



USER'S MANUAL AND INSTALLATION NOTE



WSS 750 Wind Sensor Static

- Mounting
- Connecting
- Replace an old sensor
- Technical specifications
- References



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1. Introduction

1.1 About the WSS 750 wind sensor

This document provides guidelines for mounting and connecting the WSS 750 high performance static wind sensor.

The WSS 750 can be connected to old DEIF wind displays (like WSDI and 879) or XDI-N to form a complete wind system. The sensor may also be used as a component in a larger system. In this case the system must have a free RS-485 or RS-422 input with NMEA0183 capability.

The ultrasonic wind measuring system used in the WSS 750 is fast responding, has high precision and a robust design for measuring the relative wind speed and wind direction on-board ships. The sensor is using three ultrasonic transducers arranged in a triangle, transmitting ultrasonic burst of data from each sensor to the two other sensors in the triangle, and by measuring the time difference caused by the wind passing the sensor, it is able to precisely calculate the wind speed and wind direction. The physical size and the high transmitting power of the WSS 750 makes it able to measure very precisely in almost any weather conditions.

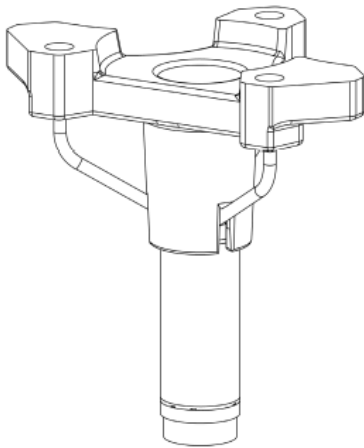
The WSS 750 comes with high power heating built inside each sensor head, which automatically activates when risk of icing occurs during low temperatures (typically below 4 °C).

2. Unpacking instruction

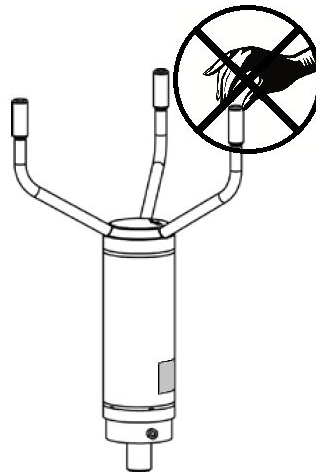
2.1 How to unpack the product

When unpacking the wind sensor, remove the transportation support foam that carries the cable and protects the sensor body. To avoid bending or twisting the three sensor arms, do not remove the protection cap, until you have installed the WSS 750 in the mast.

The sensor is protected against ESD (static electricity), but it is recommended to avoid static discharge through the connection wires during installation.



WSS 750 sensor with protection cap still mounted.



WSS 750 sensor heads are sensitive ceramic elements. Do **not** rotate, pull, strike, bend, scrape or touch the sensor heads.

2.2 Legal information and responsibility

DEIF takes no responsibility for installation or operation of the wind measuring system. If there is any doubt about how to install or operate the WSS 750, the company responsible for the installation or the operation of the product must be contacted.



CAUTION

The WSS 750 wind sensor must **not** be opened! If opened anyway, the warranty will be lost.

3. Mounting the wind sensor

3.1 Placing of the wind sensor

The wind sensor should be placed far from large objects that might influence the measuring results; however, in practice this is not always possible on board a ship. The best result is achieved by placing the wind sensor at the top of a mast away from any large superstructure and especially the funnel.

Placing the sensor just above the superstructure is disadvantageous, especially where the superstructure consists of wide side faces, over which the wind is forced. This may result in turbulence, velocities and wind directions that are out of proportion to the actual, undisturbed wind speed and wind direction.

In situations where it is not possible to mount the wind sensor away from disturbing substructures, we have provided solutions where two wind sensors are installed with a switch to be able to use the best sensor in the given situation, e.g. mounted on each side of the vessel free of turbulence when wind is coming from the side free from obstacles.

The wind sensor is intended for installation on a vertical mast or a horizontal beam using the universal mounting bracket supplied as standard.



More information

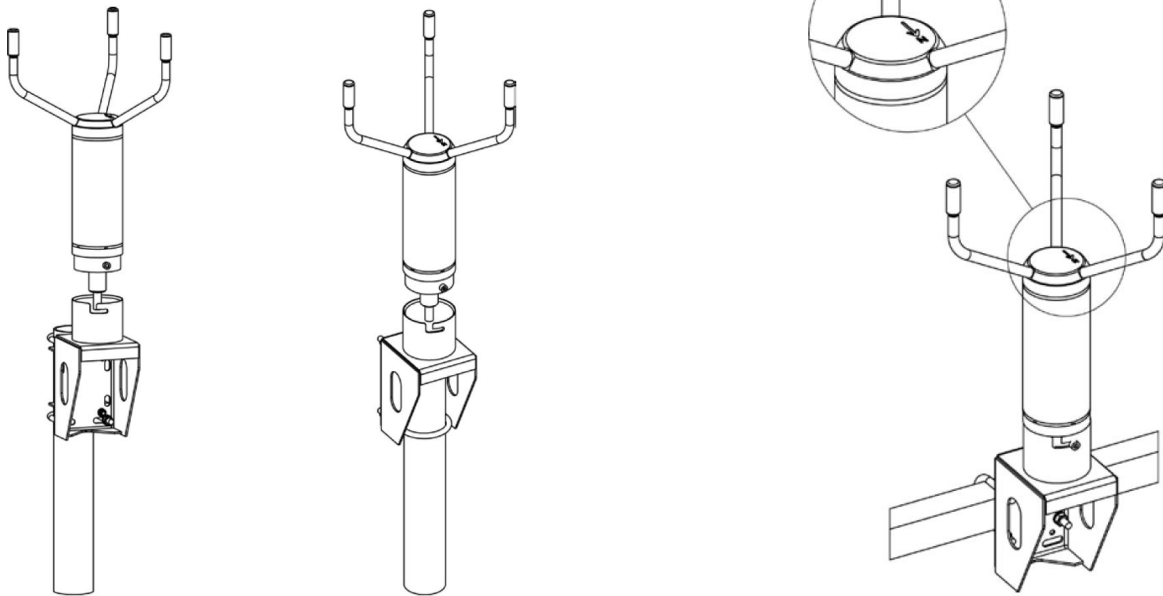
See **Dimensions** in this document for information about dimensions and sizes.



DANGER!

Do not expose the cable connector to excessive torque when mounting the sensor. The connector tightening tools supplied should be used according to the included instruction.

Mounting on a vertical mast or horizontal beam

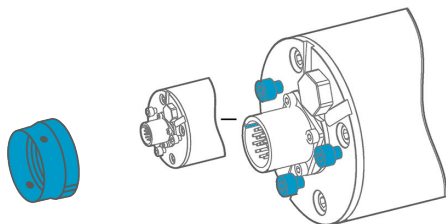


The universal mounting bracket may also be mounted directly on a flat surface.

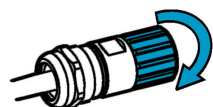
It is recommended to mount the 2 meter cable on the WSS 750 prior to installing it on the universal mounting bracket.

When mounting the 2 meter cable with the preinstalled connector on the WSS 750 there is no need for a special mounting tool. When the connector is marked with a symbol with a crossed out spanner no tool is required and the mounting instructions below should be followed:

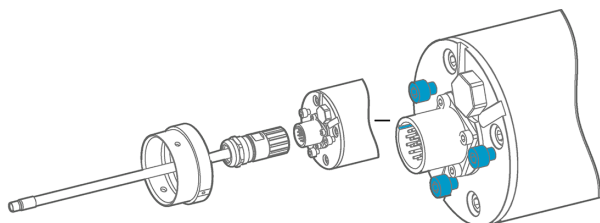
1. Loosen the 3 x M5 screws on the bottom of the WSS 750 with a 4 mm Allen key.
2. Rotate the metal ring to remove it (keep it for later use).



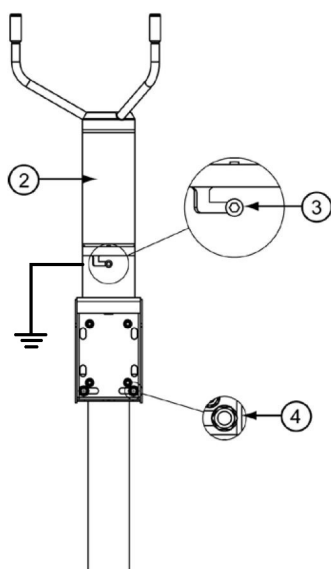
3. Push the cable connector in place ensuring the guiding pin on the connector is aligned.
4. Tighten the connector using the locking ring without any tools.



5. Insert the metal ring over the screws in the button and turn it a bit before tightening the three screws in the bottom of the WSS 750.



6. Mount the mast bracket on top of the mast.
 - a. Mount the supplied screw in the lower part of the sensor (2) and place it in the mast bracket.
 - b. Turn it slightly until the mounting screw is in the end position (3), tighten the screw to lock the sensor in place.
 - c. Mount the second screw in the mounting bracket opposite to the first screw (3) and tighten it firmly to secure the sensor.
 - d. Make sure that the sensor is correctly aligned.



IMPORTANT

The stainless steel housing of the mounting bracket must be connected to earth (for example, the steel hull).

3.2 Grounding and shield termination

Grounding of the sensor in the mast top is important for EMC protection and reliable operation.

The WSS 750 sensor shall be grounded either by making sure that the mast mount bracket has a good connection to ground via the steel mast or alternatively, mount a ground wire on one of the screws on the sensor. This should be the only ground termination for the sensor and its shielded cable.

It is important to firmly connect the cable shields in the sensor cable to the shield of the extension cable inside the installation box.

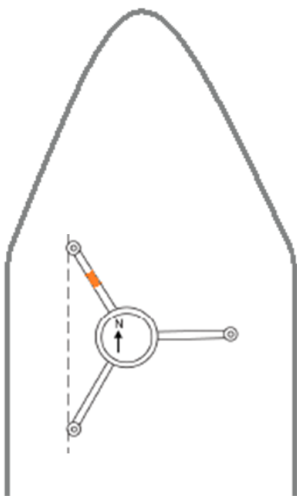
However, do not connect the shield of the extension cable going to the WSDI-2 wind indicator (or going to other systems inside the ship) to anything!

3.3 Lightning protection

In order to protect the wind sensor and the personnel in the best possible way from lightning strokes, use a lightning rod installed with the tip at least one metre above the wind sensor. The lightning rod must be properly grounded in compliance with all applicable safety regulations. The wind sensor cable screen and the extension cable screen must be connected.

For further protection of the cable between the wind sensor and the connection box, as well as the installation cable between the connection box and the interface box, it is recommended to use a metal conduit pipe. If the wind indicator (e.g. WSDI-2) is installed in a metal panel, this panel has to be carefully connected to a good earth terminal.

3.4 Alignment of the wind sensor



To ensure that the display presents the precise wind direction relative to the ship, it is very important that the wind sensor is aligned correctly. The arrow on the top of the sensor body and the sensor arm with the orange marking, must point ahead, towards the bow of the ship, and the two arms on portside must be parallel with the centre axis of the ship.

4. Power supply

4.1 Power supply

The WSS 750 system requires a 24-30 V DC, 2 A power supply.

It is recommended to use a separate galvanic isolated power supply to supply power to the wind measuring system, and the positive and negative power supply connections must not be connected to ground (earth).

5. Cable connections

5.1 Cable types

The wind sensor is supplied with a 2 m cable. The cable can be extended using the standard WSS extension cable (30 m, 40 m, 50 m or 100 m), and the IP66 connection box kit. These parts are normally ordered as accessories, but can be included in some of the DEIF anemometer system packages.

For WSS 750 (heated, 35 W), the standard WSS extension cable (4 x 0.75 mm² with shield) can be used up to 50 m.

Above 50 m, the following can be considered:

- Increase supply voltage to 28 to 30 V DC. This will work up to 100 m.
- Alternatively, increase the cable gauge for the power supply of the sensor/heating to at least 1.5 mm². This will work up to 100 m.

If a longer cable is required, the cable gauge should be increased proportionally e.g. at least a 3 mm² cable for 200 m cable length.

The maximum recommended cable length for data transfer is 300 m, with a maximum of 70 nF capacity between the signal conductors.

An alternative installation cable could be UL2464 18AWG4C + AE, 4 x 0.75 mm² screened or UL2464 18AWG4C + AE, 4 x 1.5.

6. The WSS 750 wind sensor cable connections

6.1 WSS cable connections

Function	WSS 750 Pin	WSS 750 cable # 228260 wire colour	WSS extension cable wire colours	XDI terminal no.	NX2 terminal
+24 V DC operation	1	White	Red	4	-
+24 V DC heating	5 6	Grey, Green, Pink (3 wires parallel connected)			
0 V operation	11	Grey/Pink	Black	5	-
0 V heating	7 8	Blue, Black, Red, Yellow (4 wires parallel connected)			
RS-485 A (COM2)	14	Red/Blue	Orange	-	11
RS-485 B (COM2)	3	Brown	Brown	-	10
RS-485 termination	-	-	-	-	ON
Cable shield	Shield	Shield	Shield	Not connected	Not connected



DANGER!

No supply voltage must be present during installation of the wind sensor, as this may damage the sensor circuits.

Connection of other equipment

One standard NMEA0183 input for a VDR or integrated navigation system can be connected to terminal A and B. It is recommended to use a NMEA-buffer or NCI-1 if more than one NMEA input has to be connected. (See also "WSDI-2, user's manual and installation note 4189350032 UK" on www.deif.com).

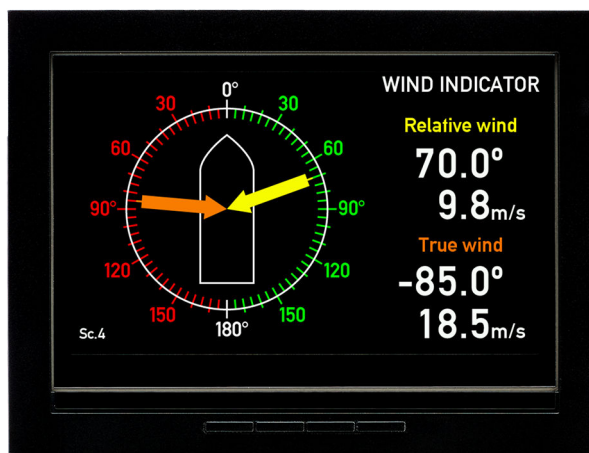
7. Connecting WSS 750 to XDI-N

7.1 Connecting

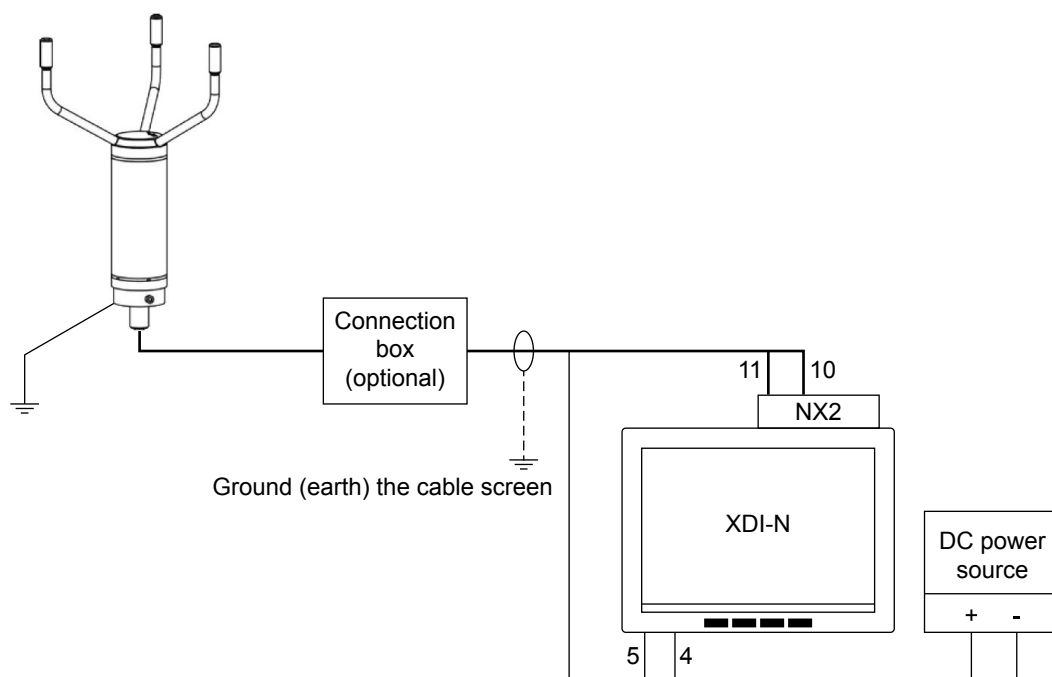
WSS 750 and XDI-N connection.



WSS 750

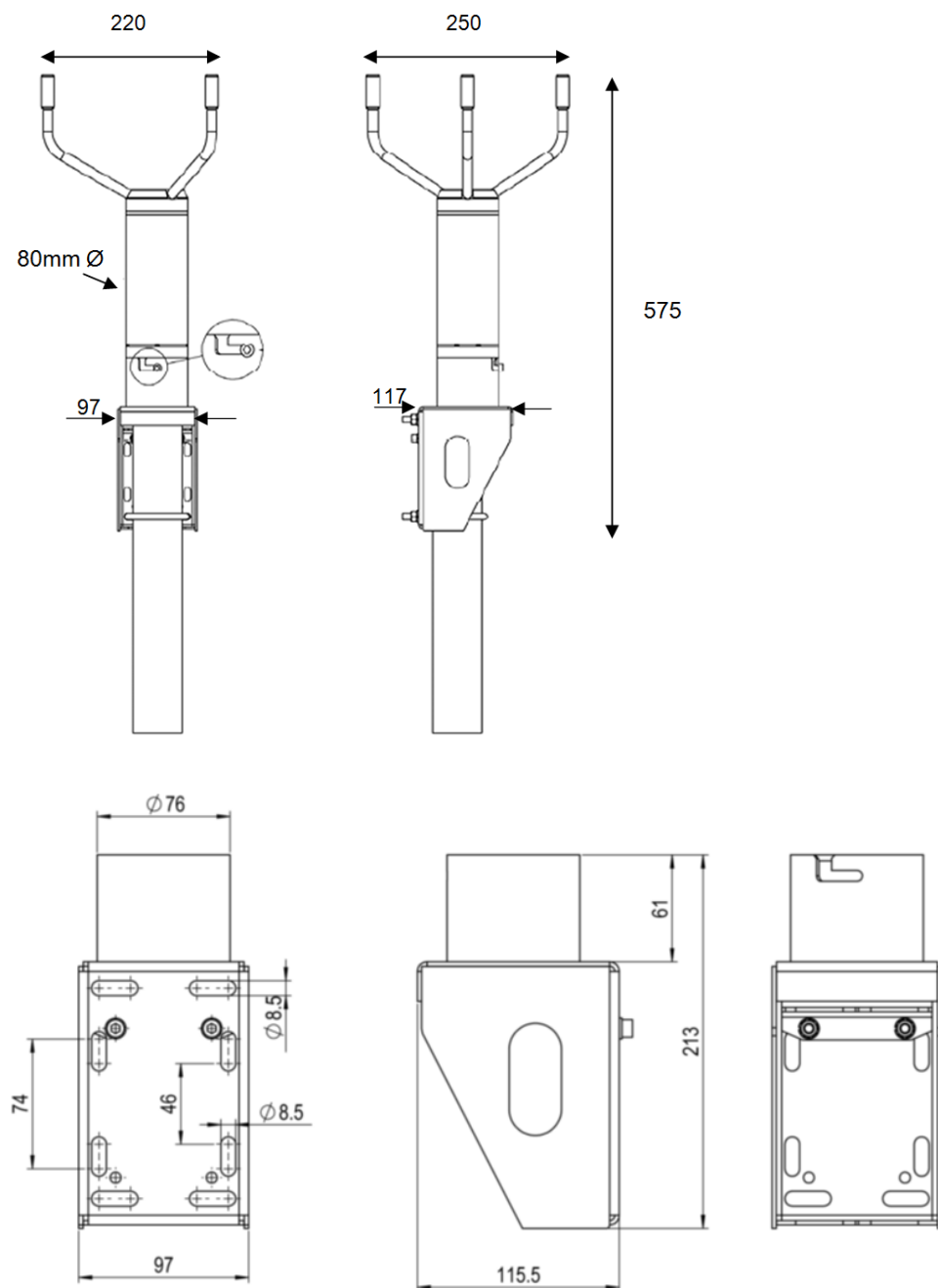


XDI-N



8. Dimensions

8.1 Unit dimensions



9. Troubleshooting a WSS 750 and WSDI-2 installation

9.1 Troubleshooting

No.	Fault symptom on WSDI-2	Cause/solution
1	No light in LEDs, backlight or display	Aux. voltage is not available (18-31 V DC) or WSDI-2 is damaged.
2	Orange error LED is flashing	WSDI-2 is defective, contact DEIF or a sales/service representative.
3	Wind speed is "----" and direction is not changing	<p>Cause: there is no valid wind data via RS-485 from the wind sensor. Check if the RS-485 port on WSDI-2 is terminated. See WSDI-2 manual: Check that "input select" is correct (0183 or r.183) Use the WSDI-2 "Error functions", to find the type of error:</p> <ul style="list-style-type: none"> • Communication error (noise or bad connection) • Error message from WSS sensor received (sensor may be damaged or defective) • LED indication for received and transmitted RS-485 data <p>If there is no data communication:</p> <ul style="list-style-type: none"> • Check voltage from WSDI-2 term 7-8 and 9-8, they must both be 2-3 V DC. If not, the com port may be damaged in WSS or WSDI-2 (lightning stroke - insufficient lightning protection) or • Check cable connection (broken or short-circuit)
4	Wind speed and direction is periodically dropping out	<ul style="list-style-type: none"> • Bad connection • WSS 750 sensor house is not grounded correctly • Heavy electrical noise or insulation error in the ship's electrical system (AC or DC) • WSS 750 is not able to calculate valid data - snow, ice, extreme rain or damaged sensor head (lightning)
5	Wind speed and direction is dropping out or is unstable when outdoor temperature is dropping below 5 °C	<ul style="list-style-type: none"> • WSS 750 aux. power supply is not able to supply current enough to drive the heater. (24 V DC power supply > 2 A is recommended) or extension cable is too thin.
6	Wind speed is "----" and direction is not changing when an additional device (VDR or Nav system) is connected in parallel on the RS-485 port (A and B)	<p>The added device is most likely overloading the RS-485 bus (only one extra NMEA input is allowed). Termination on the RS-485 bus is missing. The connection to the added device is damaged or short-circuited. Cable screen is wrongly connected making a noise loop. Solution: use a NCI-1 NMEA converter (out) or a NMEA buffer to solve the problem.</p>
7	Wind direction is wrong	Check that the sensor is aligned correctly. The arrow in the bottom must point ahead and be parallel with the ship's centre line (see chapter "Mounting the wind sensor").

10. Replace WSS or WSS-L with WSS 750

10.1 How to replace

The WSS or WSS-L wind sensor can directly be replaced by WSS 750 high performance sensor, without major changes to the installation, and the existing extension cable and installation box can normally be used.

In an XDI-N wind indicator system:

- Make sure the cable length and dimension are in line with the guidelines in chapter "Cable connections".
- Make sure the power supply is able to source at least 24 V DC 2 A continuously.

See chapters "The WSS 750 wind sensor cable connections" and "Connecting a WSS 750 to XDI-N" for connection details.

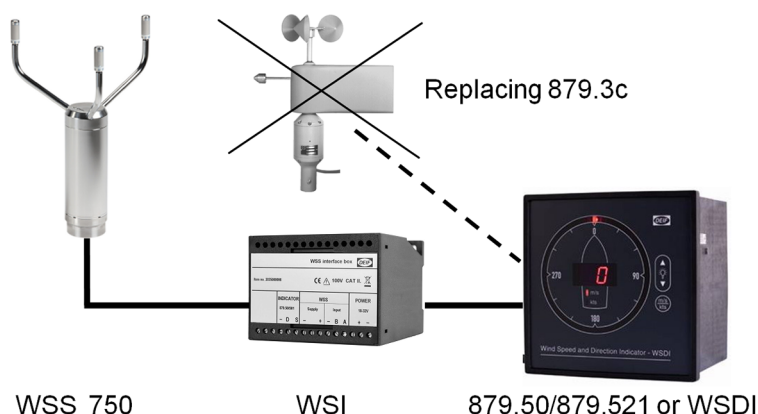
In a WSS/WSS-L upgraded WSDI/879 indicator system:

- Make sure the cable length and dimension are in line with the guidelines in chapter "Cable connections".
- Make sure the power supply is able to source at least 24 V DC 2 A continuously.
- The WSI interface box must be rewired, so the power supply for the sensor is directly connected to the 24 V DC source. (The 30 V DC supply in WSI is limited to max. 20 W, where WSS 750 requires up to 35 W)

See chapter "Replace old sensor type 879.3c with WSS 750" for detailed connection information to WSS 750.

11. Replace old sensor type 879.3c with WSS 750

11.1 How to replace



An older wind indicator system with a display type: 879.50/879.521 or WSDI (WSDI-1) can be upgraded with the WSS 750 sensor. It requires, however, one of the available upgrade kits to replace an old 879.3c dynamic wind sensor.

The kit includes the WSS 750 wind sensor and the interface box type WSI. The WSI interface translates the incoming RS-485 data signal from the new sensor into two separate TTL signals for respectively speed and direction, used by the 879.50/879.521 or WSDI display.

Follow the installation instructions in the beginning of this manual to mount and align the new sensor correctly.

To use the existing mast cable, you must:

- Make sure that the cable length and dimension is in line with the guidelines in chapter “Cable connections”.
- Make sure that a power source able to source 24 V DC 2 A continuously is available.

Before mounting the new sensor using the existing cable, remember to disconnect the cable from the 879 or WSDI wind display and check that the cable is not damaged.

The 2 m cable from the WSS 750 is connected to the existing cable using a connection box. The existing box may also be reused. The WSI interface box must be mounted indoor. It is often practical to mount it close to the display, but it is not required.

11.1.1 WSS 750 wind sensor connection to WSI interface box

Wind sensor WSS 750 Wire colour	Extension cable Wire colour	Interface box WSI Terminal no.	Comments
Grey/Pink and [Blue, Black, Red, Yellow]	Black	1 – Power	Connect to 24-30 V DC 2 A power supply continuously.
White and [Grey, Green, Pink]	Red	2 + Power	
Red/blue (A)	Orange	4 Input A	RS-485 comm. from WSS.
Brown (B)	Brown	5 Input B	
Violet	Not available	6 Not connected	RS-485 common.
Screen	Screen	Not connected	Cable screen is connected to earth when the sensor house is connected to GND (earth).

11.1.2 WSI interface box connection to WSDI (WSDI-1) or 879 display

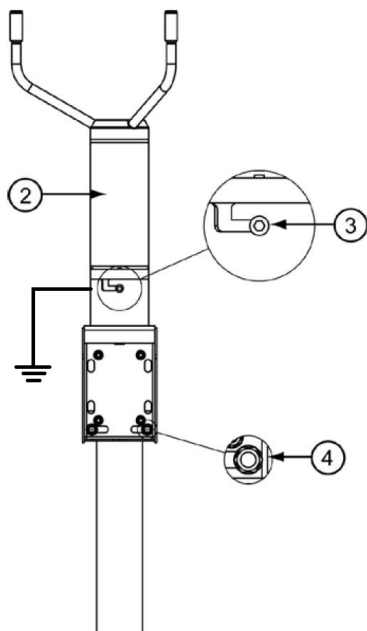
Interface box WSI Terminal no.	Display WSDI Terminal no.	Comments
12 - (0 V)	2 0 V	
11 D	4 Direction	Data 0 V Wind direction (D) and wind speed (S)
10 S	3 Speed	
	5 Screen	
	AC	Aux. supply 110 V AC or 220 V AC
	AC	
	GND/Earth	Ground
	1 + 5 V	+5 V DC for external mode shift/dimmer
	A Signal	NMEA0183 output
	B Return	
	Screen	
	9	External mode shift/dimmer, see "879 installation instructions ext. dimmer 4189340009 UK" on www.deif.com .
	10	
	11	

11.1.3 Grounding the wind sensor



More information

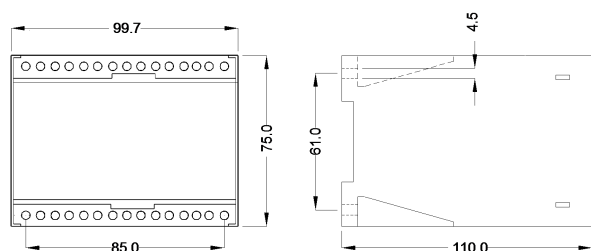
See **Mounting the wind sensor** in this document for more information about grounding and lightning protection.



IMPORTANT

The sensor's stainless steel house or mounting bracket must be connected to earth (for example, the steel hull).

11.1.4 WSI interface box dimension



11.2 Faults, causes and solutions

No.	Fault symptom on WSDI	Cause/solution
1	No light in LEDs, display	Internal fuse may be blown (see WSDI manual for details)
2	Flashing display	Aux. voltage is too low, 24 V power supply may not be able to supply enough current to drive WSI and WSS 750.
3	Direction LED jumps 0 to ~240 deg. and wind speed is 0	Aux. voltage is too low, (see point 2 above)
4	2 or 3 happens only if outdoor temperature is below 5 °C	The aux. supply is not able to supply current enough to drive WSS 750 heating. (24 V DC power supply >2 A is recommended)
5	Direction LED jump 0-90-180-270-0 deg. and wind speed is 0	<p>The connection from WSI to WSDI is most likely OK. Cause: WSI is not receiving data from WSS 750. Check aux. supply between WSI term 1(-) and 2(+): 18-31 V DC. Check voltage between WSI terminal 4(A) and 6(-) respective 5(B) and 6(-), both 2-3 V DC (may fluctuate due to data packages).</p> <p>If voltages are not right – possible cause:</p> <ul style="list-style-type: none"> • Bad cable connection from WSS 750 to WSI (disconnect or short-circuit) • RS-485 com port is damaged in WSS 750 or in WSI (close hit of lightning – insufficient lightning protection?) <p>If voltages are OK – possible cause:</p> <ul style="list-style-type: none"> • Bad connection • WSS 750 not grounded correct on stainless house or mounting bracket • Heavy electrical noise or insulation error in the ship's electrical system (AC or DC) • WSS 750 is not able to calculate valid data - snow, extreme rain or defective sensor head (lightning) • A sensor head on WSS 750 is damaged.
6	Wind direction is wrong	Check that the sensor is aligned correctly. The arrow in the bottom must point ahead and be parallel with the ship's centre line (see chapter "Mounting the wind sensor").
7	No data on the NMEA output	<p>There must be correct wind data on the WSDI display.</p> <ul style="list-style-type: none"> • NMEA data may be in the wrong NMEA format (see WSDI manual for more details). • Terminal A and B may be wrongly connected to the external system's NMEA input. Try interchanging wire A and B.

12. References and disclaimer

12.1 References to other documents

- WSS 700 series data sheet 4921250070 UK
- WSDI-2, user's manual and installation note 4189350032 UK
- Wind measuring systems, application notes 4189350050 UK

Documents are available on www.deif.com.

12.1.1 Disclaimer

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