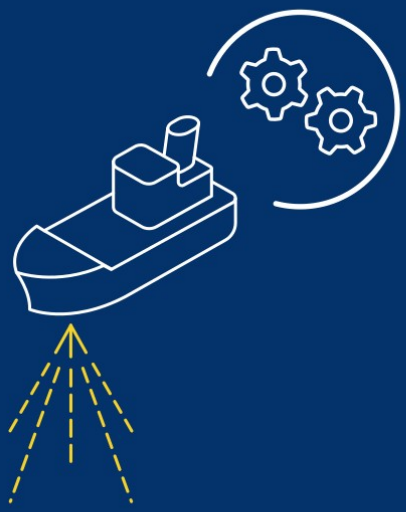
NORTEK MANUALS

Nortek VM Hardware and Installation

N3015-044 | V1.0



Contents

1 Introduction

This is the installation manual for Nortek Vessel Mounted (Nortek VM) systems. The first sections on mounting are general and apply to all versions of Nortek VM. The subsequent VM Coastal 23 and VM Ocean and Operations 40 sections are specific to those packages. The difference between the VM Coastal and / Operations systems is that the Coastal system is designed for use on a vessel of opportunity, whereas the Operations and Oceans setups are designed for a permanent installation. Looking at the hardware setup, a clear difference is that the Coastal system has a direct connection between the VM-ADCP and Processing Unit. The Ocean and Operations systems have a Junction box interconnecting the VM-ADCP and Processing Unit.

This manual is the starting point of configuring the system. After setting up the hardware, please use the software manual to configure the Nortek VM Acquisition software and start measuring.

1.1 Checking the inventory

Check the content of the received package against the packing list included in the shipment. Do not hesitate to contact us if you find any part of the delivery missing.

1.2 Nortek online

At our website, http://www.nortekgroup.com, you will find technical support, user manuals, and the latest software and firmware. General information, technical notes and user experience can also be found here.

The Nortek Support website has an FAQ section. Here you can find short articles that answer some common questions about our instruments, and related topics.

1.3 Feedback

If you find errors, omissions or sections poorly explained in this manual, please do not hesitate to contact us. We appreciate your comments and your fellow users will as well.

1.4 Contact

We recommend first contacting your local sales representative before the Nortek main office. If you need more information, support or other assistance, you are always welcome to contact us or any of our subsidiaries by email, phone or fax.

Email: support@nortekgroup.com (for technical support questions)
Phone: +31 88 6543700

1.5 Health and safety

CE	The system is designed and produced to comply with the council directive of 2014/108/EC relating to electromagnetic compatibility. The design is according to RoHS II directive 2011/65/EU
	The mark on the left is in compliance with the Waste Electronic Equipment Directive 2012/19/EU (WEEE). It is a requirement NOT to dispose of the equipment as unsorted municipal waste but to use the return to collection systems according to local law or return to the Nortek facilities.
	Relevant plastic parts on the Signature sensor are marked for end-of-life recycling (Directive 2008/98/EC on waste)
	Use the following safety guidelines to help ensure your own personal safety and to help protect your equipment and working environment from potential damage. **Data usage limitations** The Nortek VM system is not to be used for navigation or for any purpose relating to safety at sea. **General Power Safety for the 4414 Interface unit and Computer** Observe the following guidelines when connecting your equipment to a power source: • Check the voltage rating before you connect the equipment to an electrical outlet to ensure that the required voltage and frequency match the available power source. • Do not plug the equipment power cables into an electrical outlet if the power cable is damaged. • To prevent electric shock, plug the equipment power cables into properly grounded electrical outlets. Do not use adapter plugs that bypass the grounding feature or remove the grounding feature from the plug or adapter. • Do not operate your equipment with any cover(s) removed. • Unplug this apparatus during lightning storms or when unused for long periods of time. • Do not expose the unit to rain or an environment where it may be splashed by water or other liquids, as doing so may result in fire or electric shock. **System Safety** • The system is designed to be used on a moving vessel. Make sure that all parts are well secured, and nothing can come loose when exposed to heavy vibrations or sudden movements which may occur aboard a vessel. **Safety when installing and operating the Signature VM Sensor** • When mounting the Signature sensor on any vessel or other platform, be careful to follow proper precautions and safe-work procedures as applicable to working with medium-weight, long, unwieldy material (work-gloves, helmet, and if on-board, possibly lifejacket). • Ensure that nothing rests on your equipment's cables and that the cables are not located where they can be stepped on or tripped over.

1.6 Revision history

Table 1: Revision history

Version	Date	Notes
V1.0	January 2025	Initial release of separate hardware and installation manual

2 System overview

The Nortek VM system is a highly integrated system with the sole purpose of accurately measuring vertical profiles of the water's velocity and direction from a moving platform.

Velocity of the water is measured using a Nortek VM ADCP (Nortek Vessel Mounted Acoustic Doppler Profiler) sensor. The VM-ADCP sensors are advanced three-, four- or five-beam current profiling systems. The VM-ADCP also measures its own speed and direction across the bottom using a technique known as 'bottom-tracking'.

Geographical position, speed and heading of the vessel are required to acquire and correct VM data on moving vessels. The VM Coastal Series contain a true heading dual antenna GNSS system, this Ethernet device is the source for accurate timing via the PTP master-clock capability. The VM Ocean and Operation Series are delivered without a GNSS. Its assumed that a survey grade GNSS and heading source is on board of this permanent installation.

Minimum requirements for the heading source: Non-magnetic, 0.5 degree or better, NMEA HDT, THS or NTHPR string format with >5Hz updates. The minimal GNSS requirements are DGNSS, preferable supporting SBAS corrections. with >5Hz updates of NMEA GGA, ZDA, VTG string format.

A Processing Unit computer system with Nortek VM Acquisition software collects the data, takes care of accurate timing, and continuously monitors the quality of the data. Since no additional data from any external sensors is required and the Processing Unit comes fully configured, the whole system is basically 'Plug and Play'.

For the VM Ocean and Operation Series the processing unit requires to be connected with a GNSS and a Heading source, via one of the 4 RS232|422|485 configurable ports or via the Ethernet port on the processing unit. The Coastal Series are supplied with a GNSS providing accurate position and heading data.

3 Mounting types

There are several options to mount a VM-ADCP on a vessel. The simplest option is using a pole mount which is most suitable as a temporary solution or a solution for smaller vessels. The hull mounted options are a more permanent solution. These, and other options are explained in the sections below.

The given information discuss concepts with pros and cons. Designs differ per vessel and are based on a thorough deliberation between the multiple stakeholders. Nortek is not liable for the effects and ADCP performance of the design. We encourage to involve a naval architect for these kind of designs.

3.1 Sea chest

The sea chest is an ADCP instrument case which holds and protects the ADCP from the environmental conditions as flow, floating debris or grounding. The design concept can be used for the VM Ocean 100 kHz, the VM Ocean 55 kHz and the VM Operations 333 kHz.

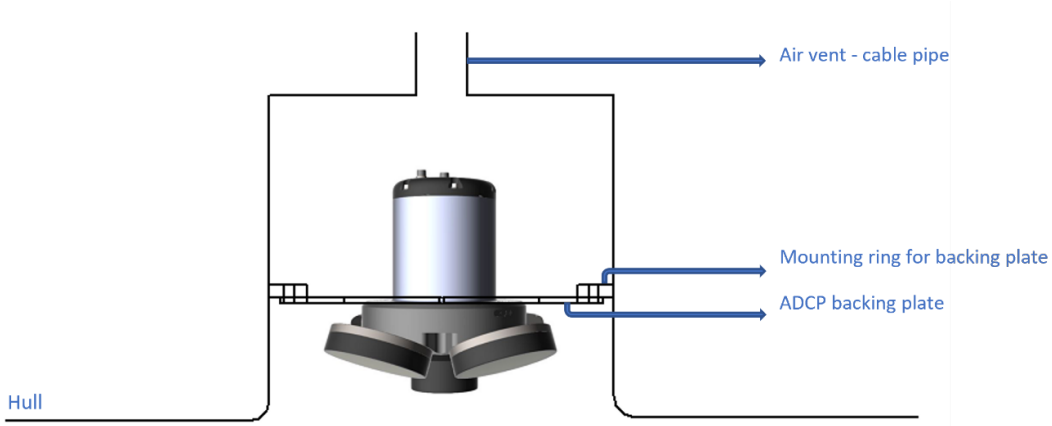


Figure 1: Longitudinal cross section of a basic sea chest design with a Nortek VM 100 kHz fitted

A sea chest is a cylindric shaped structure which is welded within the hull and holds the ADCP subtracted in the hull. Its design is wide enough not to obstruct the beam pattern of each individual transducer. The ADCP can be mounted via a backing plate which makes it possible to service the ADCP in dock or in water with diver assistance. This backing plate also contains holes to drain trapped air and brings (sea)water towards the ADCP grounding point on the back of the ADCP. The cable conduit on top of the structure vents the trapped air and brings the instrument cable(s) towards a location above the waterline inside the vessel. This cable conduit is typically fitted with an air vent (valve) and cable gland on the top end of the cable conduit. From this point the instrument cable is connected to the junction box supplying instrument power and a data connection towards the processing unit or INS, located elsewhere in the vessel. Please note that any new through hull penetration or modifications should be inspected by a DNV or other class authority.

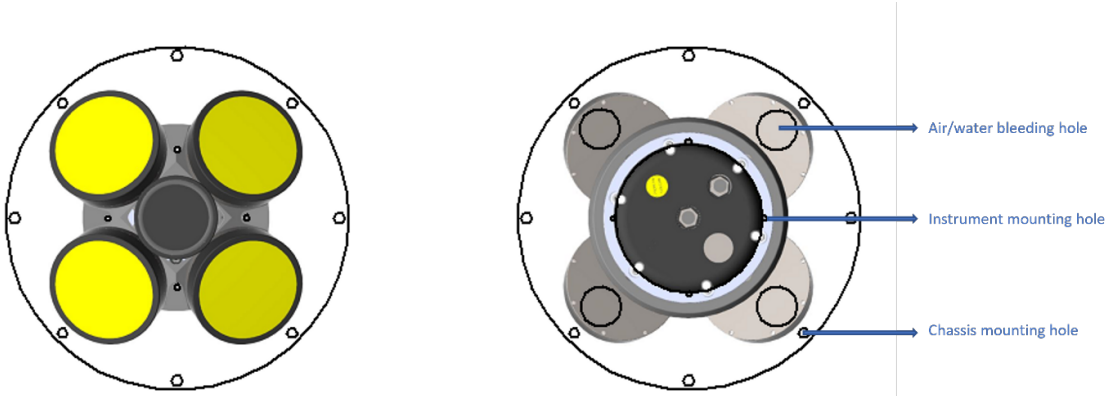


Figure 2: ADCP front and backside with backing plate mounted

3.2 Sea valve

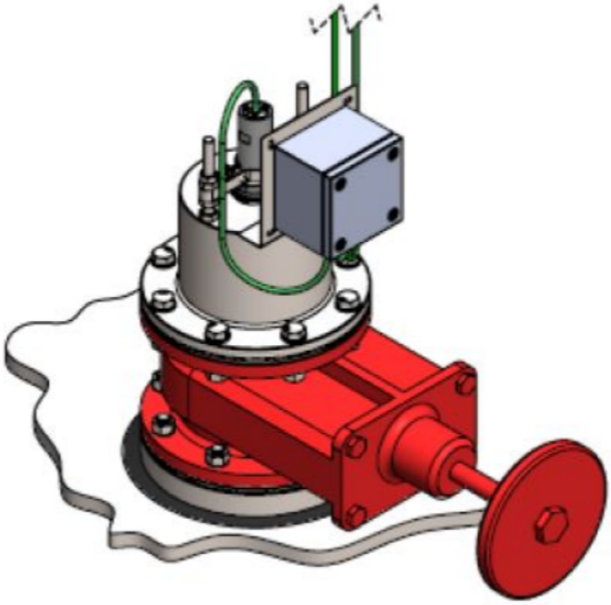


Figure 3: Sea valve assembly

A sea valve is a hull mounted solution which is welded into the hull and allows the sensor to be mounted flush with the hull. However, modifications make it possible to extend the sensor deeper into the water column, for instance into a blister. The advantage of this system is that the sensor can be retrieved for inspection and maintenance or for debris and ice. This can be done without the need for divers or vessel docking. The drawback is similar to that of the sea chest solution and it may experience aeration in front of the ADCP transducers as it is straight mounted flush with the hull. Specific care should be taken while selecting the mounting location. Attentiveness on aeration is required selecting the location of a flush hull mount. Aeration not only blocks the transmitted acoustic energy, the popping bubble can also emit sound in the operating frequency band. The profiling range will either be reduced or at certain levels even completely stopped. Nortek offers an optional, DNV type approved, sea valve solution for the 333 kHz VM-ADCP, as well as a permanent hull mounting bracket and pole mounting bracket. Please refer to the relevant installation manuals for details.

3.3 Blister

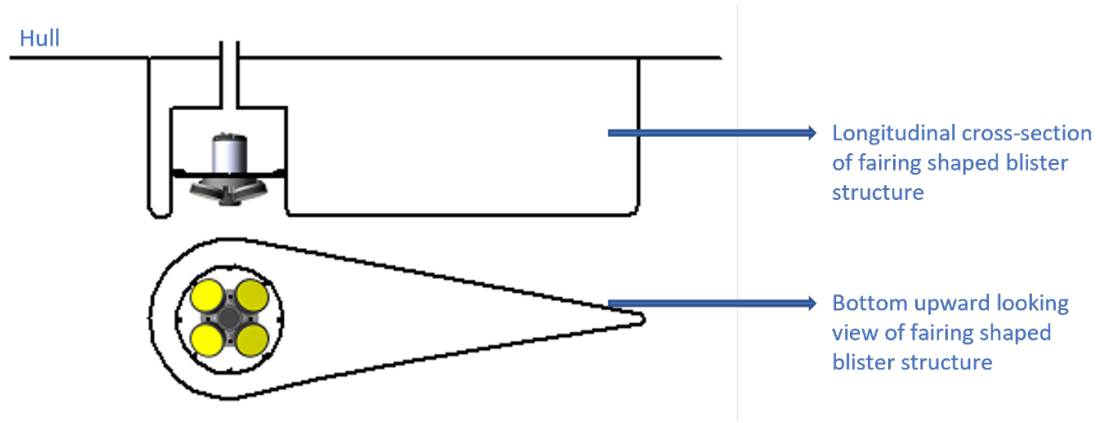


Figure 4: The blister concept

A blister similar to the sea chest concept but is a fairing shaped structure which holds the ADCP and is welded onto the vessels hull. It has the advantage that air bubbles directly under the hull are guided aside the fairing structure and can't appear in front of the ADCP transducers. This is beneficial as aeration block or diffuse the acoustic signal of the ADCP and should be minimized. It is advised to keep approximately 20-30 cm distance between the front of the blister and the ADCP. As a drawback the draft and drag of the vessel are increased by this structure.

3.4 Gondola

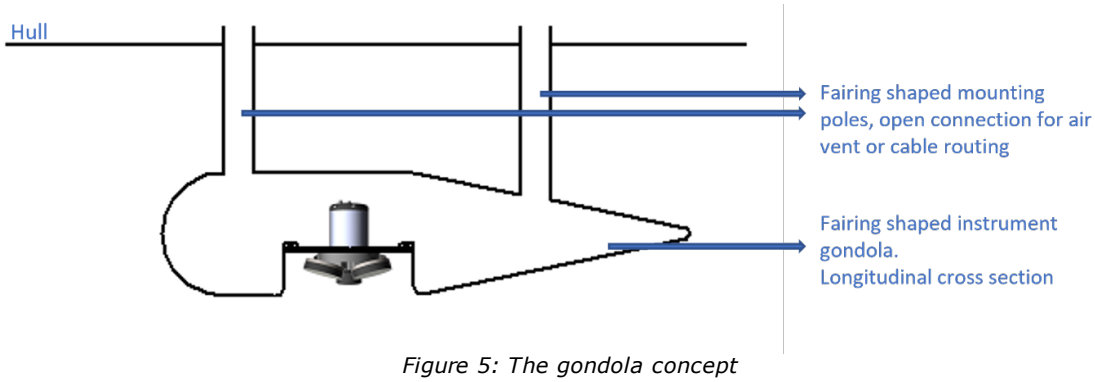


Figure 5: The gondola concept

A gondola is a variant of a blister structure but has an opening between the hull and its body. The opening can be as large as 0.5-2 meters. The gondola makes it possible to mount the ADCP further away from the surface and reducing the risk of acoustic signal debilitation due to air bubbles. During higher sea states waves distribute more air into the surface layer. An ADCP fitted in a gondola structure will perform better during higher sea states as it will face less bubbles which decrease the ADCP performance significantly. As a drawback the draft and drag of the vessel is permanently increased by this structure.

3.5 Drop keel

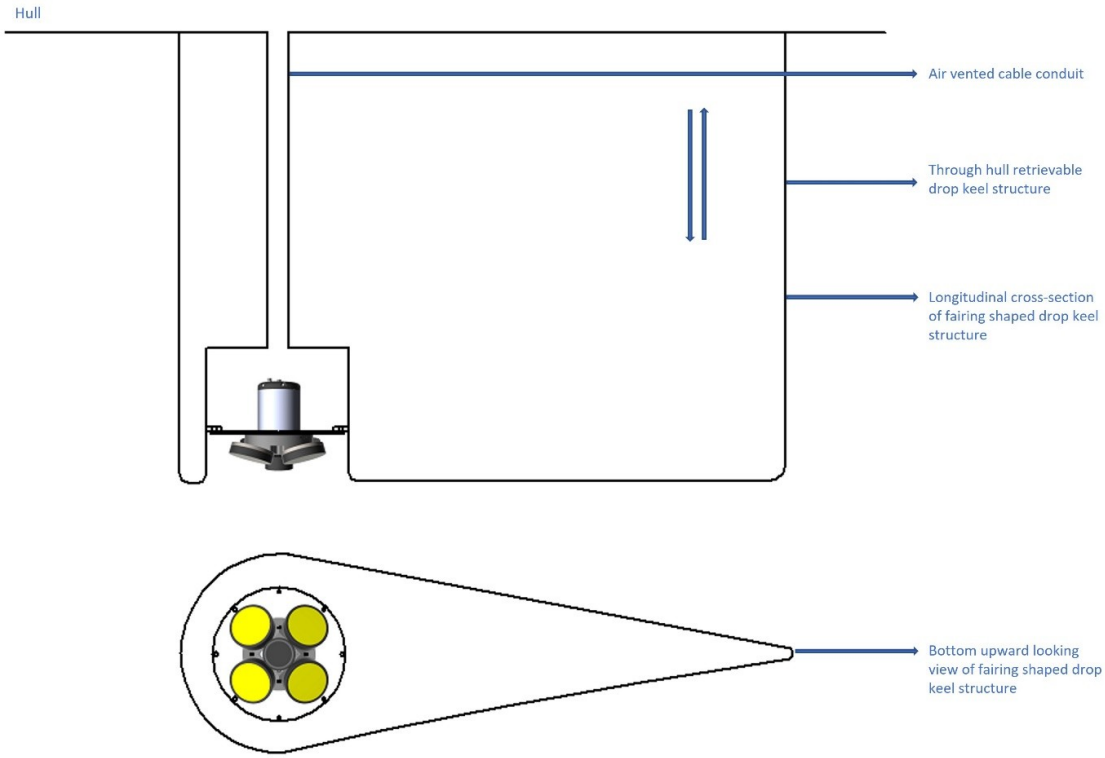


Figure 6: The drop keel concept

The drop keel is an acoustic instrumentation keel containing the ADCP inside. The complete keel can be retracted during high cruise speeds, sailing into port or during ice conditions. It can be lowered once ADCP data is of interest (either during sailing or stationary) Overall this is the structure which performs the best while collecting ADCP data. The keel can be lowered to any manual depth depending on the sea state and amount of air bubbles present. The costs of investment, space requirement and maintenance of the hydraulic parts may be seen as a drawback of the solution. A variant of this structure is a pole mounted ADCP structure lowered from a moonpool. When the ADCP is operated withdrawn inside a moonpool itself, slushing should be prevented. Slushing can cause acoustic background noise and aeration interfering with the ADCP measurements.

3.6 Pole mount

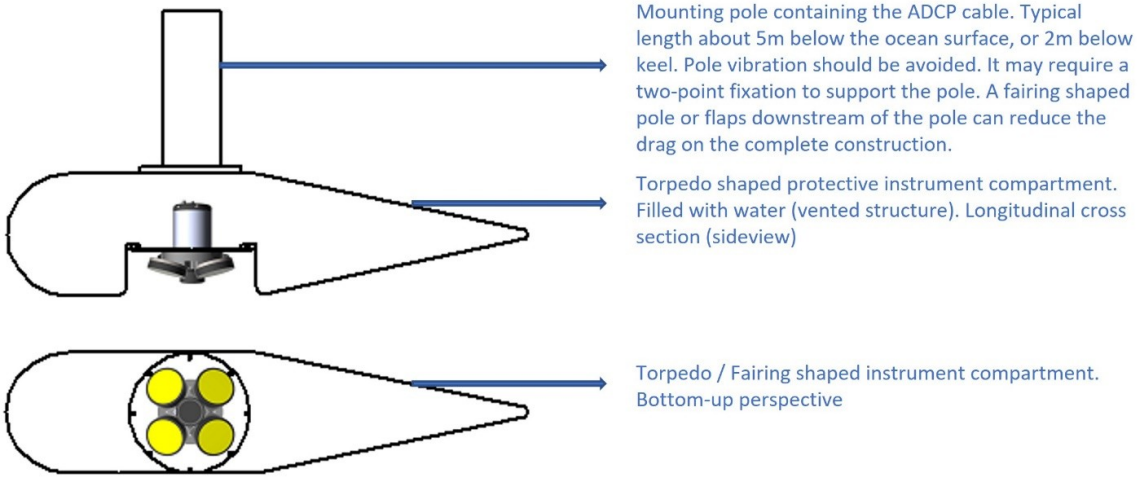


Figure 7: The pole mount concept

An over the side pole mount can be seen as a temporary solution where the instrument is mounted inside of a fairing shaped structure to protect the instrument and to reduce the drag. Depending on the sea state the pole can be lowered deeper beneath the surface layer. The beams should not be blocked by the vessels hull. A bow directed guy line can be used as a strain relief.

3.7 Acoustic window

An acoustic window is a clear transparent polycarbonate, synthetic, plate which completely covers the ADCP inside the mounting structure. It has the advantage that the ADCP is protected from debris or ice. The ADCP chamber can be left open and be allowed to fill and refresh itself with seawater. It can also be sealed and filled with a non-biological substance like distilled water. In this case the ADCP is protected against marine fouling. However the outer side of the polycarbonate, in contact with seawater, will still be affected by marine fouling. In case the salinity (ppt) of the filling substance is known, a fixed ppt can be set to correct for the speed of sound. This allows the ADCP to function independent of speed of sound changes of the seawater. In case the space is filled with a non conductive fluid such as distilled water the instrument grounding will be insufficient and an external ground lug 19 is required. Please inquire Nortek for this option.

Acoustic window designs are complex designs, and an ideal outcome cannot be guaranteed up front.

With a proper window design the loss of range can be expected to be within 3-5 dB. The effect may be negligible compared to the potential advantages of an acoustic window installation. The signal strength (influencing the profiling range) can be further reduced if the incorrect plate material and/or thickness is selected. Acoustic ringing inside the enclosed structure may also reduce the VM-ADCP performance. Please contact Nortek for the latest available information in case you are considering an acoustic window design.

4 Mounting location

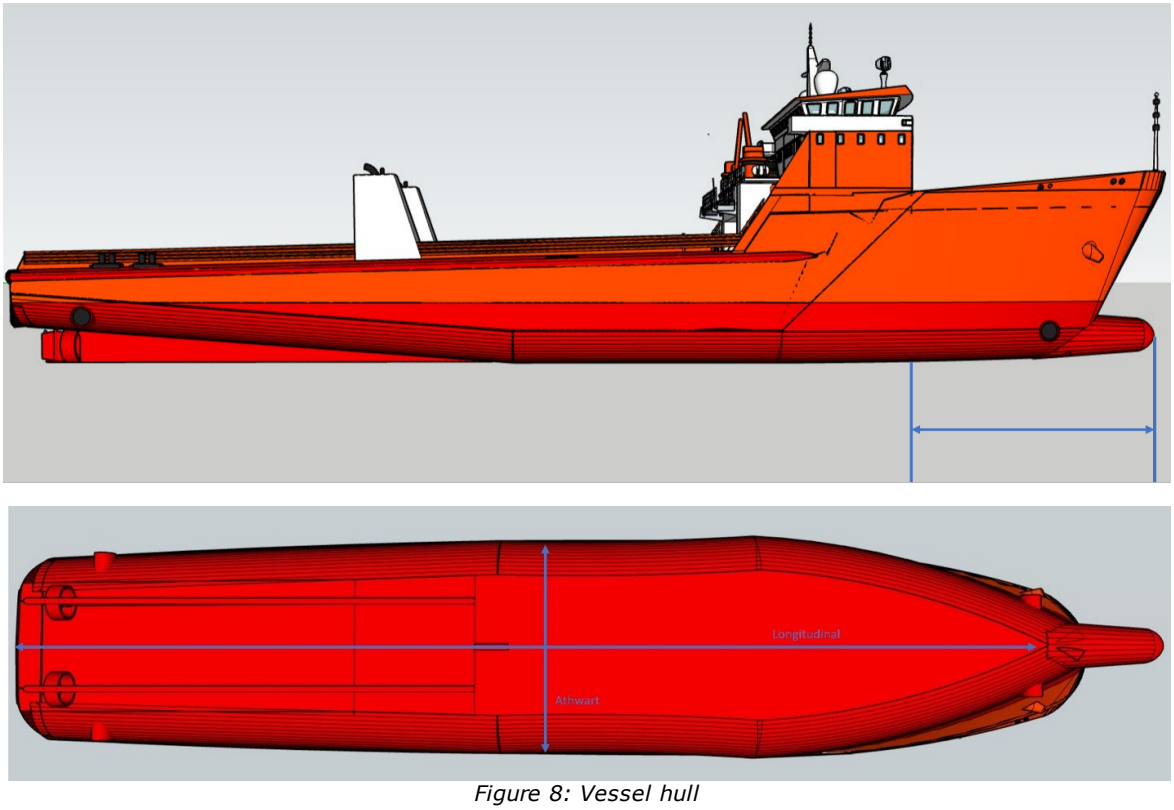


Figure 8: Vessel hull

Typically the best mounting location is found between 0 and 1/4th of the ships length, behind the bow. The mid longitudinal line is the most ideal line to mount the instrument as it has a minimal vertical acceleration during vessel roll. The instrument itself must be fitted without tilt. In general, for flush hull or shallow blister mounted instruments a location closer to the bow tends to be the location with a minimal disturbed layer under the hull. However, this varies per design. While this rule of thumb seems correct for vessels with a sharp bow, a bulbous bow or a thruster opening, alike the figure above, can push air under the hull after each time it rises above the waterline. This will lead into aeration under the hull and a degraded signal during higher sea states. If the vessel has a bulbous bow or a thruster opening is present and it's not closed while sailing it may be considered to mount the instrument up front of the thruster opening or use a lowered mounting structure to avoid degraded signal performance because of air bubbles. We advise to consult a naval architect selecting the most suitable mounting location for your vessel.

Care should be taken to avoid any signal degradation by:

- Air or water in- or outlets up front of the transducer
- Sharp welds or objects up front of the transducer mounting which can cause cavitation.
- Strong electromagnetic fields in the near boundary of the instrument causing electronic noise on the ADCP signal.
- Any other acoustic devices operating in the same acoustic frequency range.

4.1 Ship movements

On smaller vessels it may be better not to mount the VM-ADCP too close to the bow or stern. Instead, the best areas are toward the middle of the ship. There are two reasons to pick an area toward the middle. First, the vertical motion due to pitch and roll is minimal toward the middle. Second, the ship-induced flow field has stronger asymmetries toward the bow and stern. These asymmetries will reduce the accuracy of the velocity data close to the hull and are best kept to a

minimum. Ship-induced motion is usually a bigger problem when the relative water depth is smaller, and the ship is larger or bulkier (less "classic" hull structure).

The tilt angle of the installation should be as small as possible because a level sensor head makes it easier to interpret and analyse the velocity data. However, a few degrees of tilt do not make a great difference in the accuracy of the horizontal velocity data.

4.2 Ship generated flow fields

All ships generate their own flow field. The magnitude of this field is a function of the ship size, shape, ship speed, and the water depth. It is weaker away from the hull than it is close to the hull and it will be weaker on the side of the ship than it is directly below the hull. The magnitude of the flow field can be analysed by looking for persistent vertical gradients in the velocity data.

a) The flow field is strongest close to the hull and will usually "pull the water along with the ship". As a result, the sign of the velocity gradient will remain constant and it will not change direction as the ship moves in the opposite direction. If the gradient remains constant, regardless of the direction of the ship motion, it is not a part of true current regime, but an artefact of the ship induced flow field. For this reason measurements taken from small ships collecting data in shallow waters can best be collected from an ADCP mounted on the bow of the vessel.

b) When the VM-ADCP sensor is mounted close to the bow or to the stern, it will show a net vertical velocity close to the hull. If the vertical velocity has a strong gradient (i.e. it is not constant with the water depth), it is usually a result of the motion.

5 Mounting the VM-ADCP

When mounting the VM-ADCP, care should be taken to keep the physical and beam properties of your specific instrument into account.

5.1 Mounting alignment

A 4 beam VM-ADCP is ideally mounted with 2 beams directed to port and two beams towards starboard side. When aligning the unit with any offset of 45, 135, 225 or 315 degrees to the bow none of the beams will directly measure the dominant vessel speed. In this set-up its also possible to perform a quick sanity check on the individual transducers as, in a uniform flow situation, all 4 beams should provide the same velocity magnitude along the beam. Three beam systems are aligned with beam 1, 2 or 3 facing towards the bow. It is default to mount the VM-ADCP with the X-Y or X marking, for the 55 and 333 kHz units, towards the bow. Any mounting errors can be corrected for by applying an offset in the VM-ADCP software. Mounting offsets can be found performing an VM-ADCP heading alignment procedure after installation, for instance during a Sea Acceptance Test (SAT) 53.

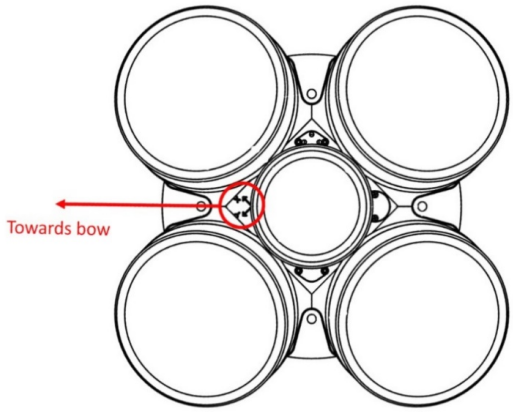


Figure 9: 4 beam Signature 100 kHz

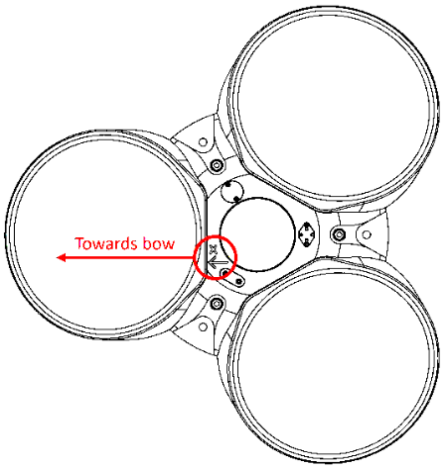


Figure 10: 3 beam Signature 5 5kHz

5.2 Beam pattern

The transducers of the Nortek VM 1000, 500 (VM Coastal) are slanted at a 25-degree angle, the transducers of the VM 250, 333, 100 and 55 units at a 20-degree angle. The acoustic beam pattern should not reflect against any objects in the direct neighbourhood of the VM-ADCP. The acoustic beam pattern can be drawn in using a cone increased by 15 degrees from the transducer.

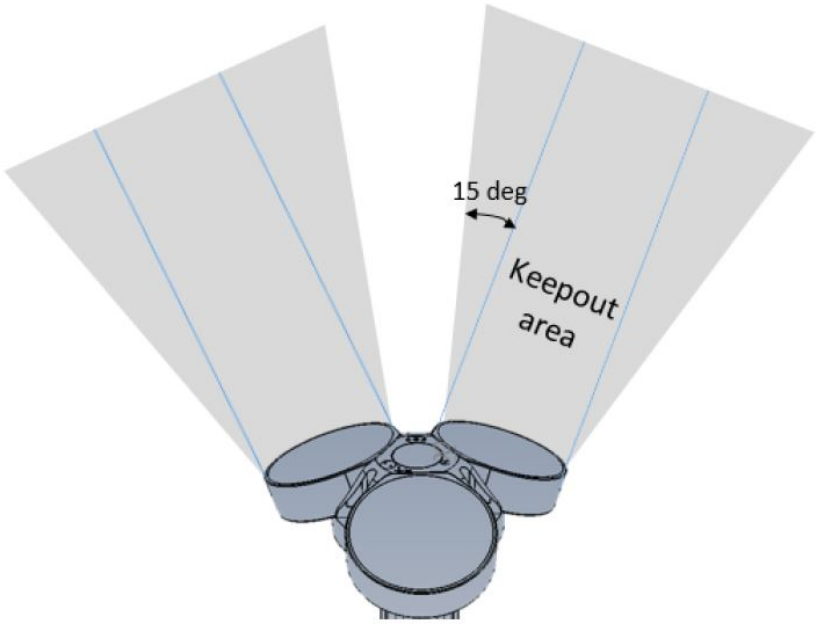


Figure 11: Advised keep out area

Table 2: Transducer diameter

Instrument & frequency	***Transducer diameter in mm***
Signature1000	35
Signature500	67
Signature250	174
Signature333	67
Signature100	169
Signature55	276

5.3 Fixating the VM-ADCP

To fixate the VM-ADCP we strongly encourage you to make use of the mounting holes near the transducer head using a flange at the back. We do not advise the use of mounting clamps around the ADCP housing as this can deform the housing with potential water ingress as a result.

5.4 ADCP mounting plate

To mount the Nortek VM-ADCP in a mounting structure a steel backing plate may be used. The VM-ADCP is mounted to the backing plate and the plate is mounted to the chassis ring of the mounting structure. The plate requires to have holes to be able to drain trapped air away from the transducers and to have the VM-ADCP grounding point in contact with water. It is advised to have the backing plate and the surrounding mounting structure treated with antifouling paint to allow the air bleeding holes to stay open. As the Nortek VM-ADCP system doesn't make use of its internal compass, magnetic steel plates, and fasteners are allowed to be applied. Please be aware of galvanic corrosion when using two different kinds of metal, which can be solved using plastic isolation plates, gaskets and nylon bushes. Spring washers, locking nuts or Loctite® should be applied to prevent loosening or loss of the instrument due to vibration. For diver operated, in water servicing, of the VM-ADCP the use of M20 or larger fastening material is advised for easier mounting or disassembly during marine fouling.

Figure 12: ADCP mounting holes

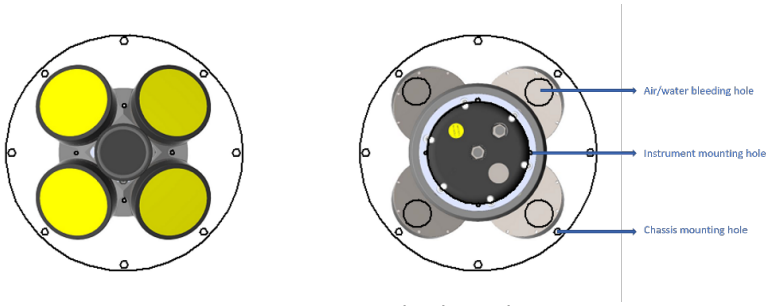


Figure 13: ADCP backing plate

At installations where the instrument is fully exposed to flowing water and possible debris we advise to make use of a pipe around the ADCP housing with a flange mount on the back of the instrument transducer head. The pipe should be about 15 cm longer as the housing itself to be able to protect the connector and first section of cable.

5.5 ADCP grounding

The Nortek VM-ADCP contains a titanium grounding plate at the back of the instrument. The grounding plate suppresses the electrical noise penetrating the system. Noise will affect the instrument measurement range and its overall performance. The grounding plate should be in contact with (sea)water while the instrument is in use. In the case its not possible to have this plate in direct contact with the surrounding conductive salt water, a 60 cm ground lug can be delivered as an option. The ground lug can be connected to the vessels hull or any other large conducting material which is in contact with sea water. The ground lug is plugged into the secondary 8-pin connector at the back of the VM-ADCP. A ground lug may also increase the grounding performance when the instrument is deployed directly in fresh water or in a distilled water filled acoustic window set-up.

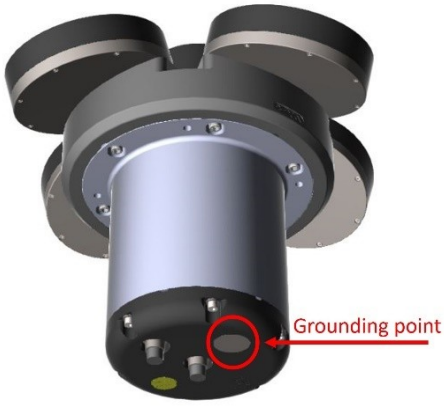


Figure 14: Instrument grounding point

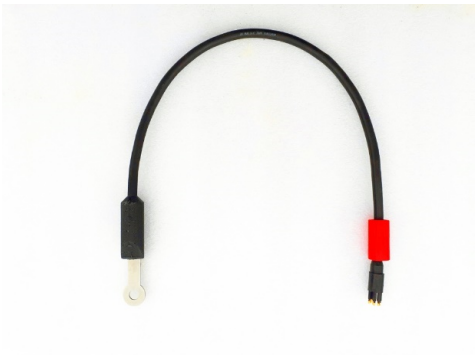


Figure 15: Instrument ground lug

5.6 Biofouling

Marine growth has a dampening effect on the transmitted acoustic signal and will limit the profiling range. Marine growth, or biofouling, on VM-ADCPs should be considered when planning permanent mountings. The speed and thickness of the growth depends on the geographical location and use of the vessel (constant sailing or moored intervals, vessel speed, temperature, sunlight conditions, latitude, will affect the rate of growth). Fouling can be a problem in weeks in

tropical areas if the vessel is moored, or it can take up to months or no issue if it keeps sailing in colder regions.

Antifouling paints or ClearSignal™ coating are often used to avoid the transducers from being covered with barnacles or other evil crustaceans. The important thing when it comes to antifouling is that the paint is not too thick or doesn't contain any metal flakes; otherwise, the signal strength will decrease. Nortek offers the external optional service to have the Ocean 100 and 55 kHz unit coated with a single time permanent ClearSignal™ coating, at order. Note that this service extends the delivery time by 3 weeks. Please consult the ClearSignal™ company website for more and the most recent information about this third-party product. Standard commercial antifouling paint products change their content over time. Nortek can't recommend nor can exclude any possible damage to the transducers applying antifouling paints. Please contact Nortek for the latest knowledge and information in case you consider applying standard antifouling paint on the transducers.

Please take care that the instrument grounding point is NOT covered with paint. When applying antifouling paint, we recommend coating the backing plate to keep the air bleeding holes open.

We realize that barnacles must be removed mechanically, but we strongly advice using any sharp objects capable of harming the polyurethane transducer surface. We also recommend staying away from strong organic solvents such as acetone. Nor use high-pressure water, sandblasting, metal tools to clean the transducer face.

6 Connecting the VM-ADCP

Depending on your setup, the VM-ADCP is either connected to a Junction Box for Nortek VM Ocean or Operations; or is connected directly to the processing unit for a Coastal system. Please follow the guidance in the following sections to ensure cables and connectors are handled with care.

6.1 Cable conduit

A cable conduit runs from the VM-ADCP location towards, typically, a location above the water line. The conduit is not only used to guide the cable but can also air vent the VM-ADCP mounting structure if a valve is fitted on the conduit and above the waterline. We advise to use a cable gland on top of the conduit, inside the vessel, to avoid the cable from being damaged from any sharp edges on the conduit opening. Underwater close to the VM-ADCP the conduit must remain open to allow air to escape. The cable should be fixed and sharp edges near the conduit entry should be grinded away. Larger conduit diameters, a minimized number of bends and a large conduit bend radius and lubrication allow easy cable routing. Please note that conduits must be inspected and approved by the vessels class authority.

6.2 Replacing the VM-ADCP while the vessel is in water

For fixed mounting solutions below the waterline it is most convenient to service or replace the ADCP when the vessel is in dock. However, as the VM-ADCP cables are kept short and fitted with a Subcon connector on both ends, it is possible to retrieve the VM-ADCP using diver assistance. The lifetime of the connector will degrade quickly if its left unplugged while in seawater, even for short periods of times or when it's flushed with fresh water directly after. Corrosion will eventually cause unexpected power or communication failures. We recommend retrieving and to install the VM-ADCP with the instrument cable fitted. There is a blind dummy connector delivered for the top end of the VM-ADCP cable inside the Nortek toolkit. There is also an additional blind dummy connector for the second connector on the VM-ADCP when it is not in use. Relief the tension from the cable towards the VM-ADCP connector while retrieving the VM-ADCP and cable from the ships mounting. During installation its advisable to keep a small loop of cable outside the conduit, inside the mounting structure, to make it easier to pull the cable out by hand during diver service. However, while mounting the adcp inside the structure this shouldn't put pressure on the instrument connector due to a sharp cable bent directly behind the connector.

Don't forget to attach a conduit wiring cable or rope onto the top of the VM-ADCP cable before retrieving the cable from the conduit!

6.3 Connector care

It is extremely important to keep connectors dry, clean and well lubricated. Before plugging in connectors, we recommend to always blast the pins with compressed air, inspect them for cleanliness and then protect the cable connector by applying a thin layer of silicone grease. The connectors make use of a locking sleeve. The locking sleeve must be tightened by hand only it will hold the connector on its place.

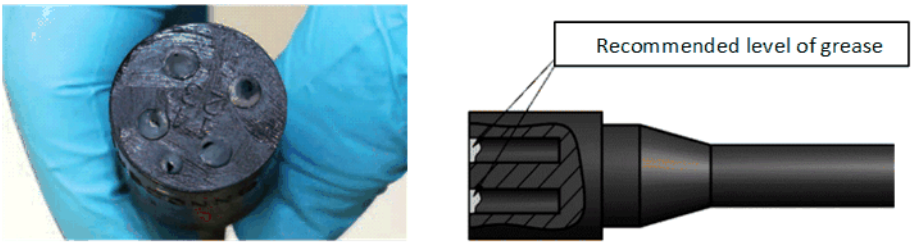


Figure 16: Greasing the connector

- Connectors must be greased with Molykote® 44 medium before every mating. A small amount of grease is supplied within the toolkit of the system.
- A layer of grease corresponding to minimum 1/10 of socket depth should be applied to the female connector.
- The inner edge of all sockets should be completely covered, and a thin transparent layer of grease left visible on the face of the connector.
- After greasing, fully mate the male and female connector to secure optimal distribution of grease on pins and in sockets. To confirm that grease has been sufficiently.

Before deployment:

- Disconnect.
- Flush the connector set with fresh water or compressed air, remove dirt. Remember to also check the female connector.
- Check that both connectors are dry. If not, let them air-dry.
- Inspect for damage, corrosion and cuts.
- Apply a thin film of Silicone grease.
- Mate the connector halves and check if they are properly mated.

After deployment and during inspection:

- Flush the connector set with fresh water or compressed air, remove dirt.
- Check that both connectors are dry. If not, let them air-dry.
- Inspect for damage, corrosion and cuts.
- Mate with dummy plug, delivered inside the instrument toolbox.

6.4 Cable care

- Do not pull on the cable to disconnect connectors.
- Avoid any sharp bends especially at the first 150 mm of cable close to the connector.
- The dynamic bend radius of the standard VM-ADCP cable is 140 mm (5.5’). When fitted in static environments this may be reduced to 100 mm.
- The standard VM-ADCP cable has a diameter of about 10mm (0.39’) and the largest diameter of the complete cable assembly is the locking sleeve, with a diameter of 22mm (0.87’). In some cases, extension molds are made on the cable. Please inquire Nortek for about the details of your delivery in case this is critical for your design.
- Ensure that the cable is fixed to the mounting fixture to avoid mechanical stress to the connection.
- Elastomers can be seriously degraded if exposed to direct sunlight or high ozone levels for extended periods.

7 VM Coastal

The VM Coastal systems are generally shipped as an integrated package that includes a GNSS next to the VM-ADCP and Processing Unit. Please follow the instructions in the following sections to get started setting up your Nortek VM Coastal system.

7.1 System overview

The VM Coastal system consists of a VM-ADCP, an Advanced Navigation GNSS and a Processing Unit. The VM-ADCP and GNSS both connect to to the Processing Unit which provides power next to the data connections. An overview is shown in Figure 17 below.

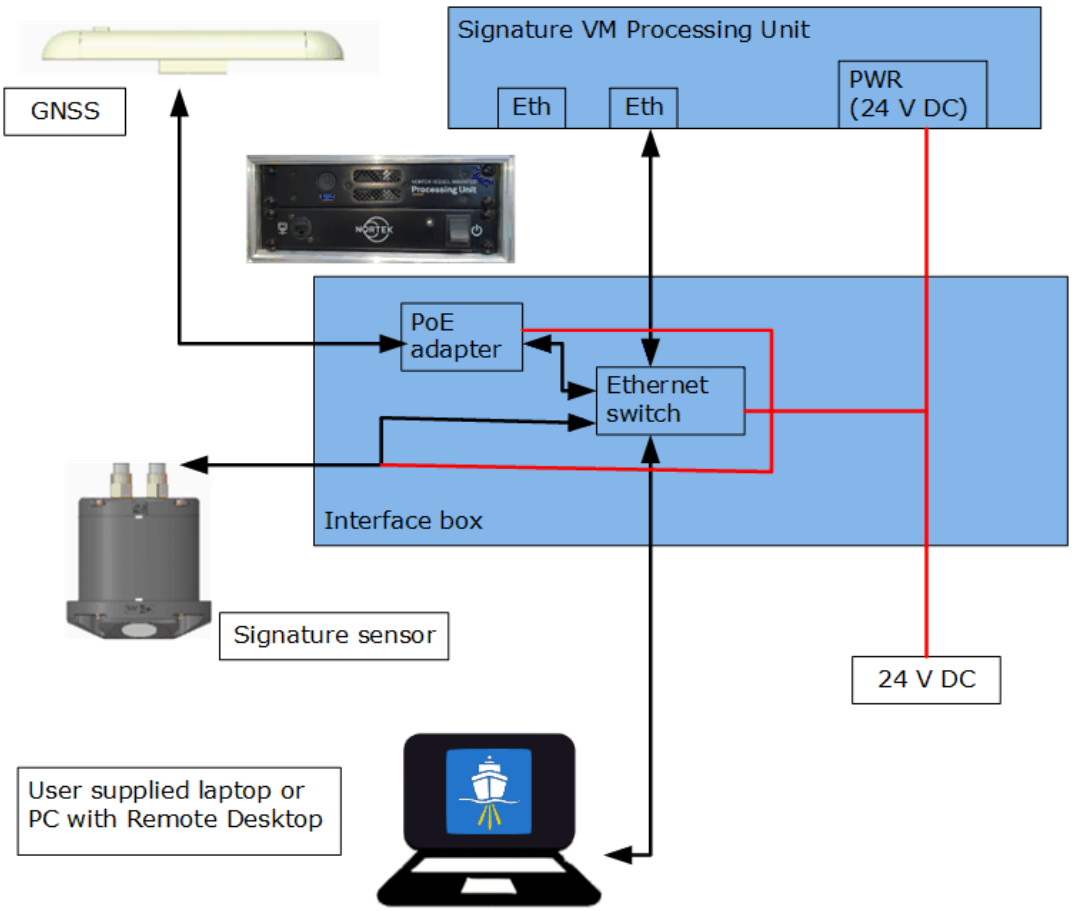


Figure 17: VM Coastal system overview

7.1.1 GNSS receiver

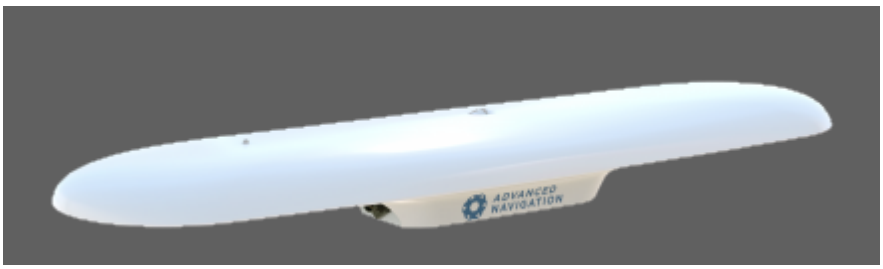


Figure 18: GNSS - Receiver

The Advanced Navigation Global Navigation Satellite System (GNSS) receiver is a fully integrated, navigation and heading solution. It provides position, velocity and heading information and does not require any calibrations or setup. The build in INS (Inertial Navigation System) provides heading even during GNSS heading outages. The antenna is equipped with

two internal GNNS receivers and its heading is not subject to magnetic interference. The vessel does not have to move to provide an accurate heading.

The built-in PTP (Precision Time Protocol) server provides an accurate timing reference for the whole VM Coastal system. The GNSS is powered through the Ethernet cable. For more details on the GNSS Sensor itself, please refer to the User Manual, as available on the Advanced Navigation Website: https://www.advancednavigation.com/product/gnss-compass. This page also holds the latest firmware release and manual.

7.2 Instrument orientation

When mounting the VM-ADCP sensor to the vessel it is important to note the orientation. As shown in figure 19 24, the 'X' should not point straight forward, but 45 degrees off the centre line. If mounted like this, the heading offset as used by the software should be set to -45 degrees.

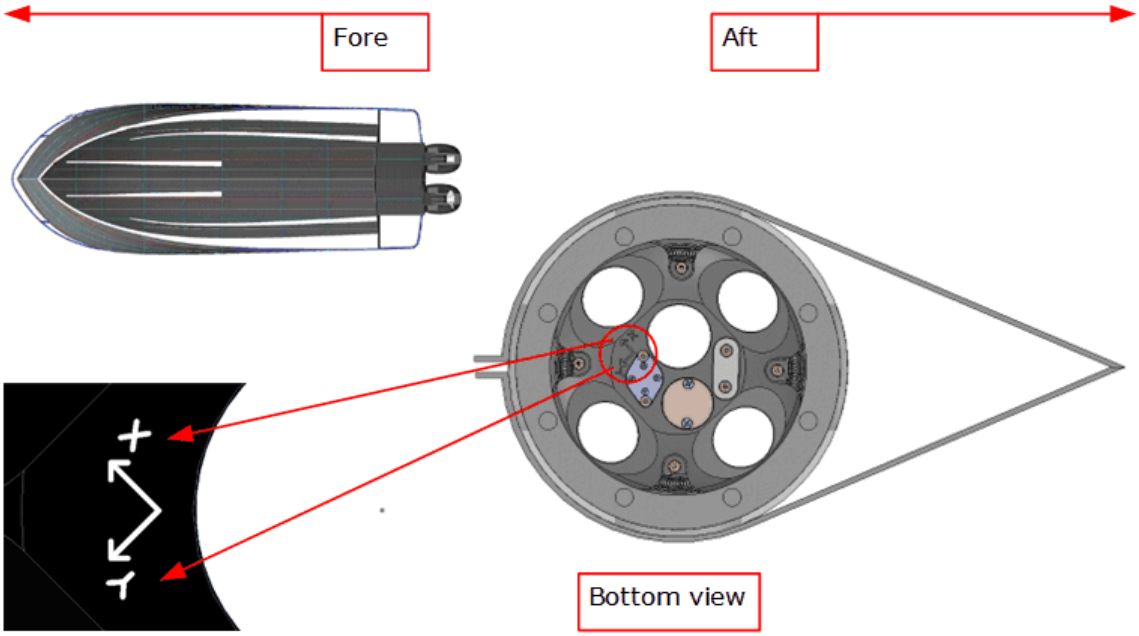


Figure 19: VM-ADCP orientation relative to the vessel

7.3 Mounting

Movable mounts are used for short term surveys or when the VM-ADCP sensor will be moved from ship to ship. Most of these mounting arrangements are designed so the VM-ADCP sensor will be mounted over the side. The mounting should be as vertical as possible. The VM-ADCP should be mounted about 0.6m or more below the surface. The beams should not be blocked by the hull or any ropes. It is important that the mount is rigid so that the orientation of the VM-ADCP sensor and GNSS antenna does not change over the course of the survey.

Note that the relative orientation of the VM-ADCP sensor as referenced to the GNSS coordinate system should remain unchanged over the survey. Mounting systems that use a separate, towed catamaran or other towed body are not suitable unless the GNSS antenna is also mounted on the towed body.

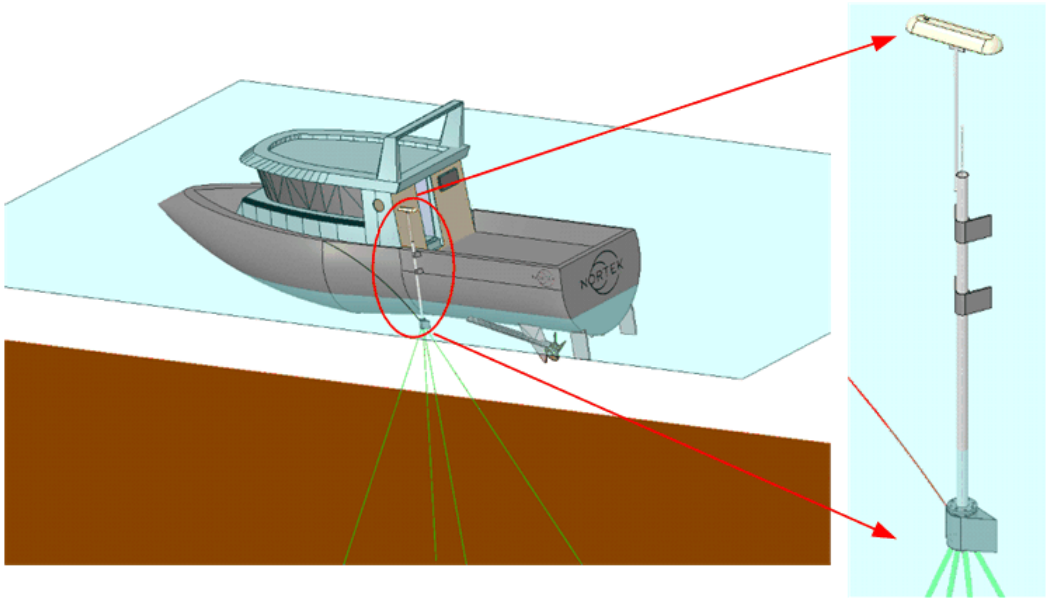


Figure 20: Over-the-side mounting pole

The VM Coastal systems are supplied with a pole mount bracket. This stainless-steel frame is basically a container for the VM-ADCP instrument that protects it against damage from impact and to ease the water-flow around it. Using the drop-shaped cover will also significantly reduce the drag on the instrument when it moves through the water.

For maximum flexibility, the top of the container has 8 slots that fit M12 bolts. It is up to the user to provide a mounting structure with a mating flange. The example (figure 21 25) shows a standard flange, model EN 1092-1.

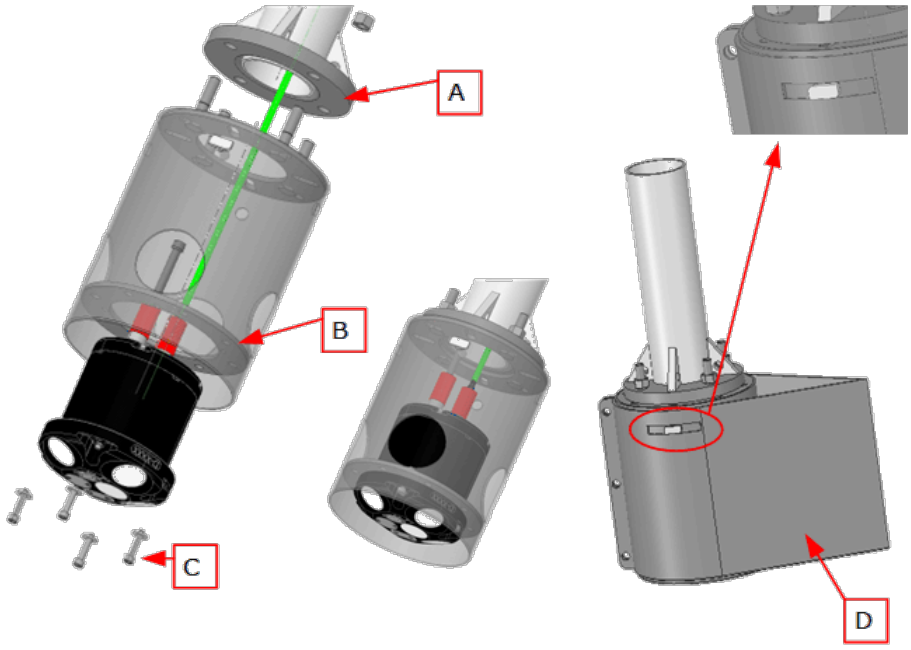
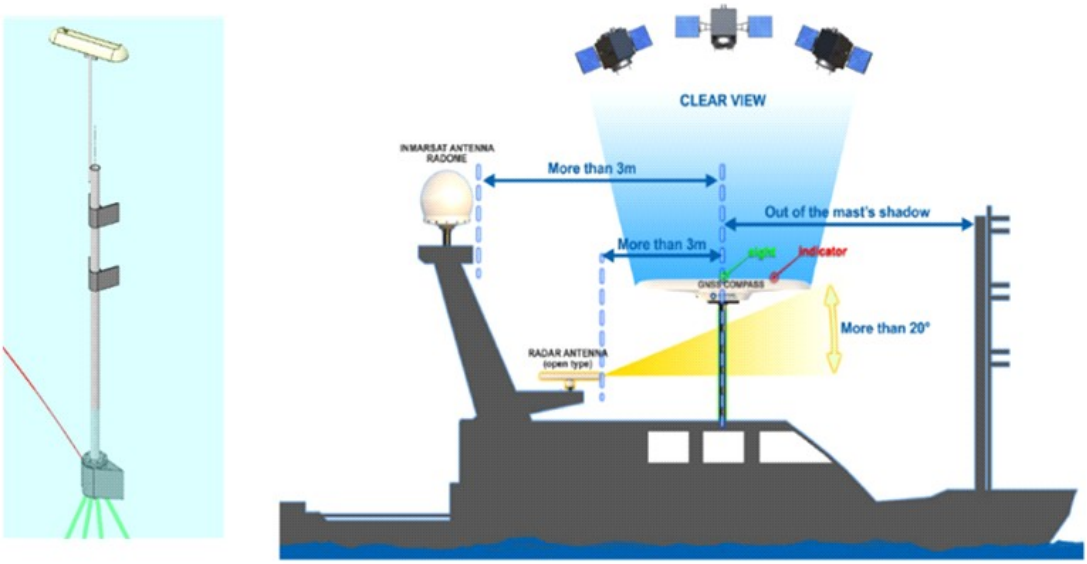


Figure 21: Mounting frame (for VM500 / VM1000)

1. Mount the bolts on top of the cylinder and align them with the holes in the flange (A)
2. Route the cable and connect it to the instrument.
3. Mount the instrument to the internal flange (B) using the four bolts (C).
4. Attach to the flange

5. Finally mount the drop-shaped cover(D), line-up the rectangular (hammerhead-) bolts with the slots in the cover.

7.4 GNSS mounting



Optimal location: right above the instrument.

GNSS Compass ideal mounting location for the vessel.

Figure 22: Suggested GNSS locations

Ideally the GNSS antenna should be mounted as close to the VM-ADCP as possible, or at least in the same vertical plane. This is not always possible and there may be several other mounting considerations like the clear view of the sky or nearby radar. It is not a huge problem if it isn't completely aligned but the closer the better.

The GNSS antenna comes with a stainless-steel Mast/Rail bracket that can be clamped to a horizontal or vertical pole as shown in figure 23 27.

To attach the antenna to the mounting pole, first put the nut and the ring on the thread, then screw on the antenna. Point the antenna so it is in line with the ship's main axis and fix it in position using the nut.

Figure 23: GNSS mounting bracket

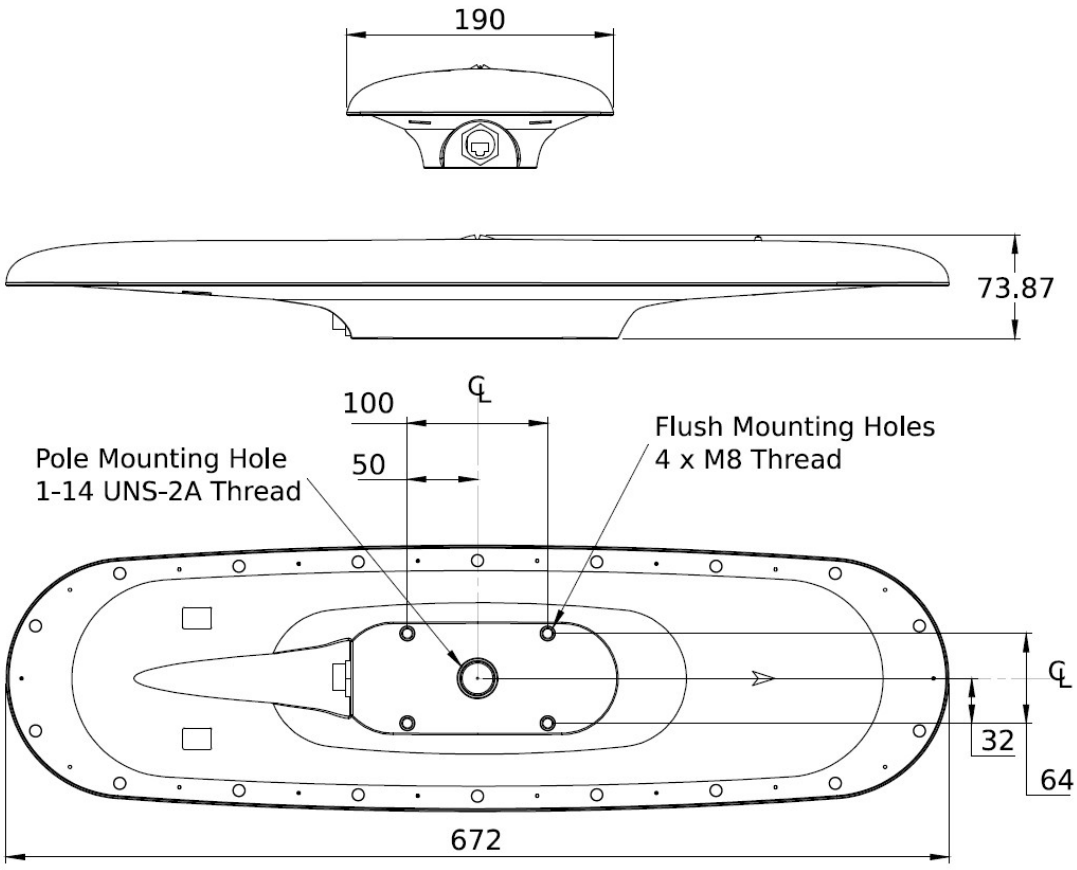


Figure 24: Mechanical drawing of GNSS Compass

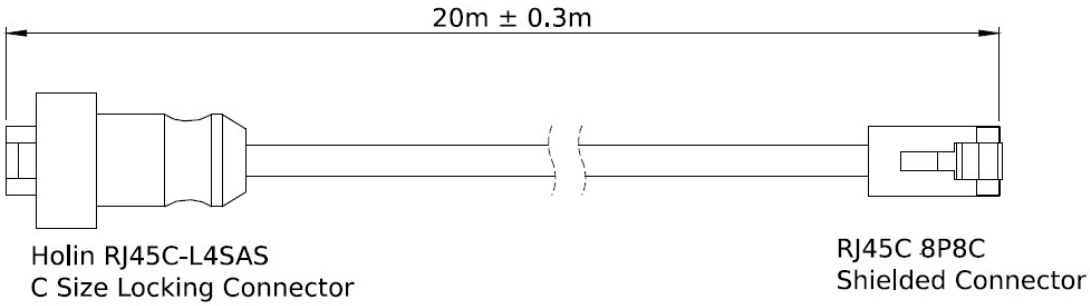


Figure 25: GNSS Ethernet Cable

7.5 Connecting the parts

The VM Coastal Series basically consist of three parts: a VM-ADCP, the Advanced Navigation GNSS and a Processing Unit. The Processing Unit is build up out of two layers. The bottom layer is the interface box, the top layer is the pc. The interface box contains all necessary interconnections and power supplies for the other parts.

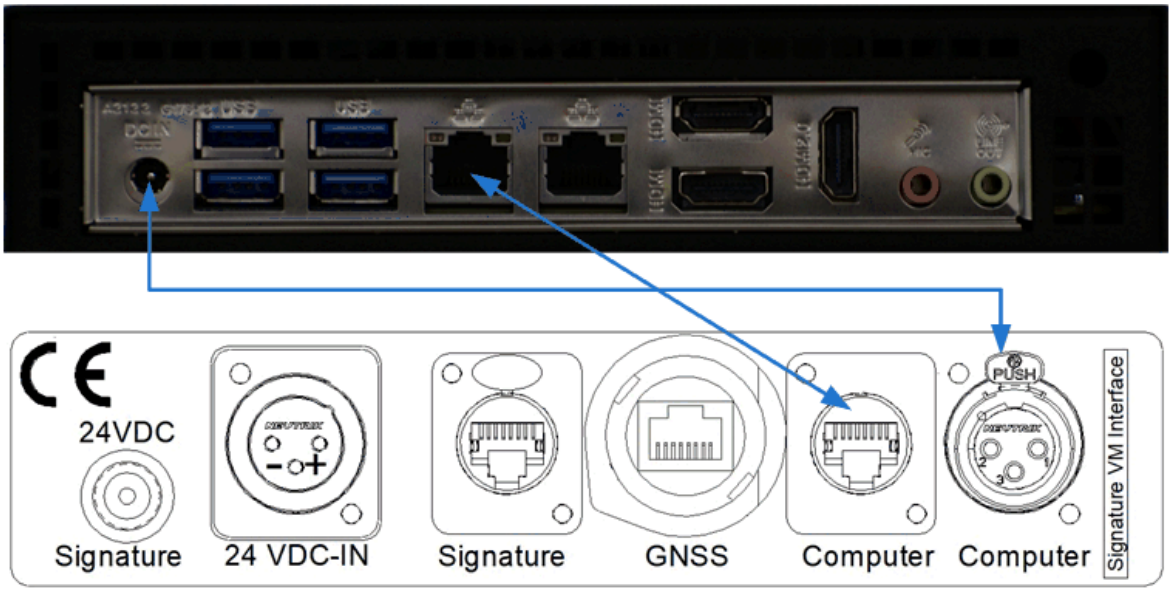


Figure 26: Connecting the interface (Version 3) to the PC

Note that only one ethernet port on the PC is configured to connect to the Nortek VM Interface. The system will not work if this is connected to the wrong port!

The second ethernet port may be connected to the local network and is only used to access the internet.

7.5.1 Interface

The Nortek VM interface provides power to the VM-ADCP sensor and GNSS and has all necessary interconnections between the different parts. Version 3 of the interface is only available in the 24 V DC version.

The 24 VDC version is powered through a 3 Pin XLR connector. Use a suitable power lead with a 3-pin female XLR connector. (Neutrik model NC3FXX-B)

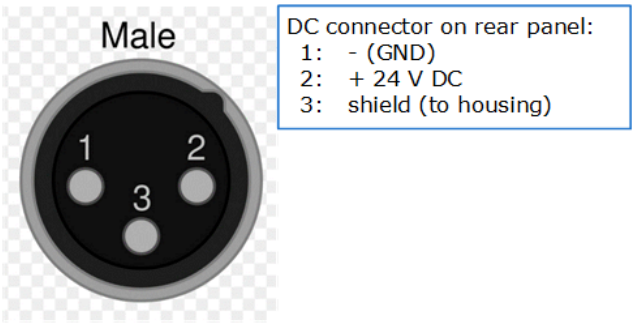


Figure 27: 24 V DC Connector pins

The unit is reverse polarity protected, so reversing the power lines will not damage it. Units built before 2020 have a fuse on the rear-panel, later models have an internal, resettable fuse.

The unit will work with any voltage between 9 and 36 VDC, but 24 VDC is preferred.

7.5.2 Connecting the VM-ADCP sensor

The VM-ADCP sensor is connected through its Ethernet interface. This is the 6-Pin connector on the sensor. The 8-Pin connector is not used in this configuration and should be fitted with a 'dummy' connector. When using a ground lug it should be connected to the 8-Pin connector.

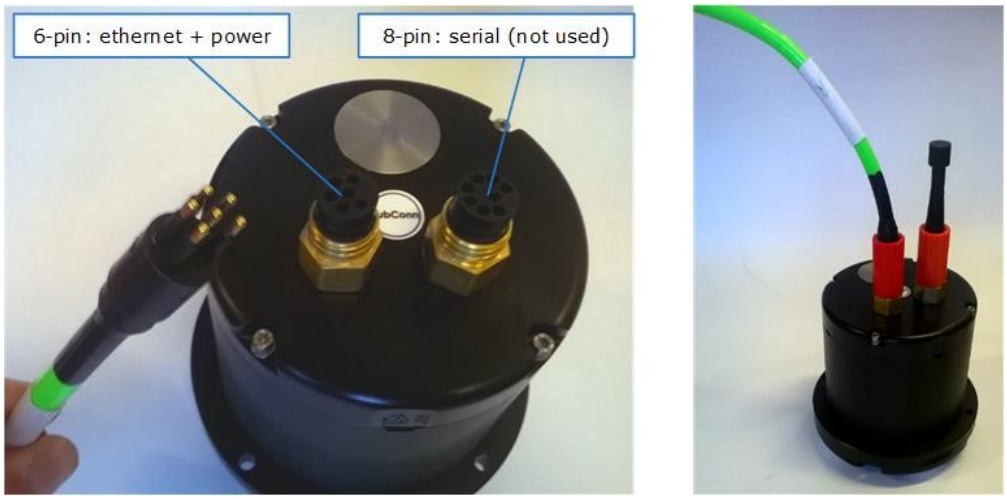


Figure 28: Nortek VM sensor connections

When mating the SubConn connectors pay attention to the following guidelines:

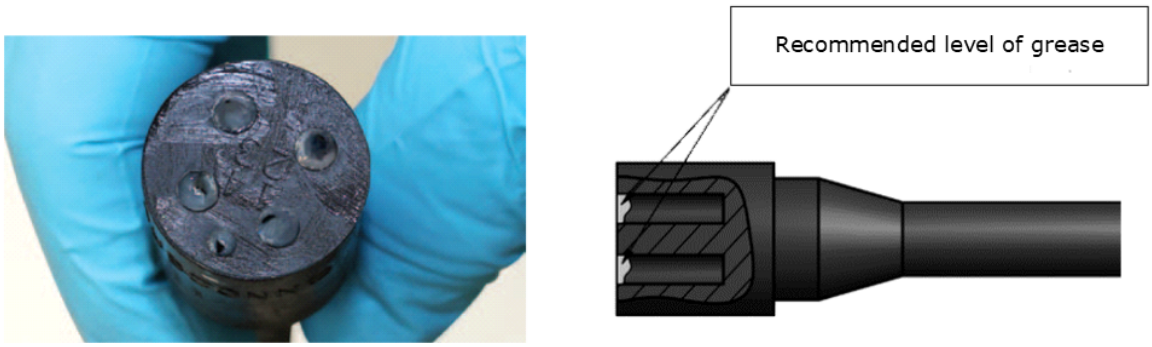


Figure 29: Greasing the connector

The other end of the power-signal cable has a metal shield Ethernet connector that fits the connector on the rear of the Interface Box. Insert the connector until it clicks into lock. To release the connector, press the 'PUSH' lever and gently pull the connector housing.

The standard VM-ADCP cable comes with a simple jack plug. On the interface that power is supplied through a DC-Power plug with locknut. An adapter cable is supplied to connect the standard VM-ADCP cable to the interface. Lock it by tightening the nut.

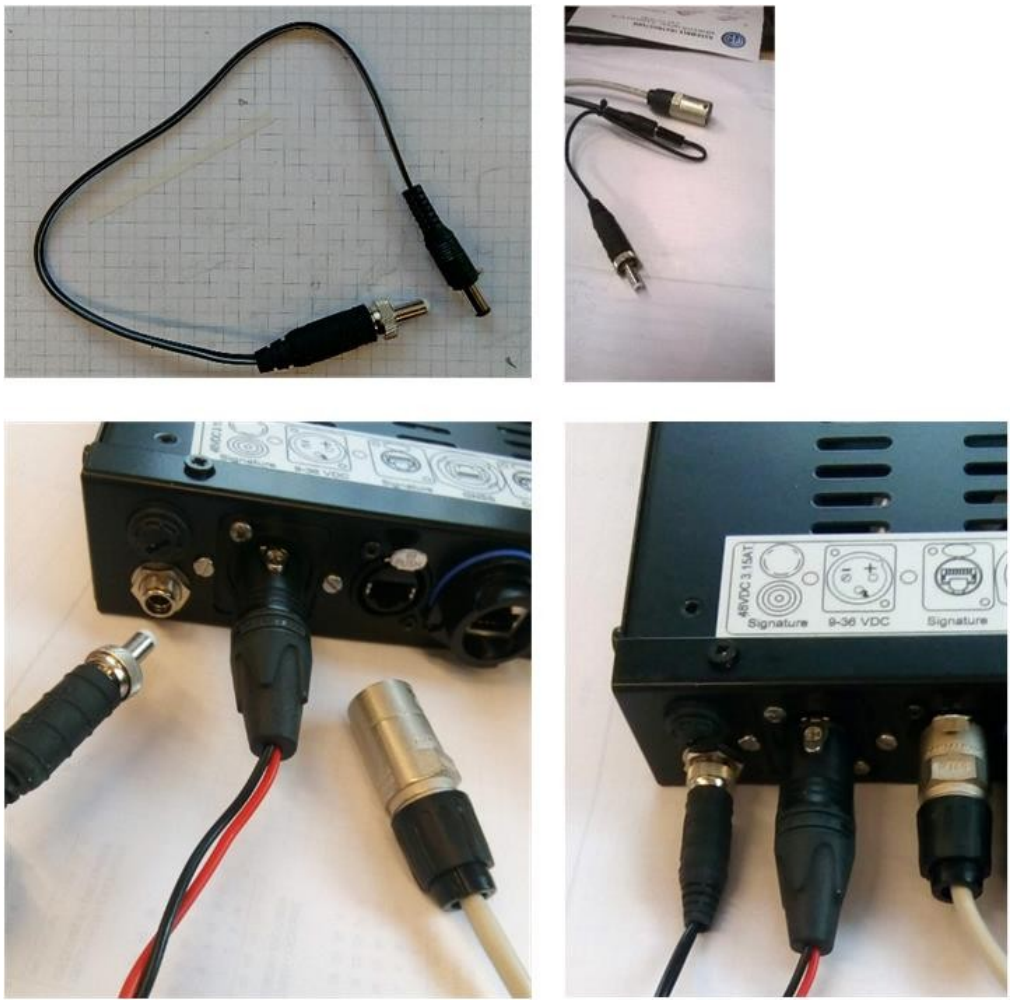


Figure 30: VM-ADCP power and data connection

7.5.3 GNSS connection

The GNSS is supplied with a 20 m Ethernet cable. One end has a small plastic connector with a bayonet lock which goes to the GNSS unit.

When connecting first check the orientation of the Ethernet connector. Then push in while holding the plastic locking-ring. Push the ring while turning it clockwise until it clicks to lock. It is a bayonet lock, so it should not need more than a 30~40 degrees rotation. This may take considerable force, and it is best to use the supplied 'Connector wrench'.

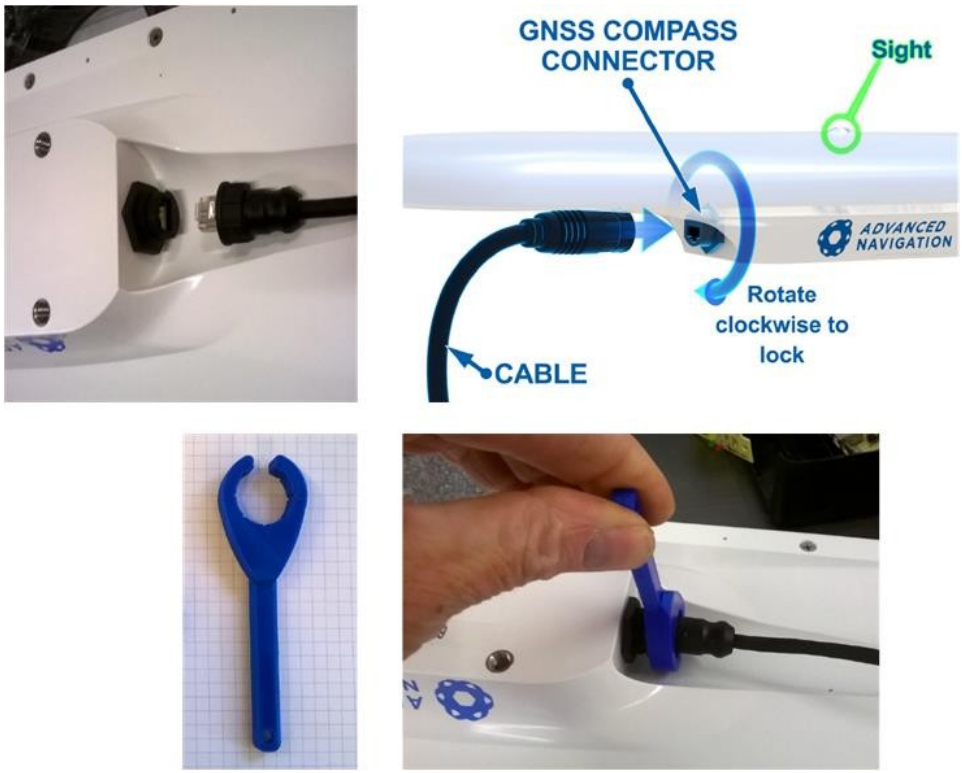


Figure 31: Connecting the GNSS connector

The other end of the cable has a large plastic Ethernet connector that fits the one on the rear of the interface box. This bayonet lock may be difficult to lock when new.
Power to the GNSS is supplied through the Ethernet cable, so no additional power connection is needed here.

Figure 32: Connecting the GNSS to the Interface Box

7.5.4 Processing Unit connections

Next to the GNSS connector is the main Ethernet port and a power connection. Both must be connected to the Nortek VM Processing Unit.

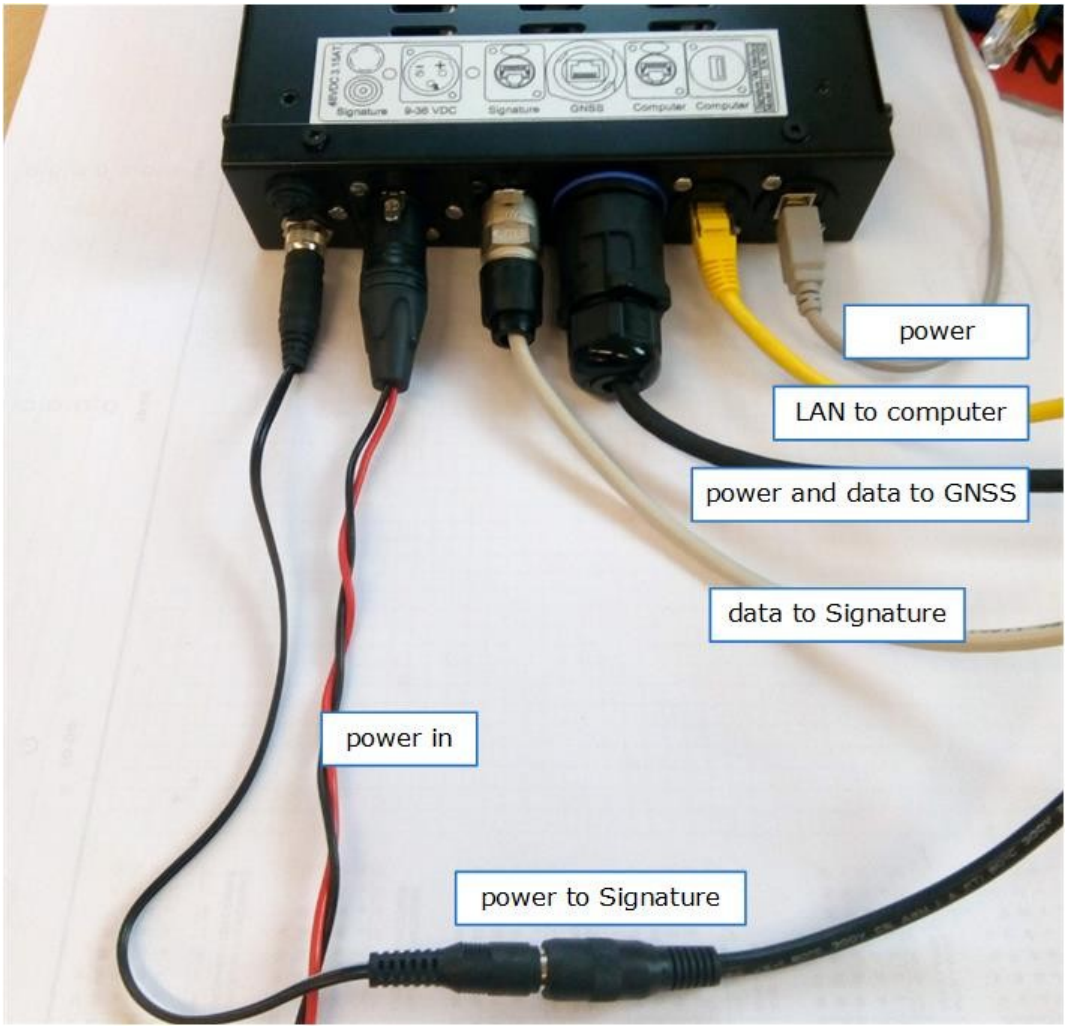


Figure 33: All interface connections

7.5.5 Power on

Switch on the interface first, then switch on the Processing Unit by pressing the main button on the front-panel for a second and then releasing it.

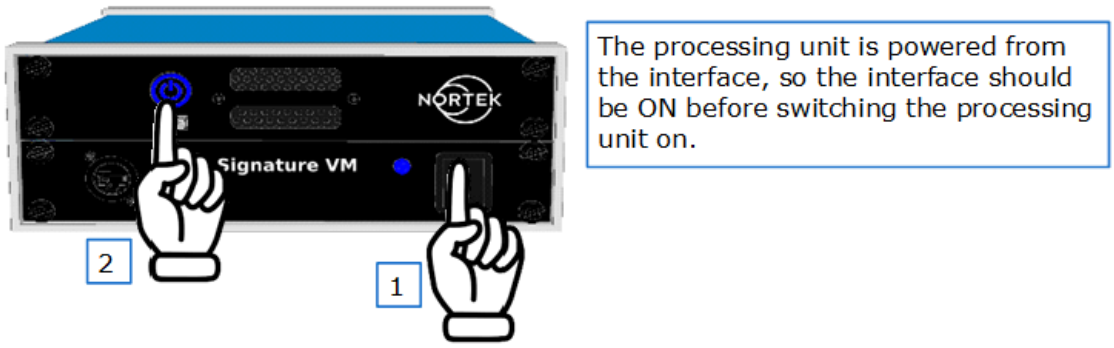


Figure 34: Switching the system on.

7.5.6 Power off

When powering the system off, first switch off the Processing Unit using the 'power down' menu, or by using the switch. Then switch off the interface.

7.6 Connecting to the Processing Unit

Though it is possible to connect to the Processing Unit using a keyboard/mouse/monitor, the general idea is to use a Remote Desktop connection from a laptop. (Not supplied with the system.)

Any computer that can run a Remote Desktop client can be used to connect to the system. Remote Desktop clients are available for Windows, Macintosh, and Linux.

The client computer can be connected to the Ethernet connector on the front panel of the interface and configured as follows.
(Note: figure 35 34 shows a configuration example for Windows 10.)

- First make sure the Ethernet adapter is configured to 'Obtain an IP address automatically'. (Control Panel->Network and Internet->Network Connections; see figure 35 34.)
- Now connect the client computer to the interface, and then open 'Remote Desktop'. (Hit the 'Windows' key, and just type 'Remote Desktop'.)
- The address of the Nortek VM PC is fixed to 192.168.100.1. The username is 'SurveyVM'. You can now click 'Save As' to save this connection for later. (See figure 36 35.)
- Click connect. If all is correct, a popup will appear asking for the password. The password is 'SurveyVM'. Once connected the screen of the Nortek VM Processing Unit will appear (see figure 37 35).
- You can select between a 'Light' or 'Dark' desktop by pressing the Windows-Key and typing: themes. In the themes settings menu you can now select the theme you like best. (See figure 38 36.)

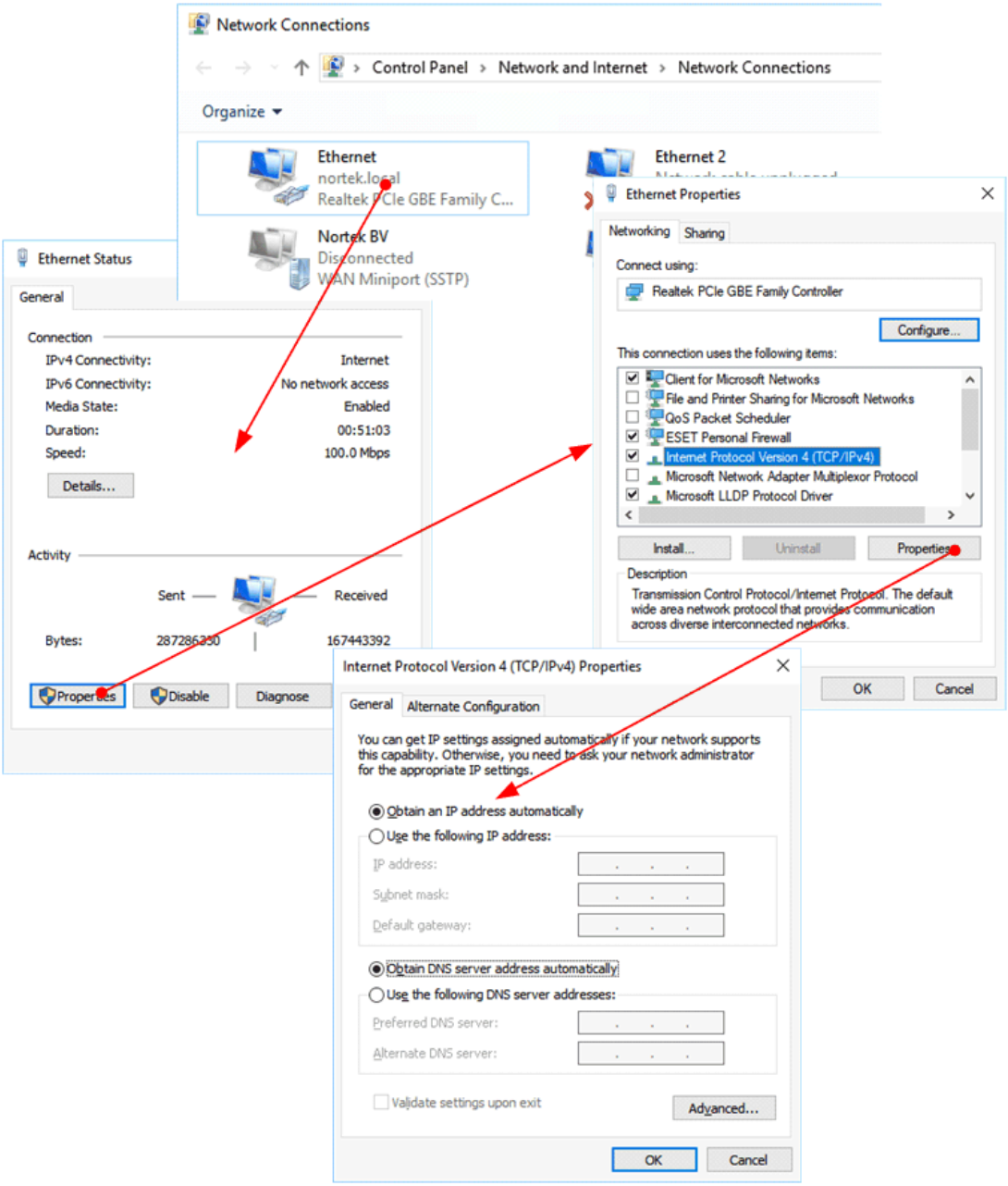


Figure 35: Configuring Windows for use with the remote desktop connection

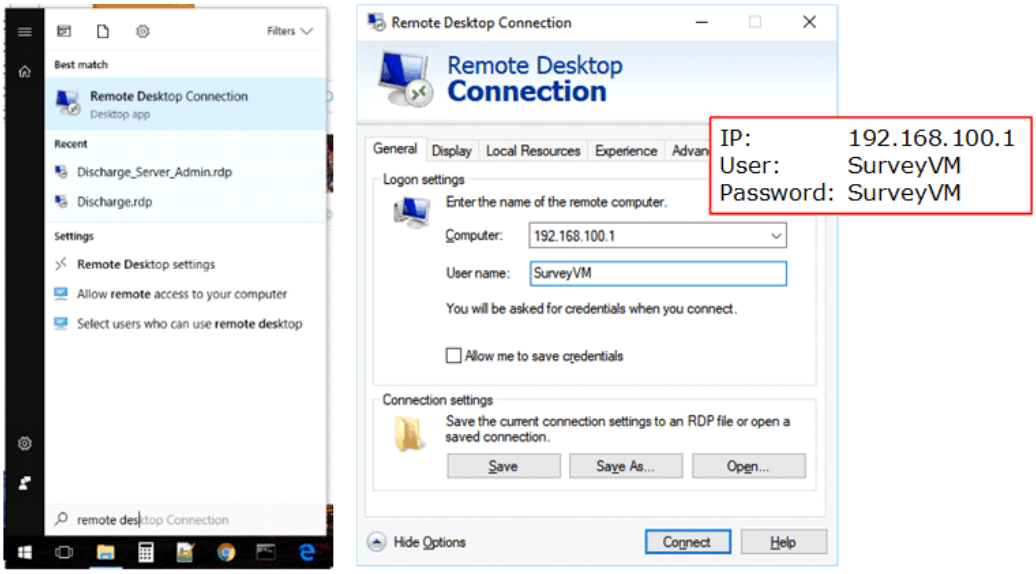


Figure 36: Setting up remote desktop

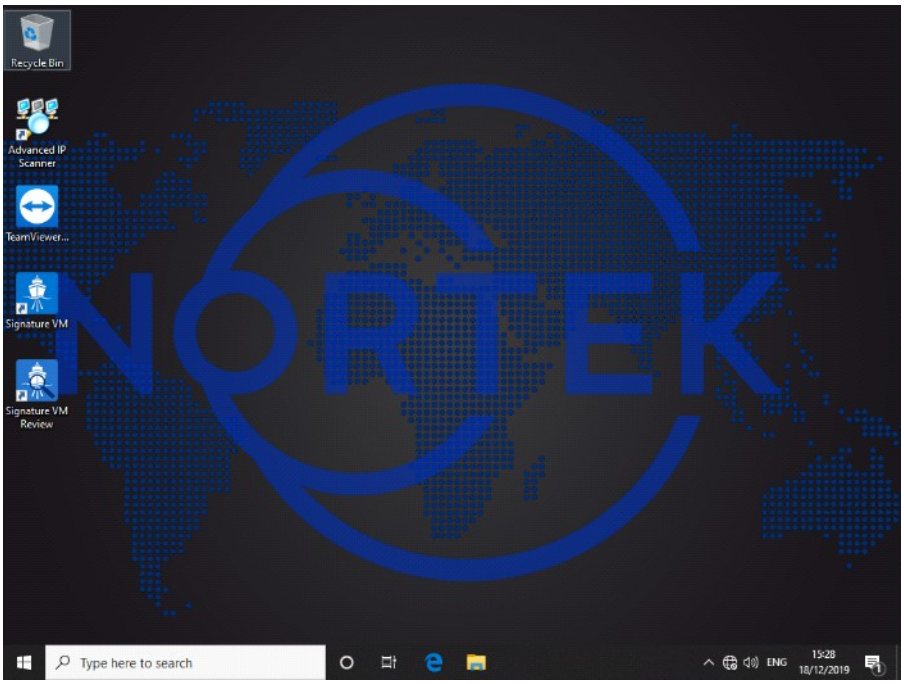


Figure 37: Dark theme

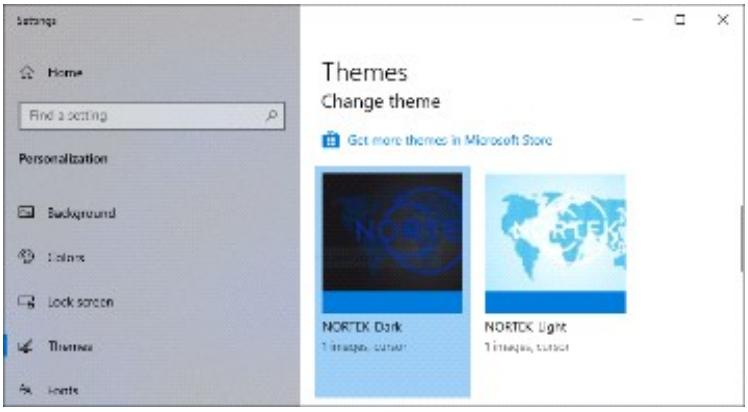


Figure 38: Desktop theme selection

7.6.1 Acquisition software

The Processing Unit should have Nortek VM Acquisition pre-installed. Please use the software manual (included with the software) to proceed connecting to the instruments and start measuring.

7.6.2 Processing Unit configuration

The Processing Unit is configured to work as a standalone unit. No connection to an external network or the internet is required.

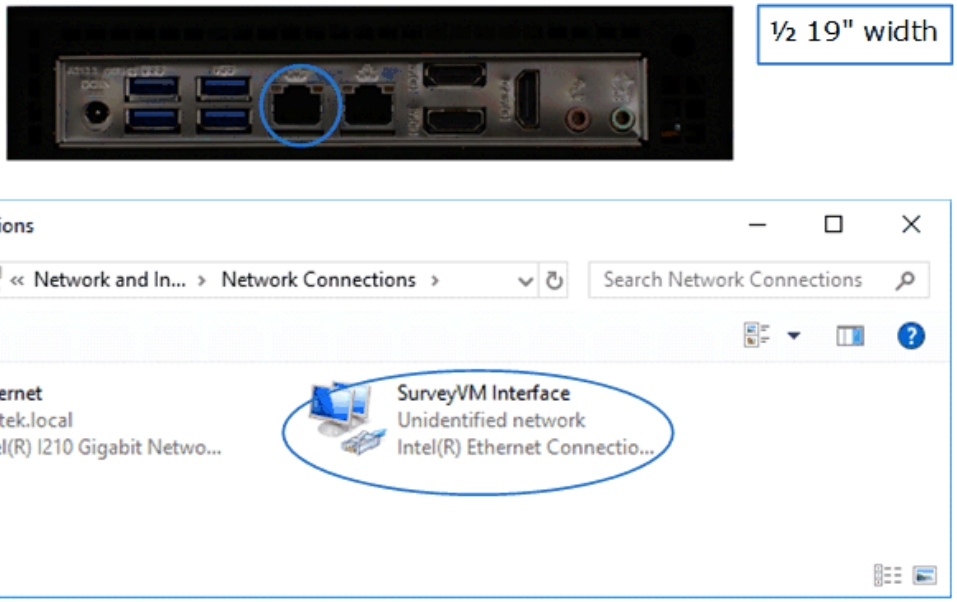


Figure 39: Network interface "SurveyVM"

Two Ethernet ports are available. One is named 'Ethernet' and is a general-purpose port that may be used to connect to internet.

The port named 'SurveyVM Interface' is set to a fixed IP address: 192.168.100.1. This port is connected to an Ethernet switch inside the interface box, and the sensors are connected to this switch.

An OpenDHCP server is running on the Processing Unit as a service. This is configured to use only the 'SurveyVM Interface' port so DHCP will only work on this port, and addresses used will always be in the range 192-168.100.1 to 192-168.100.254

OpenDHCP was added to the Windows firewall as an allowed application.

Both the VM-ADCP sensor and the GNSS are set to 'DHCP' so they will get an address from the Processing Unit when connected to the 'SurveyVM Interface'.

Remote Desktop is enabled, and this is explicitly bound to the 192.168.100.1 address, so it will only work if a computer is connected directly (or through a switch) to the 'SurveyVM Interface' port. Remote Desktop is not possible over the 'Ethernet' port.

7.6.3 Enable Remote Desktop from the other network

As mentioned above, the Remote Desktop connection is limited to be used from a computer connected to the interface, because it is explicitly limited to use only the network adapter with IP address 192.168.100.1.
If a Remote Desktop connection is required from the rest of the network, you should disable this rule.
Click the Windows key and type 'Firewall'. In Firewall, select 'Inbound Rules', and find the settings for 'Remote Desktop – User mode (TCP-in)' and 'Remote Desktop – User mode (UDP-in)'

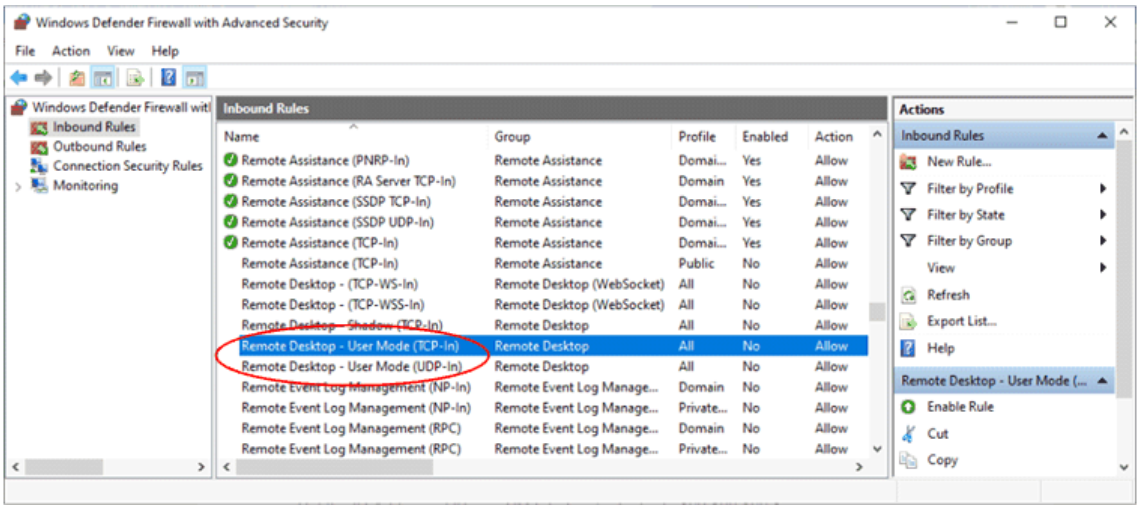


Figure 40: Firewall configuration for Remote Desktop

To change the settings, double-click on the settings, and, on the tab 'Scope', change the Local IP address to 'Any Address'. Click OK to confirm, and repeat for the other setting as well.

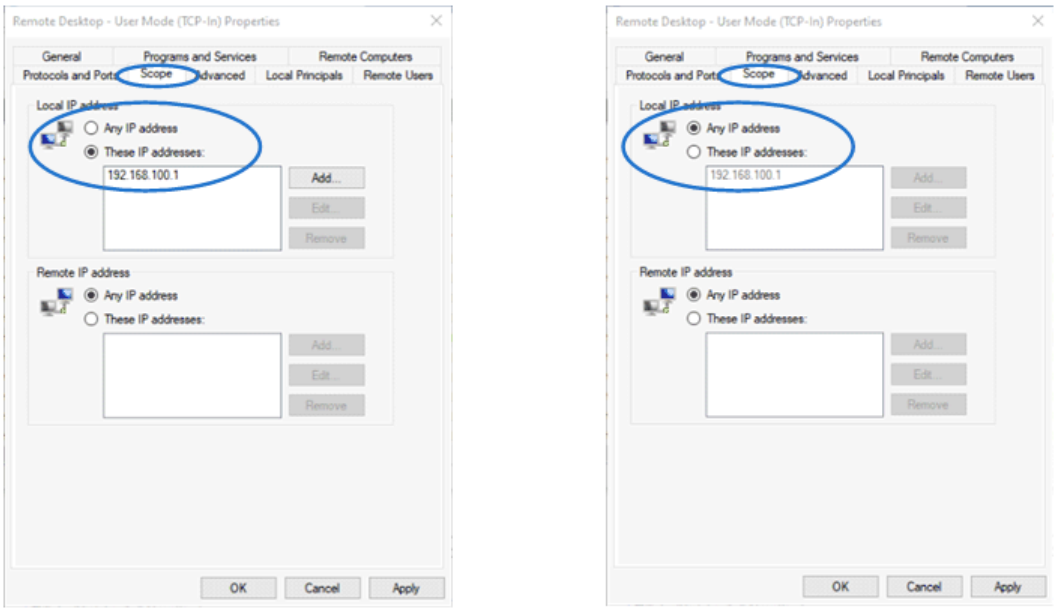


Figure 41: Firewall rule for Remote Desktop

From now on, anybody on the main network can also access the Remote Desktop.

7.7 GNSS

The Advanced Navigation GNSS Compass can be monitored and configured through its internal web-interface. Some settings require the user to enter a username and password. The default settings are:

Username : admin
Password : password

The older version 1 hardware of the GNSS instrument came in two variants: a standard (LC) and a High Accuracy (HA) version. Both offer the same accuracy in heading, roll and pitch, but the HA version has a more accurate horizontal and vertical position.

As of end 2021, a new hardware version 2 of the GNSS combines both options in a single package.

7.7.1 Filter setting

Standard filter setting on the GNSS is 'Small Boat', which is shown to work fine with most survey vessels. Should the system be used on larger vessels it could be set to 'Ship'. Note that changing the filter settings will not alter the response or lag of the measurements, it just helps the instrument to find a fix by giving it some information on the expected movements.

7.8 Troubleshooting

If there are any issues with the setup, a good first step is checking connections.

7.8.1 Communication

The blue LED indicator light on the instrument is not lit

- Is the instrument in Command mode?
- Does the LED blink (short) when applying power?

Cables are often exposed to heavy use and the power connector might break. Using a multimeter to ping through each pin may reveal a breakage.

7.8.2 Power

7.8.2.1 Interface does not switch on

First check the status of the fuses on the rear.
Inspect the fuses or measure them using a multimeter. Replace if necessary. Both fuses are 5x20 mm glass fuses, 1.6A, Slow Blow.

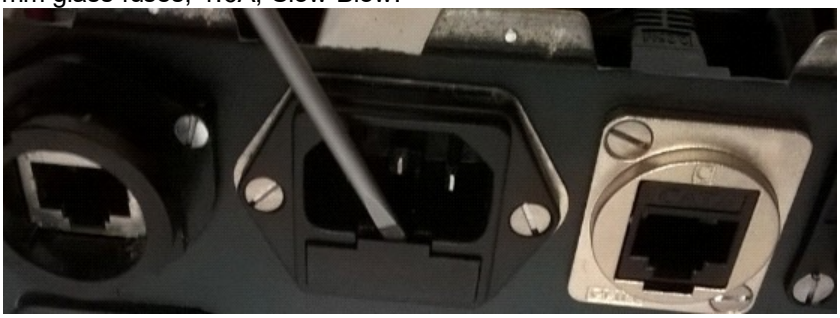


Figure 42: Mains fuses

7.8.2.2 Power to the Signature sensor

The VM-ADCP is powered from the 48 V power supply in the interface box. The exact same power line is used for the 'Power LED' on the front panel, so if this is LED is lit, there is power.

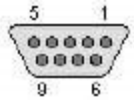
7.9 Connector pin configurations

Note that the connectors present on an instrument depend on the instrument model.

Table 3: 6-pin connector, stand alone, ethernet (N2550-003, N2550-008)

Connector on the instrument side	Pin nr	Function	Wire color	Joint	Wire color	Pin nr	Connector on the computer side
MCIL6M with MCDLS-F (red) Male face view: 	1	Gnd	Black		Black	Jacket	2-pin jack plug
	2	Pwr+	Red		White	Center	
	3	Rx-	White		Green	6	RJ 45 insulation connector
	4	Rx+	Blue		Green/White	3	
	5	Tx-	White		Orange	2	
	6	Tx+	Orange		Orange/White	1	

Table 4: 8-pin connector, serial communication, RS232 and RS422 (N2550-001)

Connector on the instrument side	Pin nr	Function	Wire color	Joint	Wire color	Pin nr	Connector on the computer side
MCIL8M with MCDLS-F (red) Male face view 	1	Gnd	Black		Black	Jacket	2-pin jack plug
	2	Pwr+	Red		White	Center	
	3	RS232 Tx / RS422 Tx-	White		Red	2	9-pin DSUB Female face view 
	4	RS422 Tx+	Blue		White	8	
	5	RS232 Rx / RS422 Rx+	White		Orange	3	
	6	RS422 Rx-	Orange		Purple	7	
	7	Sync A	White		Blue	1	2-Pin Terminal block
	8	Sync B	Green		Black	2	

*) GND on pin 1 on instrument side, pin 5 on DSUB and on Jack Plug (jacket)

8 VM Ocean and Operations

The Nortek VM Ocean and Operations series are delivered with a junction box and processing unit.
The junction box is typically installed in a close distance of the VM-ADCP, close to the inlet of the cable conduit. The processing unit is typically installed in the server or survey room of the vessel.

Nortek's Ocean series VM-ADCP cables and the all the VM Operation systems supplied with a bottom-penetration unit (seavalve) are fitted with a Subcon™ underwater connector on both ends which allows the VM-ADCP to be in water serviceable using diver assistance. The Subcon™ cable connects the VM-ADCP with the Junction Box.

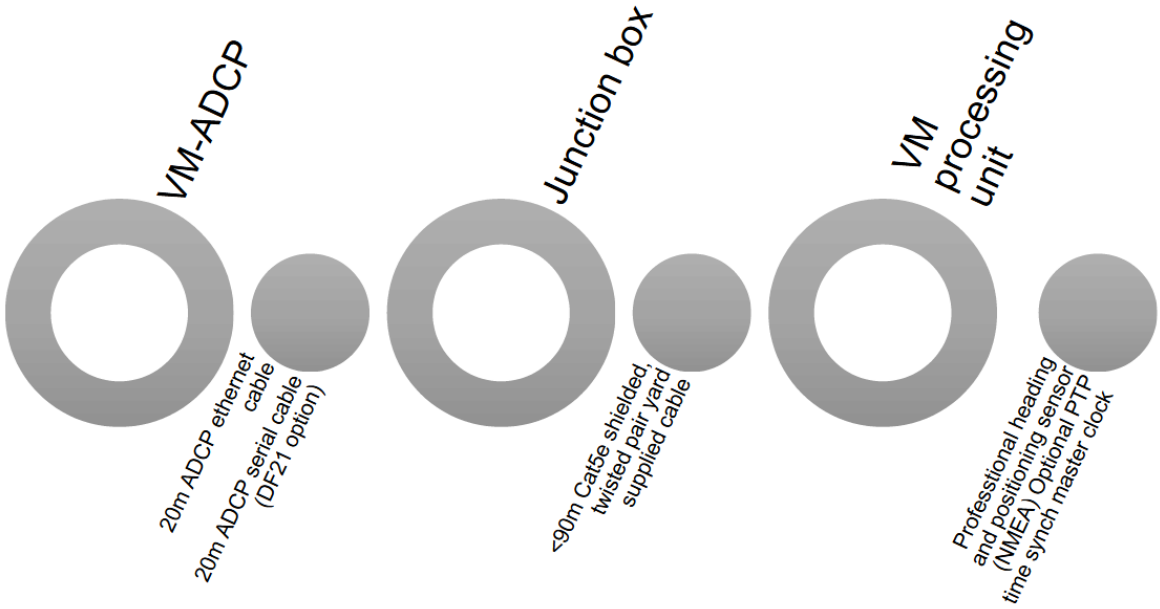


Figure 43: Schematic of Nortek VM Ocean set-up

8.1 Junction Box

The Junction Box is typically wall mounted close to the VM-ADCP sensor head. The junction box may also be mounted on top of the bell housing of the optional bottom penetration unit. Please consult the installation manual of the single or double bottom penetration unit for more information. The Junction Box provides the connection to the VM-ADCP on the one hand, and an ethernet connection to the processing unit and a mains connection on the other hand. The junction box also supports serial output for the licensed Nortek proprietary bottom-track format DF21 over serial (RS422). This optional serial output is intended to forward data to INS systems and is based on one way communication. Serial cables should be kept as short as possible and baud rate settings as high as possible to avoid any data delays. The Junction Box requires 75W, 100-240VAC noise free power source from the vessel and a yard supplied standard AC power cable.

Depending on the ADCP type and assembly the junction box has a slightly different layout. There are 3 different versions of the junction box:

1. VM Operations 333 kHz i.c.w. a Nortek sea valve assembly
2. VM Operations 333 kHz without sea valve assembly
3. VM Ocean 100 kHz or 55 kHz without sea valve assembly

The main difference is in the connections between the ADCP and the junction box. The functionality is the same. Please see the diagrams of the different versions in figures 45 42, 46 43, and 47 44 on the next pages. Please note that Subcon™ connectors should be greased, see Connecting the VM-ADCP sensor 29.

The delivery of the system does not include an ethernet cable to connect the junction box and the processing unit; this ethernet cable must be yard supplied. We recommend LAN CAT5e as a minimum, preferably LAN Cat5e with shielded twisted pairs, for example (marine approved) Prysmian/Draka ICS IE ToughCat 5e cable.

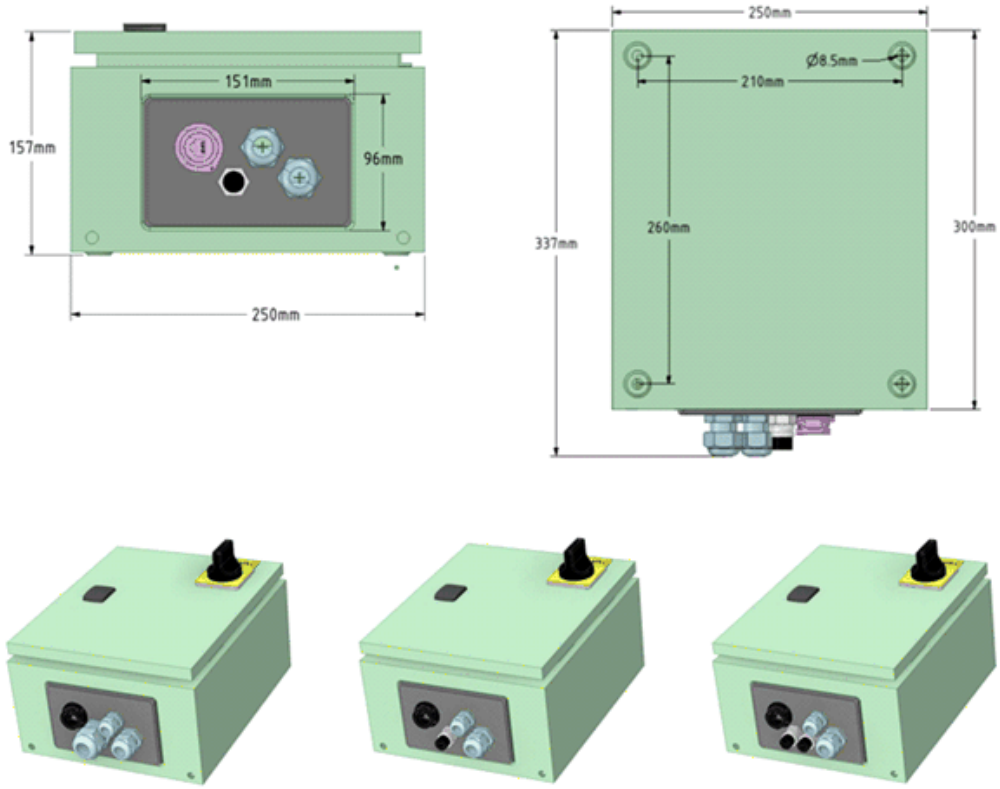


Figure 44: Junction box dimensions. The cable connection plate differs with the type of ADCP sensor or set-up. Bottom left 333 kHz sea valve version, bottom middle standard 333 kHz version (without sea valve), bottom right VM Ocean/Operation series version (100 & 55 kHz)

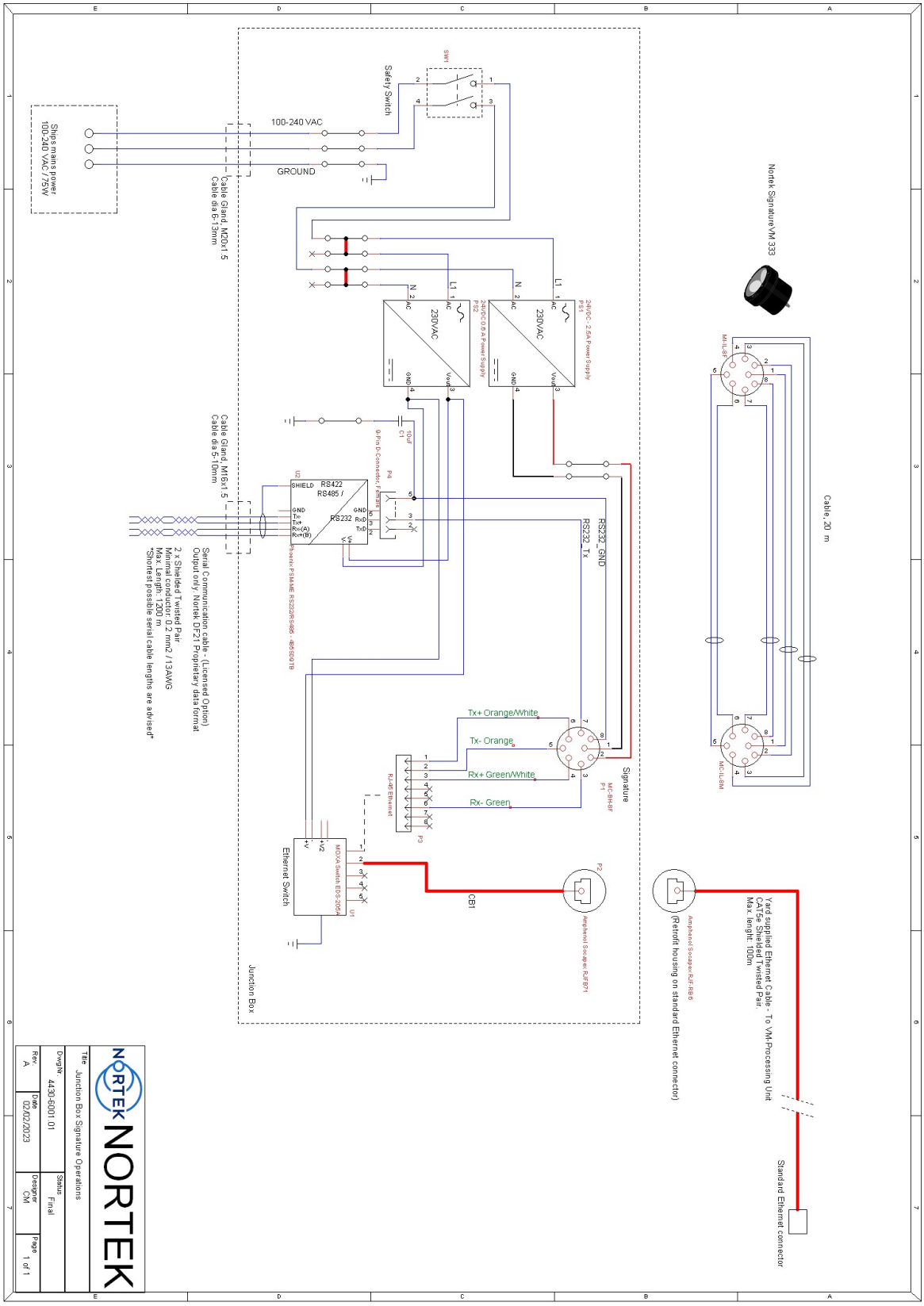


Figure 45: Junction box schematic drawing 4430-6001.01 Junction Box Signature Operations without sea valve assembly

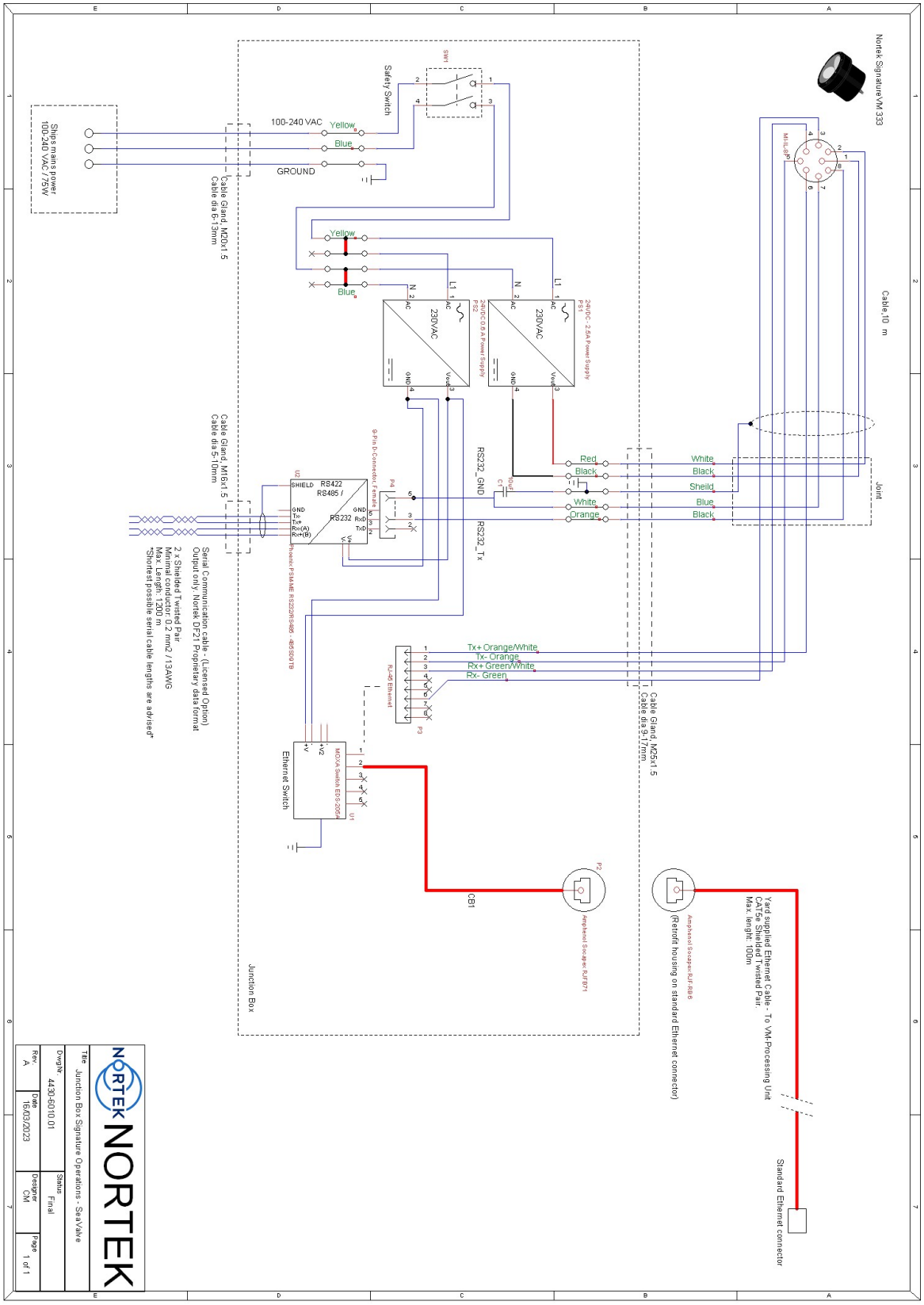


Figure 46: Junction box schematic drawing 4430-6010.01 Junction Box Signature Operations SeaValve 333 kHz unit with sea valve assembly

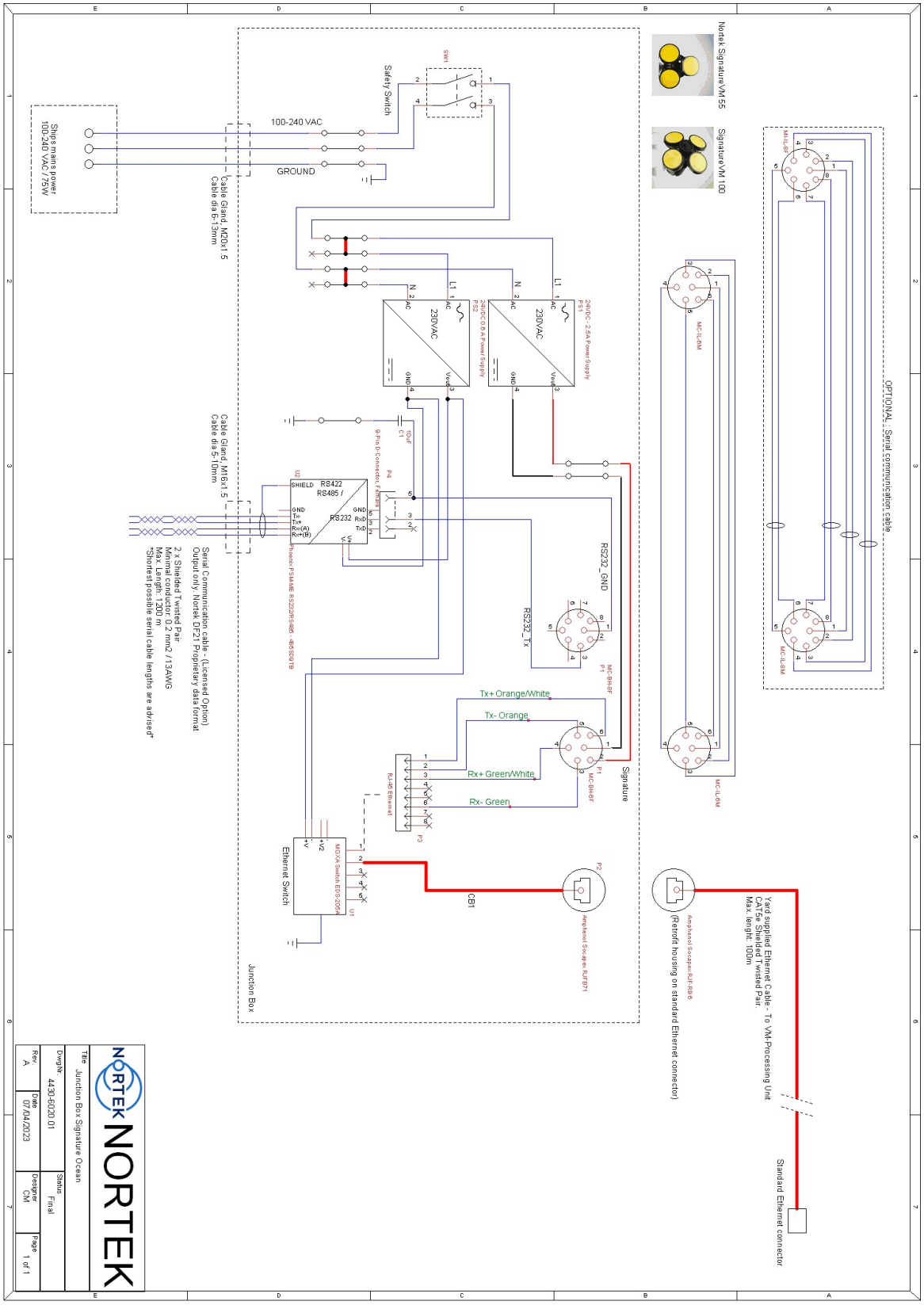


Figure 47: Junction box schematic drawing 4430-6020.01 Junction Box Signature Ocean (100 and 55 kHz) without sea valve assembly

8.2 Processing Unit

The Nortek VM Processing Unit is designed to be fitted in a 19" survey rack inside a conditioned room. The Processing Unit requires input of a professional grade NMEA heading and GNSS sensor using either a serial or Ethernet connection. The Nortek VM Acquisition software is pre-installed and the included manual provides more information about connecting to the instruments. The unit can be controlled directly using a yard supplied keyboard, mouse and monitor. It is also possible to operate the system remotely using a Remote Desktop connection or a yard supplied KVM switch.

Figure 48: Nortek VM Processing Unit

The second ethernet port at the back of the Processing Unit may be connected to the local network and is only used to access the internet. Please note that for compliance with IEC 61162-450 this port must not be connected with the vessel's bridge network.

Table 5: Nortek VM Processing Unit dimensions and connections, version 4420

Housing	19" rack-mountable 2HE
Dimensions	482x88x400 mm
Input	100-240 V AC, 100 W Max.
Total weight	5 kg
Connections	Power, VM-ADCP LAN, 2x DisplayPort, 1x LAN, 1x LAN for Remote Desktop, 2x USB, 4x RS232|RS422|RS485 configurable port.

Please inquire Nortek for the latest specifications of the Processing Unit within your delivery. Exact deliveries might vary and may be updated and/or depending on availability of components.

8.2.1 Connecting to the Processing Unit

Though it is possible to connect to the Nortek VM Processing Unit using a keyboard, mouse and monitor, the general idea is to use a Remote Desktop connection from another computer (not supplied with the system).

Any computer that can run a Remote Desktop client can be used to connect to the system. Remote Desktop clients are available for Windows, Macintosh, and Linux.

The client computer can be connected to the Ethernet connector on the front panel of the interface. Note that only the front Ethernet connector can be used, the system will not work if this is connected to the wrong port! The client computer connecting through this port needs a fixed IP address in the 192.168.100.xxx range.

With a Windows 10 computer, the configuration steps to set a fixed IP address follow. (Note: you will need an account with Administrator privilege for this.)

First select your Ethernet adapter (via Settings → Network & Internet → Change adapter options, under Advanced network settings). With your Ethernet adapter selected, you can then either click the ribbon-button "Change settings of this connection", or right-click and select Properties from the pop-up context menu, or double-click it and in the subsequent Status dialog window click the Properties button. (This is the point where you may need to select a local Administrator account if your normal account does not have Administrator privileges.)

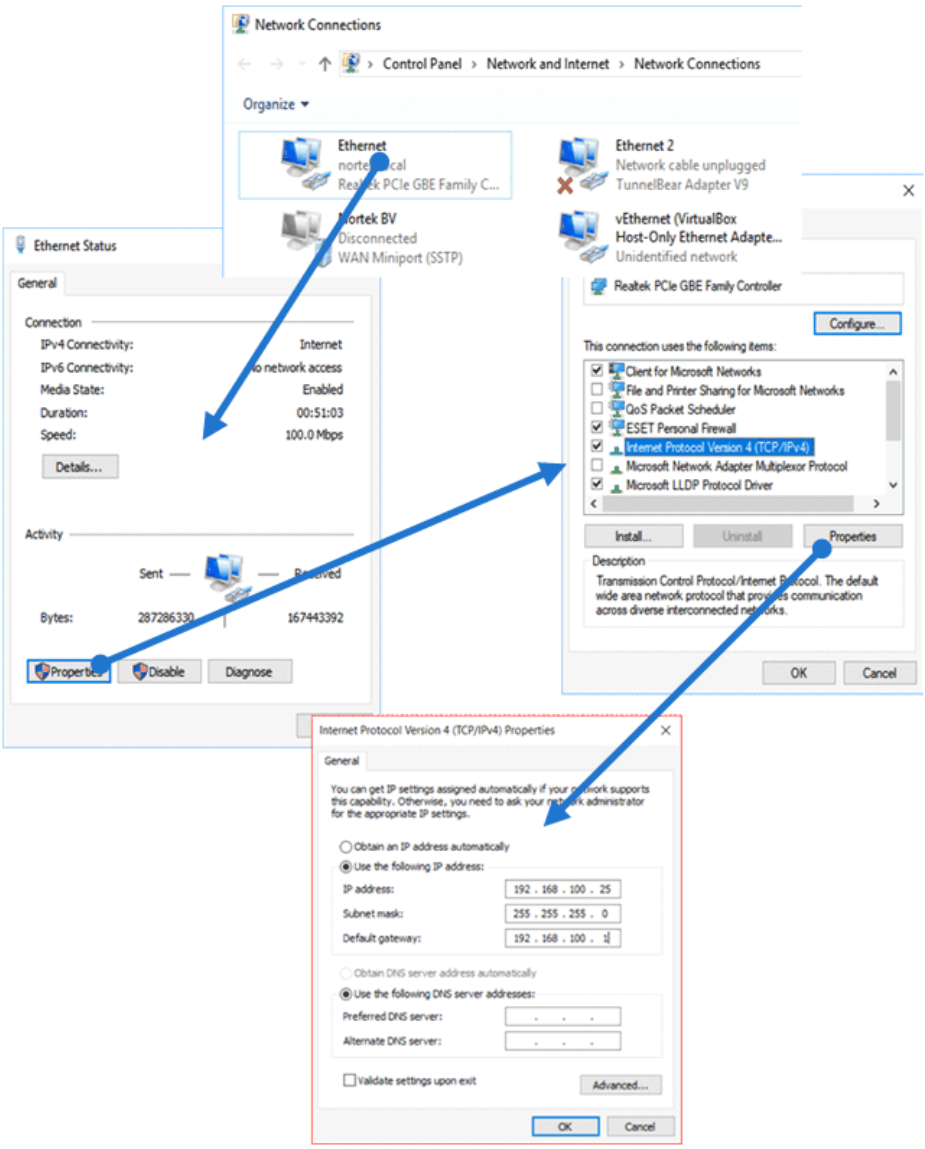


Figure 49: Configuring Windows for use with the Remote Desktop connection

In the "Properties" window, select "Internet Protocol Version 4 (TCP/IPv4)" and click the "Properties" button. In the next Properties dialog window, on the "General" tab, select "Use the following IP address", and fill in: IP address: 192.168.100.25, Subnet mask: 255.255.255.0, and Default gateway: 192.168.100.1. (In fact, you can fill in any IP address in the 192.168.100.xxx range, as long as it is not one of the IP addresses already in use, i.e., as long as it is not 192.168.100.1, 192.168.100.2, or 192.168.100.222).

Figure 49 illustrates the sequence of dialog windows for these steps, from the point "with your Ethernet adapter selected" on, via the double-click variant.

After this, close all the dialog windows via the appropriate "OK" or "Close" buttons.

Now connect the client computer to the interface, and then open 'Remote Desktop' (Hit the 'Windows' key, and just type 'remote desktop').

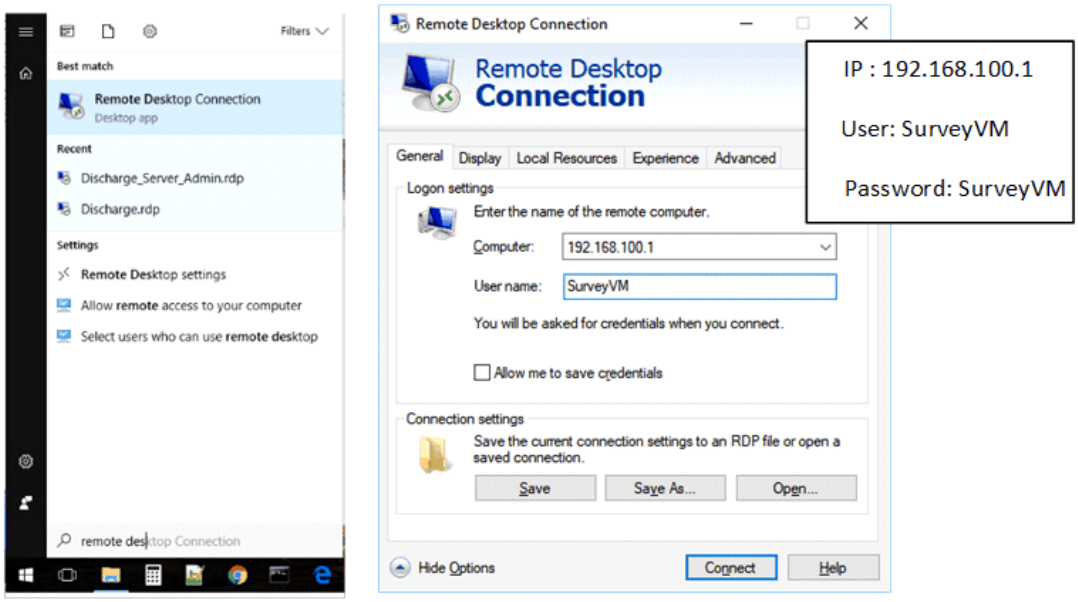


Figure 50: Setting up Remote Desktop

The address of the Nortek VM Processing Unit is fixed to 192.168.100.1. The username is 'SurveyVM'. You can now click 'Save As' to save this connection for later (see figure 50).

Click connect. If all is correct, a popup will appear asking for the password. The password is 'SurveyVM'. Once connected the screen of the VM Operations processing unit will appear (figure 51).

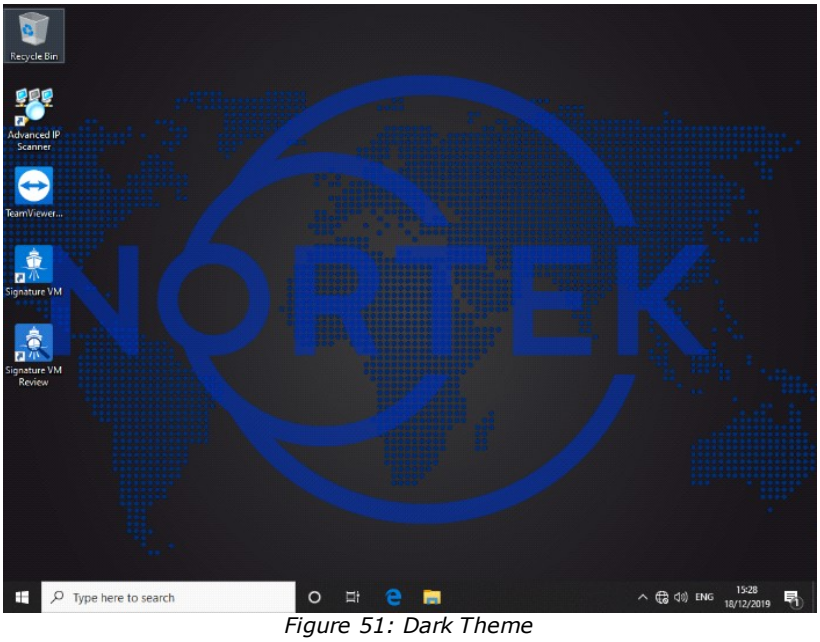


Figure 51: Dark Theme

You can select between a 'Light' or 'Dark' desktop by pressing the Windows-Key and typing: themes. In the themes settings menu you can now select the theme you like best (figure 52 48).

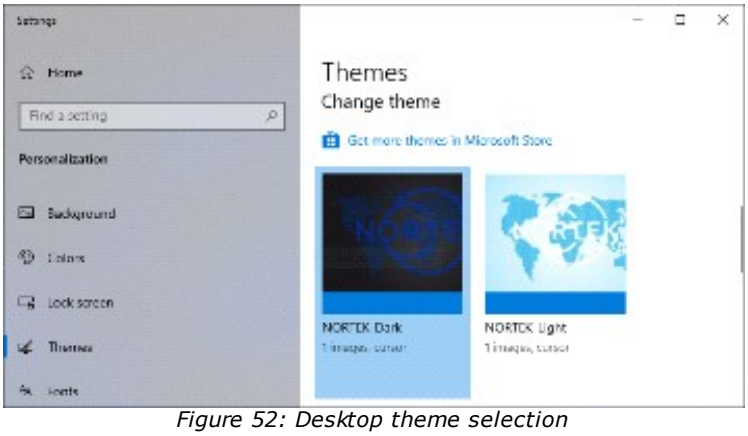


Figure 52: Desktop theme selection

8.2.2 Acquisition software

The Processing Unit should have Nortek VM Acquisition pre-installed. Please use the software manual (included with the software) to proceed connecting to the instruments and start measuring.

8.2.3 Processing Unit configuration

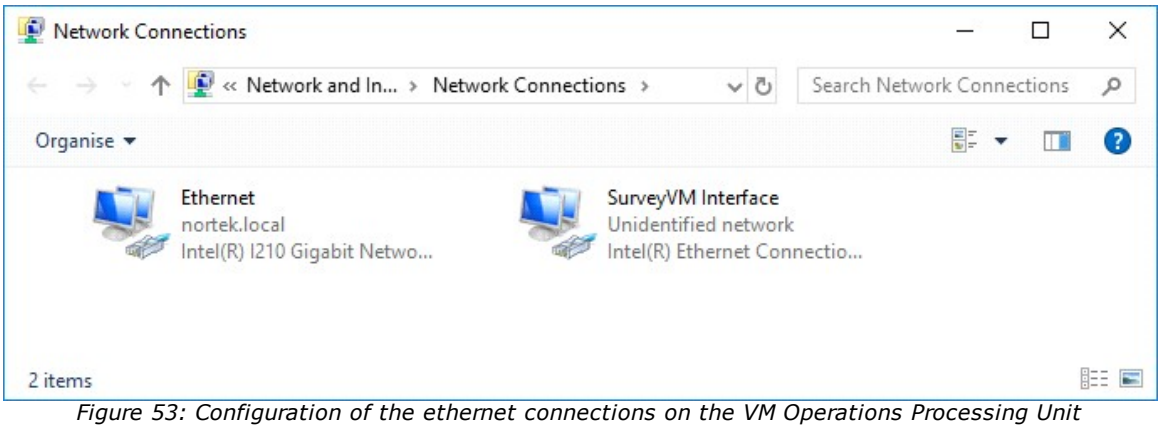


Figure 53: Configuration of the ethernet connections on the VM Operations Processing Unit

Two Ethernet ports are available on the back of the Processing Unit. One is named 'Ethernet' and is a general-purpose port that may be used to connect to the ship network.

The port named 'SurveyVM Interface' is set to a fixed IP address: 192.168.100.1. This port is connected to an Ethernet switch inside the processing unit. The VM-ADCP is connected to this switch (via the Junction Box). The network connector on the front of the processing unit is also connected to this switch. Do NOT use this network port to connect to the ship network !

Remote Desktop is enabled, and this is explicitly bound to the 192.168.100.1 address, so it will only work if a computer is connected directly (or through a switch) to the 'SurveyVM Interface' port, that is, to the network connector on the front of the processing unit. Remote Desktop is not possible over the 'Ethernet' port.

8.2.4 Enable Remote Desktop from the other network

As mentioned above, the Remote Desktop connection is limited to be used from a computer connected to the interface, because it is explicitly limited to use only the network adapter with IP address 192.168.100.1.

If a Remote Desktop connection is required from the rest of the network, you should disable this firewall rule.

Click the Windows key and type 'Firewall'. In Firewall, select 'Inbound Rules', and find the settings for 'Remote Desktop – User mode (TCP-in)' and 'Remote Desktop – User mode (UDP-in)'.

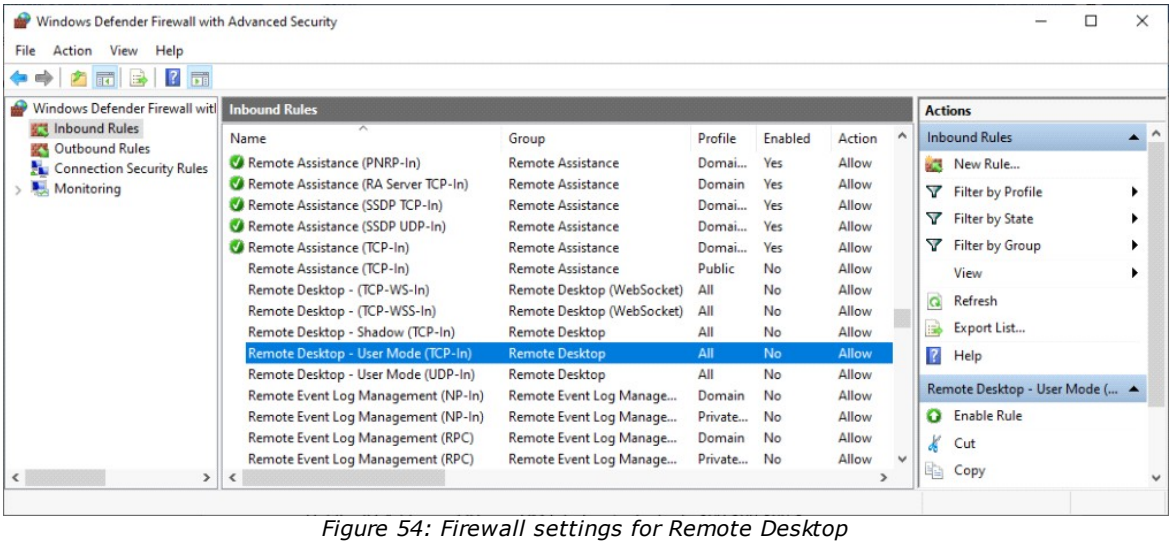


Figure 54: Firewall settings for Remote Desktop

To change the settings, double-click on the settings, and change the Local IP address to 'Any Address' (see figure 55 49). Click OK to confirm, and repeat for the other setting as well.

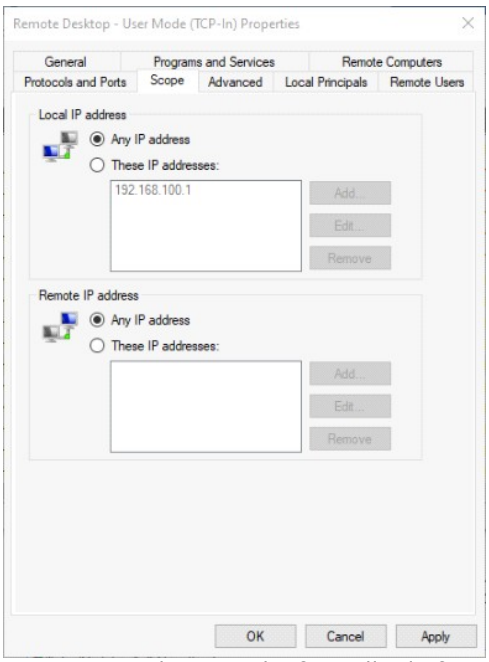


Figure 55: Changing the firewall rule for Remote Desktop

From now on, anybody on the main network can also access the Remote Desktop.

8.3 Serial interface configuration

The Nortek VM processing unit version 4420 provides an ethernet connection to the VM-ADCP (via the Junction Box) and has interconnections between the different parts. This model uses AC power and has four serial ports. Each port can be configured for use with RS-232, RS422 or RS485 signals at different baud-rates.

The serial interface is based on a 4-port MOXA 5450I. It is connected to the VM processing unit over Ethernet. It is on the internal sub-network with IP addresses 192.168.100.x. The serial interface is fixed on IP address 192.168.100.222. Data on all serial ports is transmitted to the processing unit using the UDP protocol, where each physical COM port is assigned a different ethernet IP port number.

To configure the interface, open the browser and enter the IP address (as shipped from Nortek: 192.168.100.222). This will bring up a login screen (see figure 56).

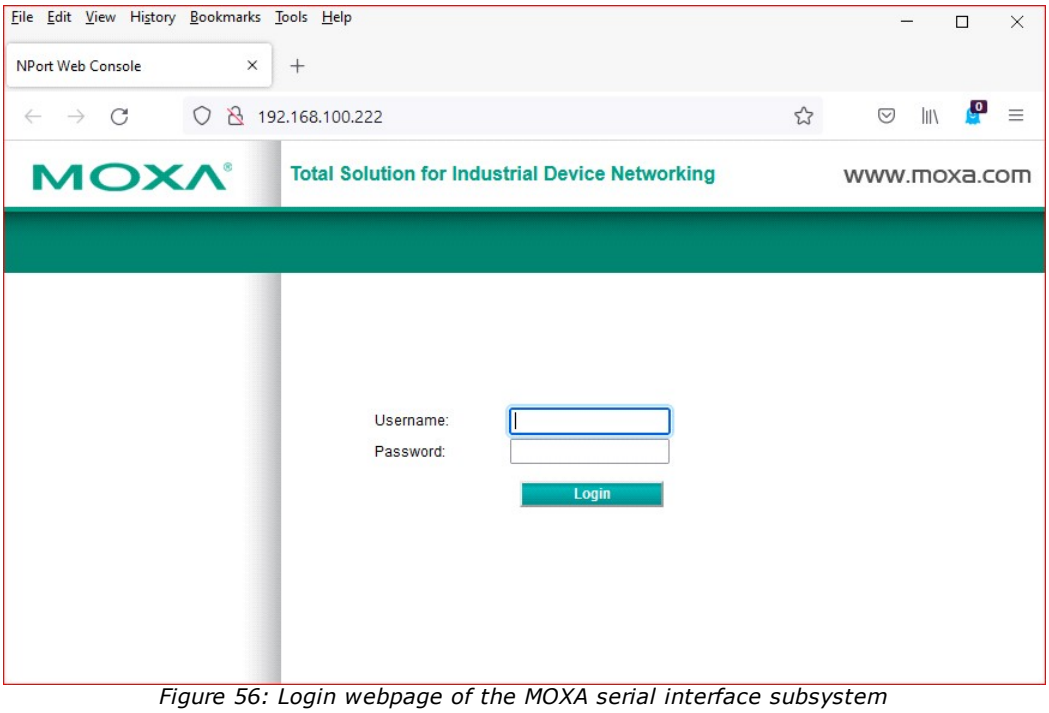


Figure 56: Login webpage of the MOXA serial interface subsystem

The username is admin, the password is moxa

Type the password in the password box, then click the login button. Sometimes you will have to click the button twice before it is accepted.

If successful, it starts with a screen showing previous login times. Click the button 'Continue'. It will now show a screen urging you to select a better password. Click the button 'Skip', and the home screen of the serial interface will be shown (see figure 57).

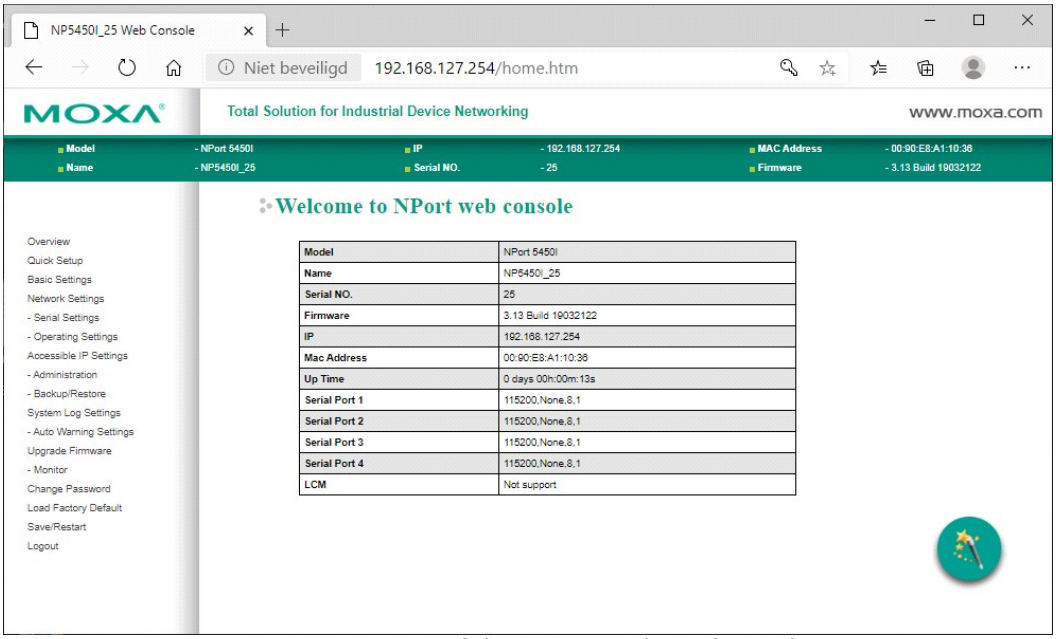


Figure 57: Home screen of the MOXA serial interface subsystem

After choosing 'Save/Restart', or after clicking the 'Submit' button, the unit will reset and there will be an audible 'beep'. This may be useful to check if the unit is actually connected and operational.

Note that 'Load Factory Defaults' will revert all settings to the original settings as chosen by Moxa, so you will have to re-configure the unit for use with the Nortek VM system. (The Moxa Factory Default IP address is 192.168.127.254; you will have to change that back to 192.168.100.222 for use in the Nortek VM system.)

8.3.1 Network settings

There are only four important settings for the network, as shown in the image in figure 58 below.

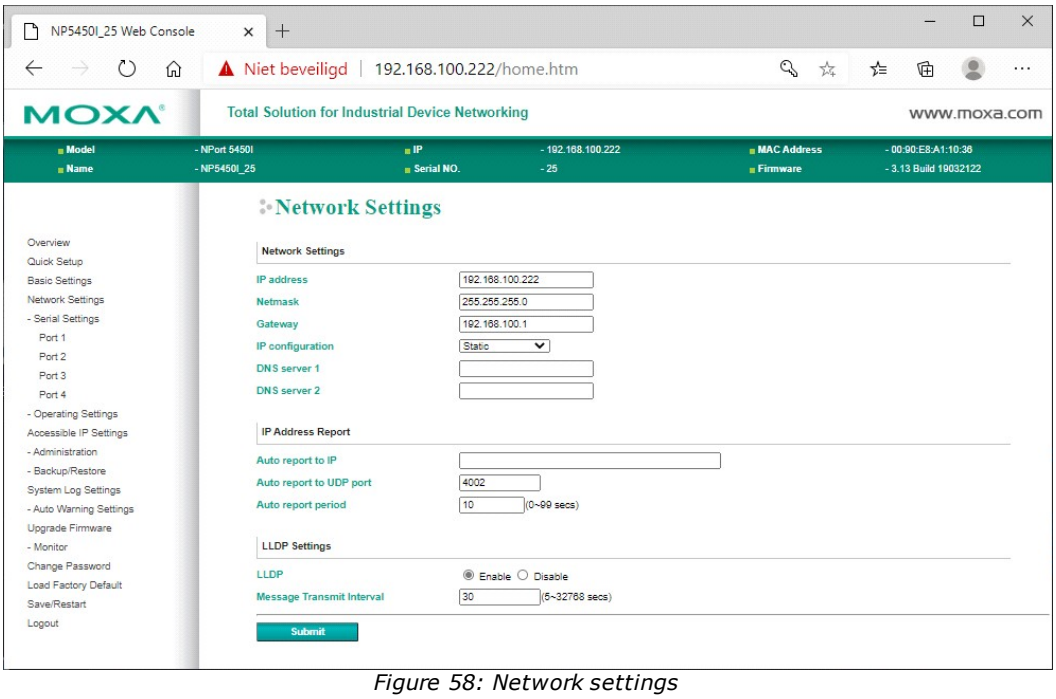


Figure 58: Network settings

The interface is set to a static IP address of 192.168.100.222, the Gateway is set to 192.168.100.1, which is the IP address of the VM Processing Unit. (The other two settings are setting the IP configuration to static, which is the first setting to make, and the subnetmask, 255.255.255.0) No other settings are relevant.

8.3.2 Operating settings

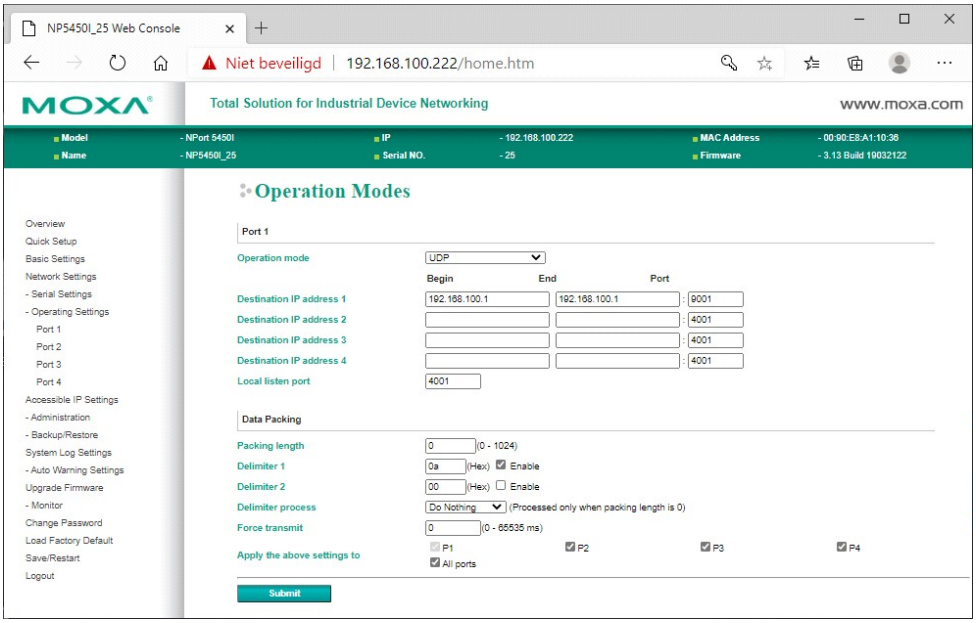


Figure 59: Operating settings – port 1

The Operation mode settings should be set for each port. Note that you can set the main operating parameters line 'Operation Mode' and 'Delimiter' for all ports at once by checking 'Apply.. to all..'. But if you change settings that are only applicable to this specific port, you will have to Submit them first before moving to the next port.

***Operation mode**: UDP Mode*. All data will be sent to the processing unit using the UDP protocol.

***Delimiter 1**: a (Hex).* Data on the serial ports usually comes in the form of ASCII text (NMEA messages). The serial interface stores these messages and sends them to the Nortek VM Processing Unit after it receives the 'Delimiter' character. All NMEA based messages end with a 'Carriage return' (or 'D' in Hexadecimal) and 'Linefeed' (or 'A' in Hexadecimal) character.

***Destination IP address 1**: 192.168.100.1 **Port** 9001:* Received data will be sent to this IP address, which is the address of the Nortek VM Processing Unit . The port number is used by the Nortek VM Acquisition software to determine which Serial port the data is coming from. Each serial port can have its own port number: 9001, 9002, 9003 or 9004. But this is not required. If two serial ports send data to the same IP port the messages will simply arrive as if they were coming from one. This is not a problem if the messages have different identifiers.

***Local listen port: 4001**.* When sending data out from the Nortek VM Processing Unit (using the 'Output' function in the Nortek VM Acquisition software), this sets the IP port where to send it to. Note that every physical serial port has its own IP port: 4001, 4002, 4003 and 4004.

8.3.3 Serial settings

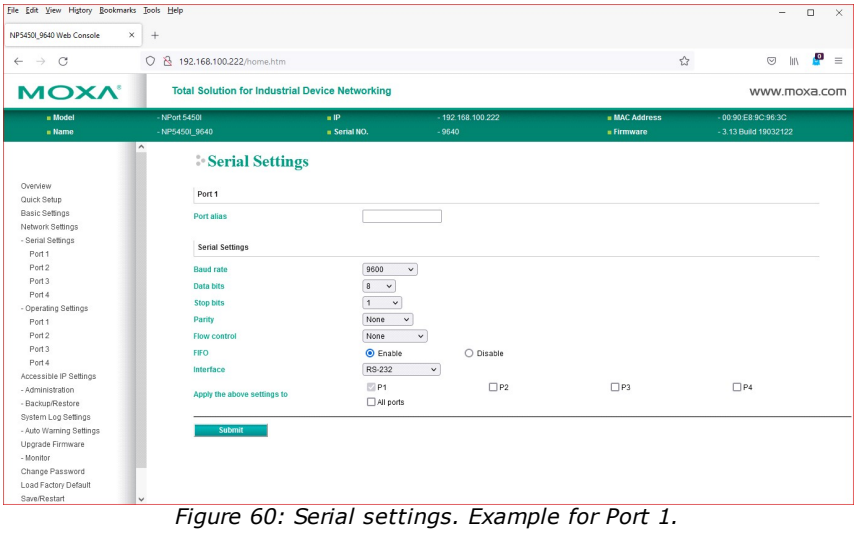


Figure 60: Serial settings. Example for Port 1.

Here each serial port can be configured for RS232 / 422 / 485, Baudrate, Parity and, Stopbits. Make sure 'flow control' is set to 'None', as there are no connections available to use hardware flow control (no RTS/CTS signals). 'Port Alias' can be left blank since that is not used.

Note that the default baudrate is set at 9600 baud. Generally speaking, you need to adjust this to the sending or receiving baudrate at the other end.

8.4 Instrument verification

Nortek delivers optional local services to guarantee the best performance of your VM-ADCP. We can assist with qualified and experienced engineers during and after the installation process. We offer the following services:

- Set To Work (STW): Verification of the mounting design, location and structure. Verification of the instrument and its installation while in dock.
- Harbour Acceptance Test (HAT): Verification of the VM-ADCP and connected auxiliary instruments. Noise spectrum analyses to minimize acoustic or electric noise on the system.
- Sea Acceptance Test (SAT): Noise spectrum analyses, ADCP heading alignment and verification of the VM-ADCP performance during different vessel speed and depth current profiling and bottom-track.

Each of these visits is documented in a report and for customers purpose and by Nortek to provide a quick overview of the system set-up and thorough remote support. Please inquire Nortek for more information about these optional services.

8.5 Spare parts

Table 6 lists available spare parts for the Nortek VM 333 and their order codes.

Table 6: Spare parts for the Nortek VM 333

Description	Nortek Netherlands item code	Nortek Norway reference	Recommended spare part item
20 m Ethernet cable MCIL8F to MCIL8M 333 kHz Operations (if the ADCP is used without the seavalve)	VM4400-5006	320217	yes

Description	Nortek Netherlands item code	Nortek Norway reference	Recommended spare part item
10 m 8 pin Ethernet cable AD2CP MCIL8F w/RS232 out (If used i.c.w. seavalve)	VM4400-5007	650194	
Toolkit VM OPERATIONS 333kHz containing 8 pin female Dummy, Tools, O-rings, Syringe and Screws	VM4400-3605		
8 pin dummy for 333 kHz OPERATIONS instrument (female)	VM4400-3622	340085	
8 pin dummy for 333 kHz OPERATIONS for end of 20m subcon terminated cable (female)	VM4400-3625	340085	
Wrench for Skindicht cable gland	VM4400-3100		
Skindicht CN M63x1.5 F50 cable gland	VM4400-8620	514314	yes
Spare set for extension pipe (Includes O-ring 1x 39.6x2.4, 6x 35.0x2.0, 24x Flat head Phillips Screw M5x10, 6x ¼”-20x7/8” Socket Cap Screw)	VM4400-8610	420055 & 420113 & 400066 & 400008	yes
NSO adapter housing pipe 212 mm	VM4400-8605	524304	
NSO End pipe 330 mm	VM4400-8606	524306	
NSO Extension pipe 455 mm	VM4400-8607	524303	
Roxtec RS31 cable gland	VM4400-8630	514311	yes
Set of screws 333 kHz ADCP backside adapter housing pipe 212mm	VM4400-8651		yes
Set of screws 333 kHz ADCP backside mounting bracket	VM4400-8652		yes
Set of screws 333 kHz ADCP head	VM4400-8653		yes
NSO "Glass" Ring 333 kHz ADCP (delrin/POM window retention ring)	VM4400-8510	524307	
Window Polycarbonate 333 kHz ADCP	VM4400-8511	524302	yes
Gasket DN 200 PN10, set of 2	VM4400-8640	420102	yes

Description	Nortek Netherlands item code	Nortek Norway reference	Recommended spare part item
NSO 333 kHz ADCP Pole or Blister mounting frame (Excl. transport case)	VM4400-3005		

Figures

Figures

Tables