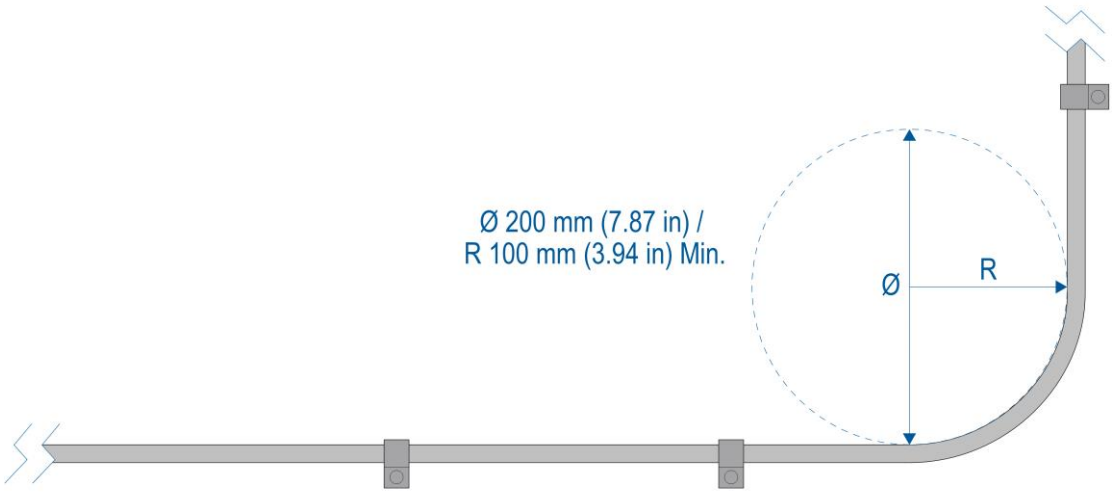
It is important to use cables of the appropriate type and length.

- Unless otherwise stated use only standard cables of the correct type as supplied with the equipment.
- Ensure that any additional cables that are not supplied are of the correct quality and gauge. For example, longer power cable runs may require larger wire gauges to minimize voltage drop along the run.

ROUTING CABLES

Cables must be routed correctly to maximise performance and prolong cable life.

- Do NOT bend cables excessively. Wherever possible, ensure a minimum bend radius of 100 mm.



- Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Do NOT run cables through bilges or doorways, or close to moving or hot objects.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.
- Where a cable passes through an exposed bulkhead or deckhead, use a suitable watertight feed-through.
- Do NOT run cables near to engines or fluorescent lights.

Always route data cables as far away as possible from:

- Other equipment and cables,
- High current carrying AC and DC power lines,
- Antenna.

STRAIN RELIEF

Ensure adequate strain relief is provided. Protect connectors from strain and ensure they will not pull out under extreme sea conditions.

CIRCUIT ISOLATION

Appropriate circuit isolation is required for installations using both AC and DC current:

- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use an isolated power supply when using a 3rd party audio amplifier.
- Always use an RS232/NMEA converter with optical isolation on the signal lines.
- Always make sure that PC's or other sensitive electronic devices have a dedicated power circuit.

CABLE SHIELDING

Ensure that cable shielding is not damaged during installation and that all cables are properly shielded.

6.2 Grounding

All parts of the system MUST be fully and correctly connected to a proven earth point prior to connecting any source of AC power.

CONNECTION POINT
The radar system is grounded by the connectors and cables provided as part of the system. All connectors must be securely tightened and the conductivity between the equipment and ground should be checked as detailed below.

CONDUCTIVITY TESTS
During installation and maintenance, the earth connections must be tested for conductivity using a high current impedance meter such as a Megger or similar.

WRIST STRAPS
Fully isolate and mechanically disconnect all sources of AC before attaching ESD protective wrist straps to the various points in the system.

CABLE SCREENS
Unless otherwise specified, cable screens should be connected to a proven and tested earth point by use of connectors or cable glands.

WARNING

The system must NOT be operated or have AC power switched ON with Earth/ Grounding points disconnected

6.3 Maximum cable runs

STANDARD CABLES

0 to 25m: Pre-terminated standard cables are available in 5m, 10m, 15m & 25m lengths. NOTE These cables contain both the LAN and DC power cable; see section 7.1 for details.

LAN CABLE

25m to 50m: Where the distance between the network switch and the display sub-system exceeds 25m, a screened CAT5e LAN cable must be used and connected to the existing cable. Where cables are joined a screened coupler must be used and the joint should be secured to ensure that the connection cannot work loose.

50m +: Where the LAN cable is to exceed 50m, the signal must be converted to fibre. Please contact HENSOLDT UK for details.

DC POWER

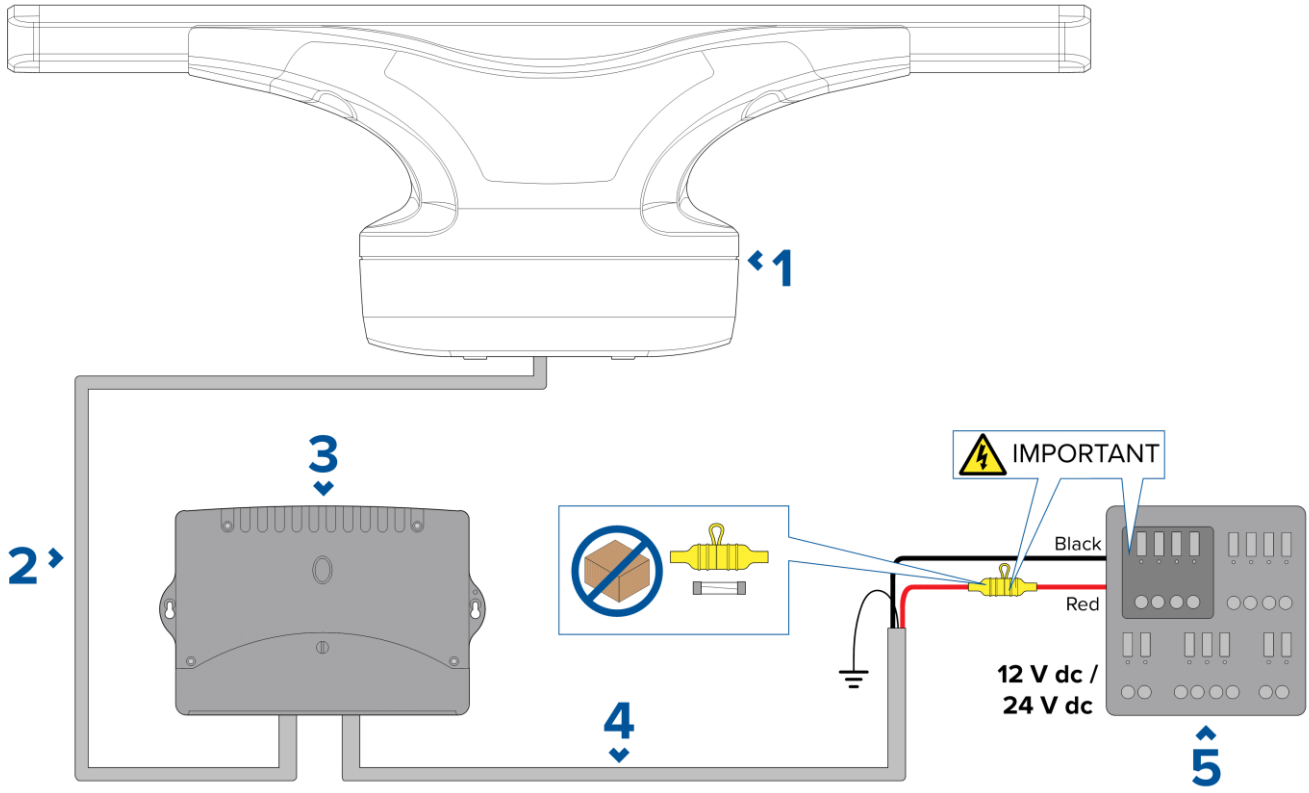
25m max: The maximum cable run for DC power between the VCU and the sensor is 25 m
Please contact HENSOLDT UK if the cable run is to exceed 25 m.

Note: The DC cable is unterminated at one end for connection to the power supply.

7 Connection Details

7.1 Transceiver Power Connections

The radar transceiver must be powered via the supplied NEO-A6 Voltage Control Unit.



1. Manta-NEO X-Band Sensor
2. Power Cable
3. Voltage Control Unit
4. Power cable from vessel power supply to VCU (power cable not supplied)
5. Vessel power supply

Fuses (not supplied) are required for circuit protection:

12 V DC

- 15 A thermal fuse at breaker (x1)
- 20 A inline fuse on RED power cable (x1)

24 V DC

- 8 A thermal fuse at breaker (x1)
- 10 A inline fuse on RED power cable (x1)

The Radar is intended for use on vessel DC power systems operating at 12 or 24 Volts DC.

- All power connections must be made via the Voltage Control Unit.
- The radar sensor must NOT be connected directly to a battery.
- The radar sensor must be connected directly to the VCU only.
- Only one radar sensor must be connected per VCU unit. Each radar sensor in your system
- requires a dedicated VCU unit.
- The power connection between the radar sensor and the VCU must be via an official power cable (a power cable is supplied with the radar).
- Do NOT cut and re-join any part of the power cable. A range of cable lengths and cable extensions is available for longer cable runs.

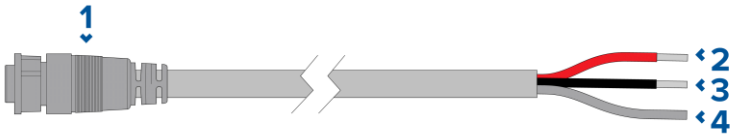
TRANSCEIVER POWER CONNECTOR

The following cables connect the transceiver to the VCU.

- All DC power connections must be made via the VCU power supply as this controls and monitors the DC supply to the system. The transceiver must not be directly connected to a separate DC supply.
- Each transceiver requires a dedicated VCU unit.
- The power connection between the transceiver and the VCU must be via the cables listed below (purchased separately).
- The transceiver must be connected to the POWER OUT terminals of the VCU.
- The screen (earth/ drain) strands of the cable must be connected to one of the VCU SCREEN terminals.

Cable length	Part number	Description
25m	NEO-A101-25	Pre-assembled DC cable for connecting between VCU and Transceiver.

Item	Description
1	**Power Connector** to the transceiver.
2	**RED WIRE** Connect to the positive POWER OUT terminal of the VCU
3	**BLACK WIRE** Connect to the negative POWER OUT terminal of the VCU.
4	**SCREEN STRANDS** Connect to one of the SCREEN terminals of the VCU.



CAUTION

The pre-assembled cable must not be cut, shortened or lengthened.

WARNING

POSITIVE GROUND SYSTEMS

Do not connect this unit to a system which has positive grounding.

7.2 VCU Connections

The VCU is intended for use on ships DC power systems operating from 12 to 24 Volts DC.

OPTIONAL AC/DC POWER SUPPLY

Where no ships +24VDC is available an optional AC/ DC power supply can be supplied. See section 11 for details.

DC INPUT CABLE

The power cable can be extended for longer cable runs between the VCU and the ships DC supply or optional AC/DC power supply.

If you need to extend the power cable, use a waterproof junction box for external connections. The junction box should provide a terminal strip with sufficient space for power connections. The terminal strip should be a minimum of 30 Amp rating for power cores. It is essential that both power cores and the screen (drain) are connected and that the connection is of a very low resistance as considerable power passes through this connection.

The following table provides recommended total power cable lengths and gauges. These figures relate to the maximum distance of power cables from the ships DC supply or optional AC/DC power supply to the VCU.

CAUTION

Exceeding the following cable lengths may cause unreliable operation.

AWG American Wire gauge	mm^2	Maximum distance 12 volt supply	Maximum distance 24 volt supply
7	10.55	15m	55m
8	8.36	10m	40m
10	5.26	8m	32m
11	4.17	6m	24m

NOTICE

If the required extensions result in unacceptably large diameter cables, use two or more smaller gauge wires to achieve the required copper wire cross-section.
For example, using two pairs of $2mm^2$ cables is equivalent to using two single 4 mm^2 cables.

EARTH / SCREEN WIRE EXTENSION

The earth wire can be extended for longer cable runs between the power supply and ground.

Extensions to the screen (drain) wire should use an 8 mm braid or AWG 10 (5.26 mm^2) multi stranded cable.

If longer cables are required contact HENSOLDT UK.

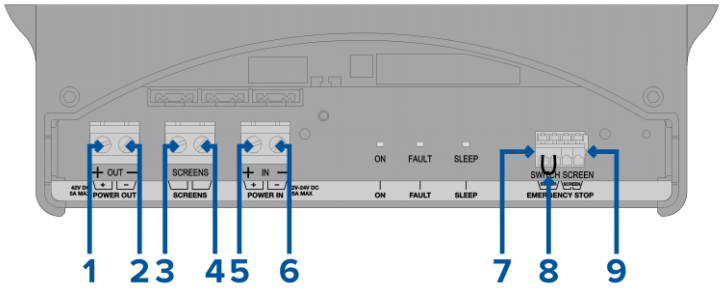
VCU CONNECTIONS

The VCU is intended for use on ships' DC power systems operating from 12 to 24 Volts DC.

- The VCU must be connected to a battery isolator switch, or a DC distribution panel.
- The battery isolator switch or DC distribution panel must be connected to the POWER IN terminals of the VCU.
- Do NOT connect additional power switches to the cable providing the power feed to the VCU.
- All power connections between the VCU and the power source must have appropriate fuse protection.
- All power connections must be of high quality to minimize resistance and to remove the risk of accidental shorts.
- The VCU SCREEN terminals must be connected to your vessel's RF ground system.
- Do NOT connect the radar sensor or the VCU to a positively grounded power system.

The following diagram illustrates the power connections of the VCU.

1	POWER OUT (Positive) – connect to the RED wire of the cable.
2	POWER OUT (Negative) – connect to the BLACK wire of the cable.
3	SCREEN – connect to the bare screen (drain) strands of the cable.
4	SCREEN – connect to a tested and proved ground/ earth point via the cable screen.
5	POWER IN (positive) – connect to the positive terminal of the DC distribution panel or battery isolator switch.
6	POWER IN (negative) – connect to the negative battery terminal.
7	Not used in this application
8	Not used in this application
9	Not used in this application



7.3 Breaker and fuse ratings

All power connections between the VCU and its power source must be protected by a thermal circuit breaker or fuse, fitted close to the power connection. The connection from the output of the VCU to the transceiver does not require a fuse or circuit breaker.

If you do not have a thermal circuit breaker or fuse in your power circuit (fitted to the DC distribution panel, for example) you MUST fit an in-line breaker or fuse to the positive wire of the power cable.

The following table provides suitable ratings for battery isolator switches, circuit breakers and fuses.

Power supply	Device	Manta NEO X-Band
12 volt	Isolator switch	30 amps (minimum rating)
	Thermal breaker	15 amps
	Fuse	20 amps
24 volt	Isolator switch	15 amps (minimum rating)
	Thermal breaker	8 amps
	Fuse	10 amps

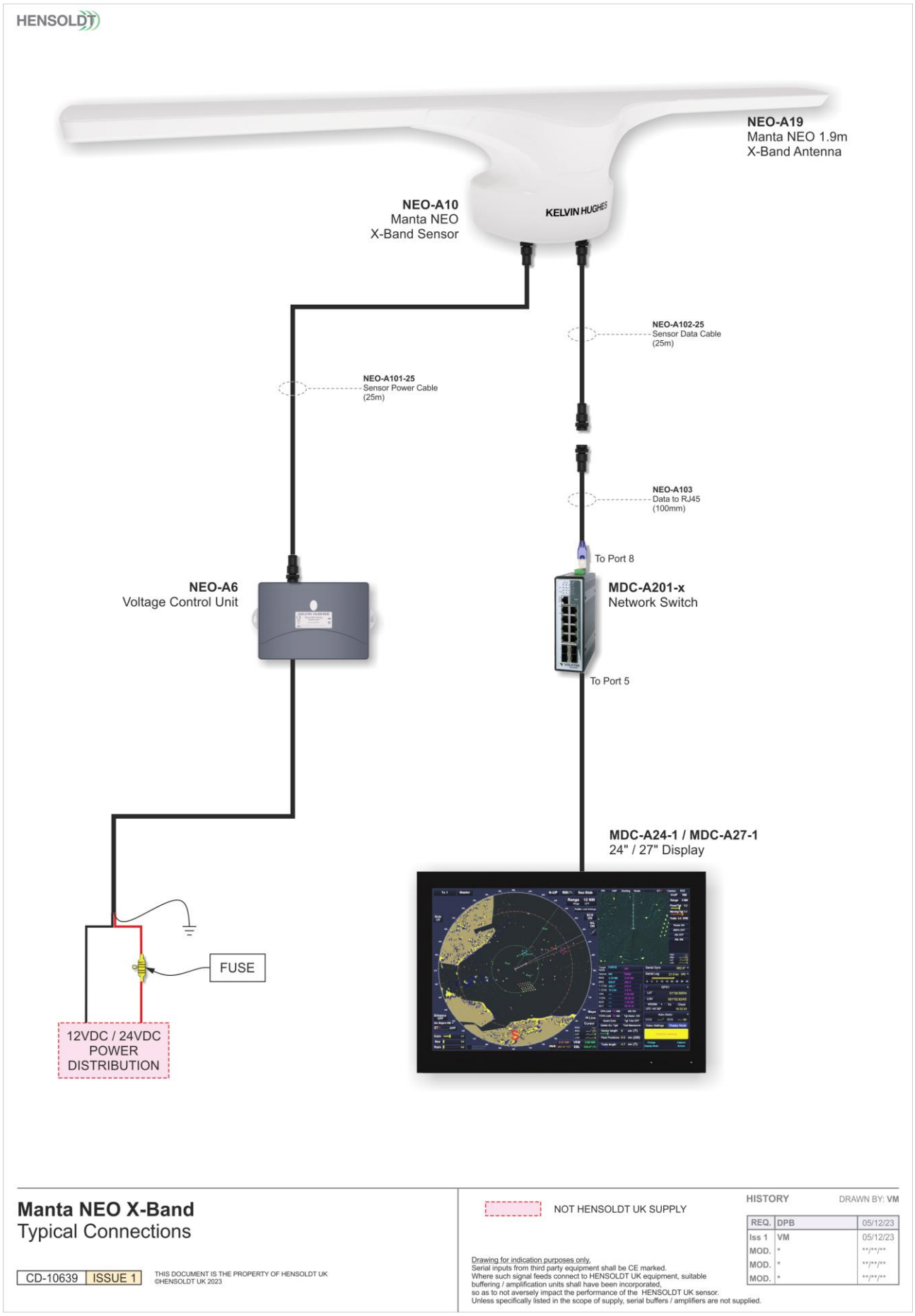
WARNING

PRODUCT GROUNDING

Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions provided.

7.4 Data Cables

This system uses two data cables to connect the Manta NEO Sensor to the Manged Network Switch.



Data Cable - NEO-A102-25

This 25 m data connection cable has the data socket on both ends.

One end connects to the Manta NEO X-Band sensor and the other ends connects do the Data to RJ45 adapter.

DATA TO RJ45 CABLE – NEO-A103

This cable allows connection to the standard Network Switch MDC-A201-1 detailed in HBK-2301-2..

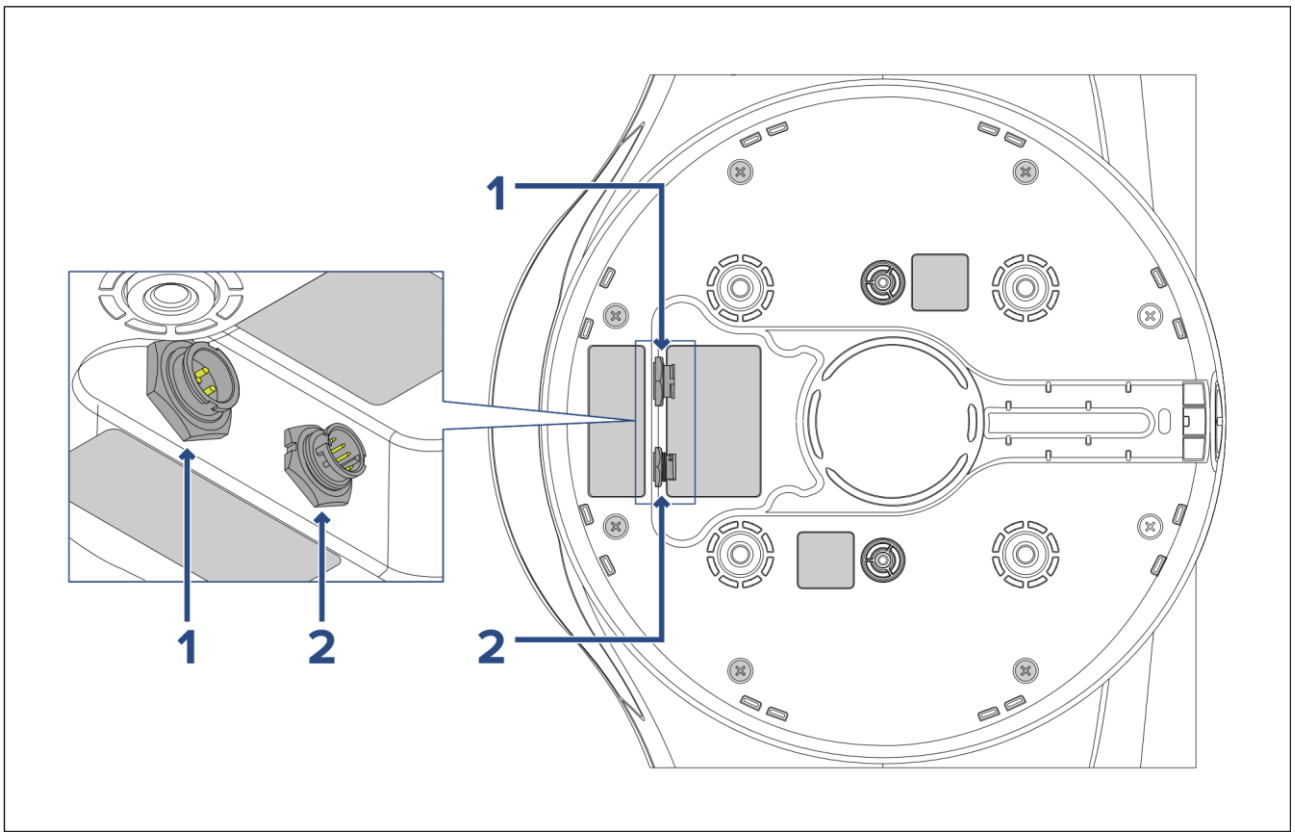
Managed Network Switch – MDC-A201-1

The managed Network switch may be used to interface the Manta NEO X-Band Sensor via the data to RJ45 cable (NEO-A103) and the Multi Function Display.

Installation and commissioning details are provided in HBK-2300-2.

7.5 Sensor connections overview

The Manta Neo X-Band sensor includes the following connectors:



1. Power connector — Connects to the power cable.
2. Data connector — Connects to the Radar data cable.

7.6 Cable routing options

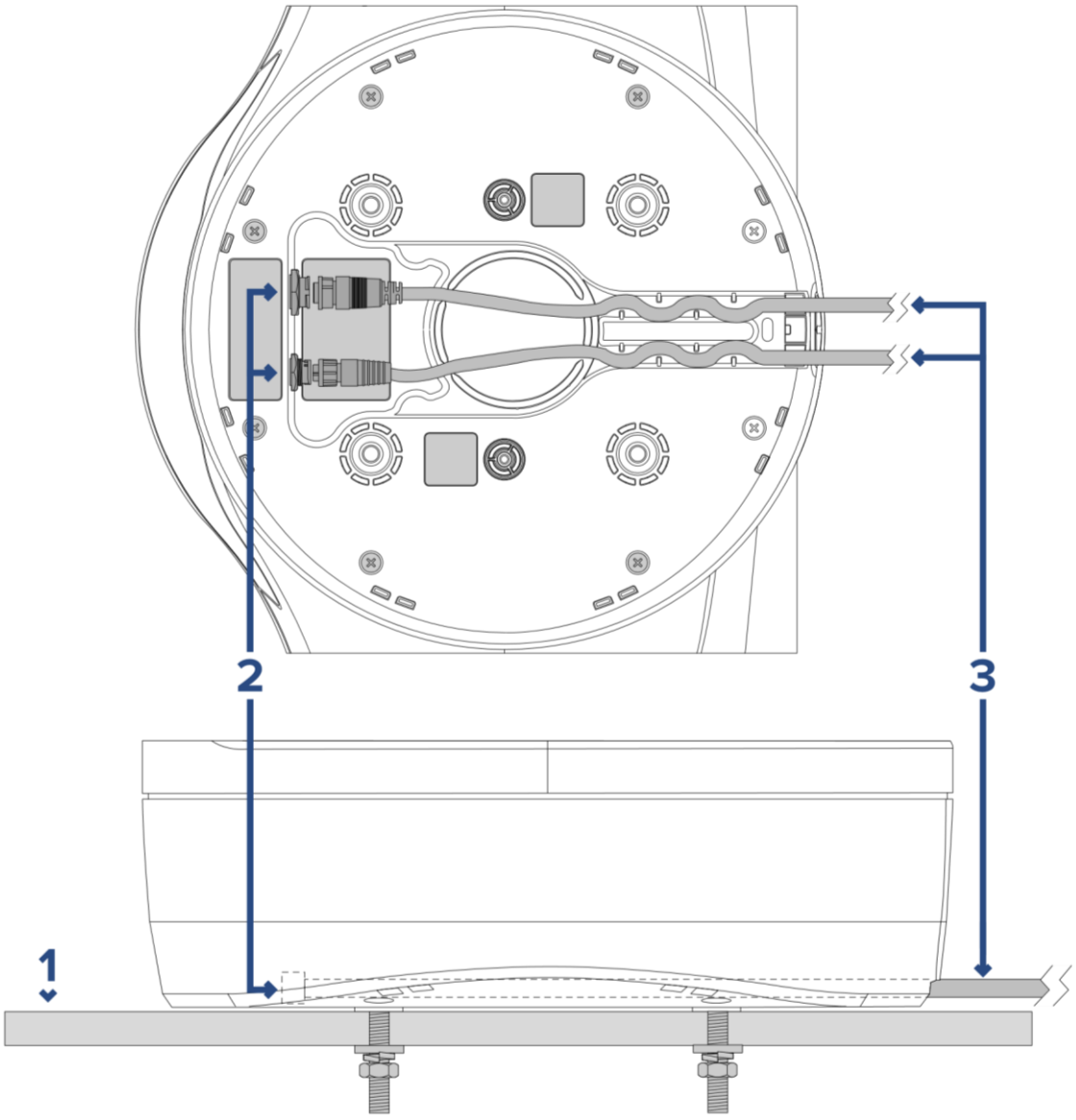
You can route the power cable and data cable away from the radar in different ways.

The routing options allow for the cable to exit the radar in two different positions — the option you choose will depend on the radar mounting location.

Rear cable exit — if the radar is mounted on an extended flat surface, and the cable cannot be routed through the surface.

Surface cable exit — if the radar is mounted on a flat surface, and the cable can be routed through the surface.

7.6.1 Rear Cable Exit



1. Mounting Surface
2. Power and Data connectors
3. Power and Data cables

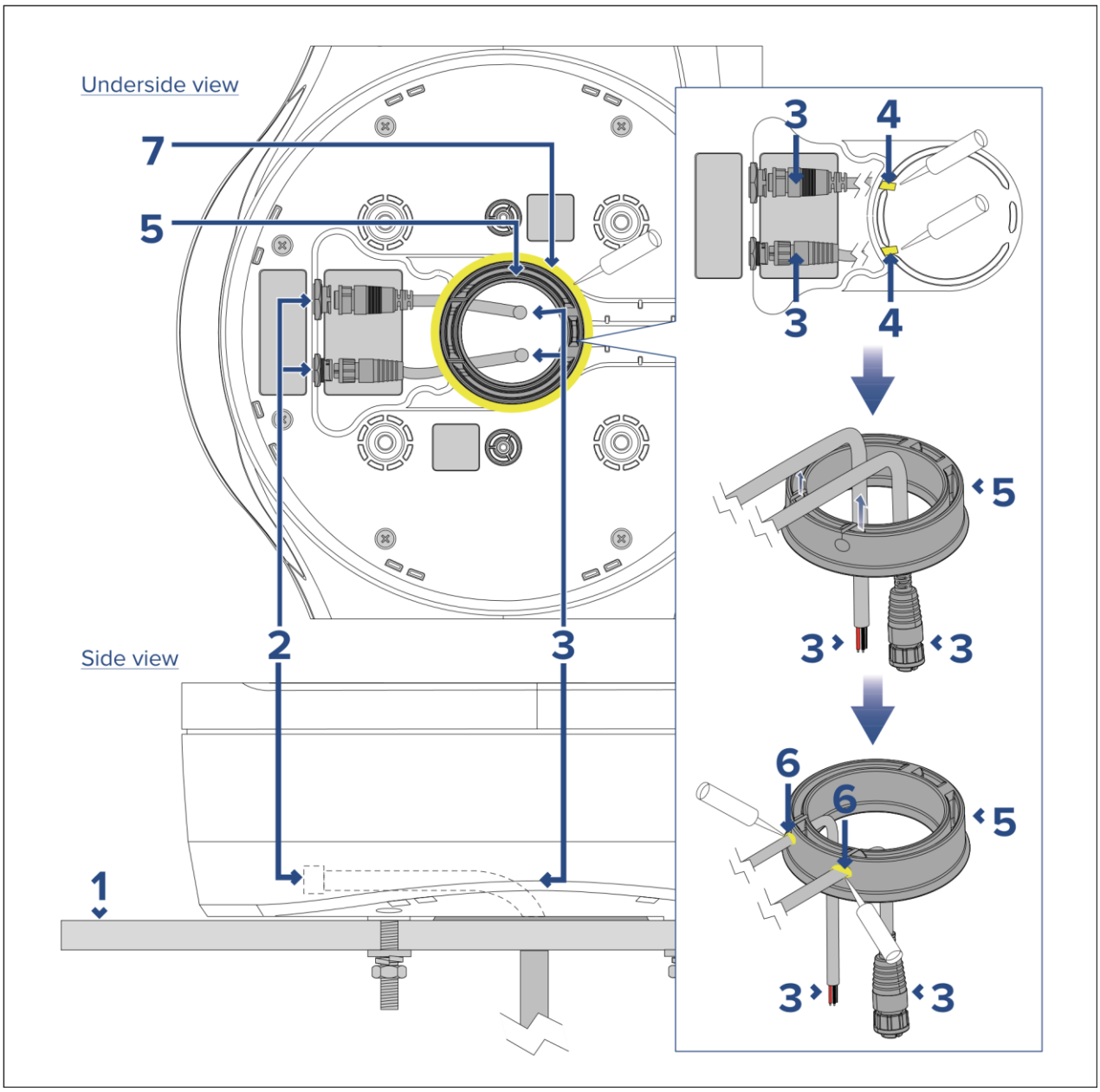
7.6.2 Surface Cable Exit

In this mounting configuration, the power and data cables are passed through the mounting surface, via the cable exit aperture on the underside of the pedestal.

CAUTION

To prevent water ingress, the cable exit aperture on the underside of the pedestal must be completely sealed with a suitable marine-grade sealant or adhesive, as described in the following instructions.

1. Connect the power and data cables to the pedestal. **Do NOT supply power to the cables at this time.**
2. **Before** laying the cables in the exit channels on the underside of the pedestal, apply sealant to each of the cable exit channels at the point where the cables pass through them, as shown in (4) in the illustration below.
3. Lay the cables in the channels.
4. Pass the cables through the aperture on the underside of the pedestal, and then through the supplied cable gasket.
5. Push the cables fully into the slits in the cable gasket, as shown in the illustration below.
6. Apply sealant all around the cables at the point where they enter the gasket, as shown in (6) in the illustration below. **Ensure 360° coverage all around the cable entries.**
7. Carefully insert the cable gasket into position in the underside of the pedestal.
8. Seal all around both the top and bottom perimeters of the cable gasket, as shown in (7), to ensure a watertight seal with the pedestal. **Take care to avoid disturbing the sealant around the cable entries.**

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8 Setting to work

WARNING

RADAR SENSOR SAFETY

Before rotating the radar sensor, ensure all personnel are clear.

WARNING

RADAR TRANSMISSION SAFETY

The radar sensor transmits electromagnetic energy; ensure all personnel are clear of the sensor when the radar is transmitting.

The system configuration is detailed in the following handbook:

- **HBK-2300-2:** Navigation Display Installation & Commissioning Handbook.

The handbook details all aspects of commissioning the Manta NEO X-Band sensor.


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9 Troubleshooting

The troubleshooting information provides possible causes and corrective action required for common problems.

Prior to packing and shipping, the equipment is subjected to comprehensive test and quality assurance programmes. However, if you experience problems with the operation of the system, this section will help you to diagnose and correct problems in order to restore normal operation.

If after referring to this section you are still having problems with your unit, please contact HENSOLDT UK for further advice.

POWER UP TROUBLESHOOTING
Problems at power-up and their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
The Manta Neo X-Band Sensor does not start up or operate or keeps turning off	Blown fuse or tripped breaker	Check condition of relevant fuses and breakers and connections, replace if necessary.
		If fuse keeps blowing check for cable damage, broken connector pins or incorrect wiring.
	Poor / damaged / insecure power supply cable / connections	Check that the power cable connector is correctly orientated and fully inserted into the display connector and locked in position.
		Check the power supply cable and connectors for signs of damage or corrosion and replace if necessary.
		With the display turned on, try flexing the power cable near to the display connector to see if this causes the unit to restart or lose power. Replace if necessary.
		Check the vessel's battery voltage and the condition of the battery terminals and power supply cables, ensuring connections are secure, clean and free from corrosion. Replace if necessary.
		With the product under load, using a multi-meter, check for high voltage drop across all connectors / fuses etc, and replace if necessary.
	Incorrect power connection	The power supply may be wired incorrectly, ensure the installation instructions have been followed.
Manta NEO X-Band sensor will not start up (restart loop)	Power supply and connection	See possible solutions from the previous page.

RADAR TROUBLESHOOTING

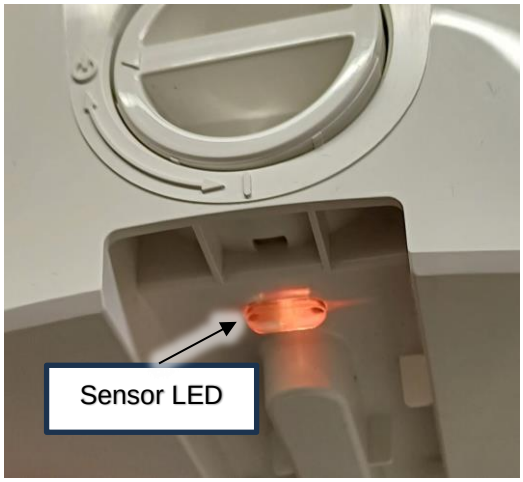
Problems with the radar and their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
No connection can be made to the sensor.	Radar powered down	Check that the sensor power supply cable is sound and that all connections are tight and free from corrosion.
	Radar not transmitting	Select Tx for the relevant Radar sensor.
	Damaged or disconnected data cable	Check that the cable connectors are fully inserted and locked in
		Check the power supply cable and connectors for signs of damage or corrosion, replace if necessary.
		With the unit turned on, try flexing the cable near to the display connector to see if this causes the unit to re-boot/re-boot/lose power, replace if necessary.
		Check the vessel's battery voltage, the condition of the battery terminals and power supply cables, ensuring connections are secure, clean and free from corrosion, replace if necessary.
		With the product under load, using a multi-meter, check for high voltage drop across all connectors/fuses etc (this can cause the unit to reset/turn off), replace if necessary.
		Check condition of relevant breakers and fuses, replace if necessary.. If breaker keeps tripping or fuses keep blowing, contact HENSOLDT UK for assistance.
	Open Array power switch in OFF position	Ensure Open Array power switch is in ON position.
	Software mismatch between equipment may prevent communication.	Ensure all items contain the latest available software.
Displayed bearing is different to the true bearing	Bearing alignment adjustment required	Carry out the Bearing Alignment procedure.
Radar will not initialize, VCU stuck in "sleep mode"	Intermittent or poor power connection	Check power connection at VCU. (Voltage at input = 12 / 24 V, Voltage at output = 42 V)

9.1 LEDs

SENSOR LED

The LED is located below the Sensor rotary switch.



Sensor LED

LED colour/ state	Possible causes
Green / flashing once every 30 seconds	Radar is powered on and operating normally
Amber / solid	Radar sensor is in sleep mode / standby
Amber / flashing once every 30 seconds	Internal fault. Refer to HENSOLDT UK
Red / flashing once every 30 seconds	Internal fault. Refer to HENSOLDT UK

VCU LEDS

The LEDs are located beneath the removable cover on the front of the Voltage Control Unit.

VCU LEDs

LED name	LED colour/ state	Possible causes
On	Green/ Solid	Radar operating normally
Fault	Red/ solid	Fault condition
Sleep	Yellow/ flashing	Radar sensor in standby
	Yellow/ solid	Fault condition, unit self-recovers after 20 seconds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10 Specifications

10.1 Radar Transceiver

GENERAL	Dimensions	388 mm x 360 mm x 335 mm (To top of antenna) Antenna length: 1945 mm	
	Weight	Sensor	16 kg
		Antenna	12 kg
		VCU	2.5 kg
	Supply voltage Using VCU	10.2 to 31.2 V DC Nominal 12 V / 24 V DC	
	Power consumption (typical)	70 W	
	Power consumption (Max)	170 W	
	Power consumption (Standby)	28 W	
	Maximum range scale	72 Nm	
	Boot up time	40 seconds	
	Standby to transmit	Less than 5 seconds	
ENVIRONMENTAL	Waterproof rating	IPX6	
	Operating temperature range	-25°C to +55°C	
	Humidity	Up to 40°C at 93% relative humidity.	
	Maximum wind speed	Starts in winds up to 100Kn	
TRANSMITTER	Frequency	9370, 9400, 9430 MHz	
	Peak output power	110 W	
RECEIVER	Receiver characteristics:	Linear	
	Receiver noise:	Less than 5 dB	
ANTENNA	Beamwidth (vertical)	25° nominal	
	Beamwidth (horizontal)	1.32° nominal	
	Polarisation	Horizontal	
	Rotation speed	24 RPM	
APPROVALS	IEC60945 IEC62388		

10.2 MDC-A205-2 AC/DC Power Supply (Optional)

INPUT	Input voltage	90 to 265VAC, 125 to 375VDC
	Inrush current	30A; Cold start at 230VAC / 25°
	Input current	<1.3A @ 230VAC
OUTPUT	Output voltage	24V adjustable +23 to +29VDC
	Output power	250W / 360W peak (10 seconds)
	Minimum loads	0A
	Load regulation +/-	5%
	Overvoltage protection	32VDC
	Overload protection	110 to 130% of output constant current mode.
	Peak short circuit current	20A (<200ms)
ENVIRONMENTAL	Operating temperature	-25° to +70°C without derating
	Storage temperature	-40° to +85°C
MECHANICAL	Dimensions	132 x 50 x 128 (H x W x D) excluding DIN-Rail mounting device. Add 10mm for a standard mounting device and EN50022 DIN-Rail.
	Weight	<1.2kg.

11 MDC-A205-2 AC/DC Power Supply

11.1 Overview

PART NUMBER: MDC-A205-2
An optional DIN-Rail mountable AC to DC power supply can be used where there is no ship's +24 VDC supply available.

SINGLE APPLICATION
When being used to power a Manta NEO X-Band transceiver, the power supply must not be used to power any other equipment.

MOUNTING
The MDC-A205-2 must be mounted to a DIN rail.

CAUTION

LINE REPLACEMENT UNIT

The power supply is a factory sealed line replacement unit and contains no field serviceable or repairable parts. The unit must not be dismantled or repaired in the field.

WARNING

ELECTRICAL HAZARDS

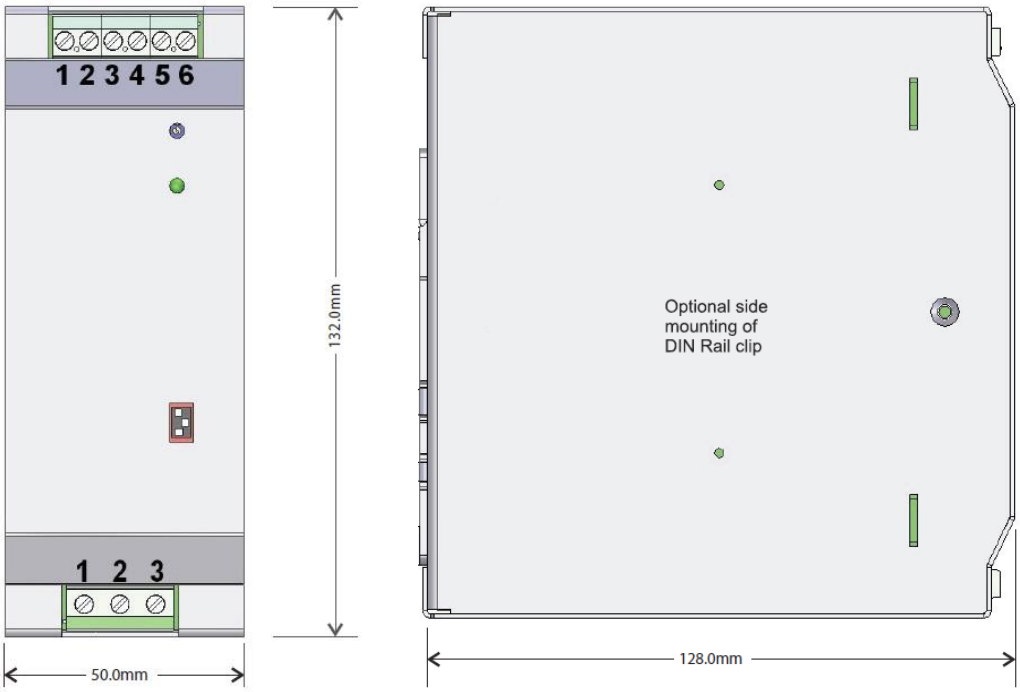
Single phase AC and DC voltages are present on exposed terminals and within the unit.

11.2 Dimensions

CAUTION

UNIT CLEARANCE

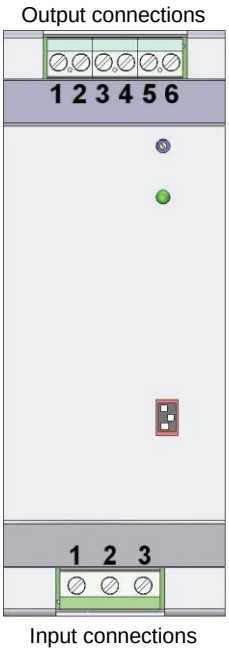
To guarantee sufficient convection, a minimum distance of 50mm below and above the power supply has to be observed.



Dimensions exclude the DIN-Rail mounting device.
Add an extra 10mm for the standard mounting device and EN50022 DIN-Rail

11.3 Termination

DC OK and DC Output Connections	
Pin	**Description**
1	DC OK signal; Potential free contact.
2	DC OK signal; Potential free contact.
3	+24VDC output
4	+24VDC output
5	0V
6	0V
AC Input connections	
Pin	**Description**
1	Live (L1)
2	Neutral (L2)
3	Safety ground / Earth (see below)
GROUND/ EARTH	
The unit connects to ground by the AC input earth connection and via the unit to the DIN Rail mount. The DIN rail must be connected to a tested and proven earth point.	



11.4 Indicator and switches

An LED located on the front on the MDC-A205-2 shows the status of the AC/DC unit as follows:

LED colour/ State	Unit status
Green ON	DC output OK.
Red FLASHING	DC output overload.
Red ON	DC output fail.

The DIL switches located on the front of the unit are factory set to OFF and should not be adjusted. For reference use only, the switch settings are as follows.

DEFAULT SWITCH SETTINGS SHOWN IN BOLD.

SW1	SW2	SW3	Description	PSU Configuration
OFF	**OFF**	**OFF**	Overload results in latched switch off.	**SINGLE OPERATION**
OFF	OFF	ON		Parallel operation
OFF	ON	OFF	Overload results in hiccup mode.	Single Operation
OFF	ON	ON		Parallel operation
ON	OFF	OFF	Overload results in current limit, with latched switch off short circuit protection.	Single Operation
ON	OFF	ON		Parallel operation
ON	ON	OFF	Overload results in current limit, with latched switch off short circuit protection.	Single Operation
ON	ON	ON		Parallel operation

11.5 Overcurrent protection devices

The unit is fitted with an internal fuse that is not user accessible. The AC supply to the unit must be protected by a suitably rated lockable external breaker (not supplied).

The DC output is protected by over current protection mechanisms within the unit.

12 Contact

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