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USER's MANUAL/INSTALLATION NOTE

Wind Sensor Static, WSS 500 series

- Mounting
- Connecting
- Replacing an old sensor
- References

DEIF A/S · Frisenborgvej 33 · DK-7800 Skive
Tel.: +45 9614 9614 · Fax: +45 9614 9615
info@deif.com · www.deif.com

Document no.: 4189350072A

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1. Introduction

This document provides guidelines for mounting and connecting the static wind sensor WSS 500 series.
The WSS 500 series ultrasonic wind measuring system is a fast responding and accurate general purpose system that is designed for measurement of wind speed and wind direction on-board ships.
The sensor is based on three ultrasonic transducers arranged in a triangle for measuring of wind speed and wind direction. By measuring the time it takes for a set of ultrasound bursts to travel from each transducer to the other two, the wind speed and direction can be calculated.

The wind sensor is available in two different versions:

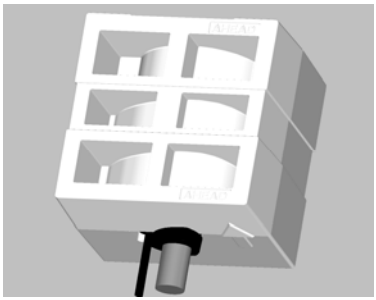
- WSS 550 with a built-in heater, which will automatically engage when risk of icing occurs during low temperatures.
- WSS 500 without the heater is intended for applications in geographic areas where the risk of icing is very low, or where occasional dropouts caused by icing are acceptable.

The WSS 500 series can be directly connected to the DEIF XDi-N display indicator or WSDI-2 wind display to form a complete wind system.
The WSS 500 series can also be used as wind sensor for previous DEIF wind displays, such as WSDI and 879, in which case it must be connected via an interface box.
The sensor may also be used as a component in a larger system; in that case the system must have a free RS-485 or RS-422 input with NMEA0183 capability.

Important: Be aware that the term *WSS 500 series* (or *WSS*) will apply to both WSS 500 and WSS 550.

Unpacking

The WSS 500 series sensor is delivered in a cardboard box.
Inside this box, the sensor is packed in a white foam box (called a protection cap), which is supposed to stay on, until the sensor is mounted in the mast.
This will effectively protect the delicate sensor heads.



Do not remove the white protection cap or the tape keeping it in place, until the sensor is mounted 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.

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 500 series, the company responsible for the installation or the operation of the product must be contacted.

The units are not to be opened by unauthorised personnel.
If opened anyway, the warranty will be lost.

2. Mounting the wind sensor

Placing of the wind sensor

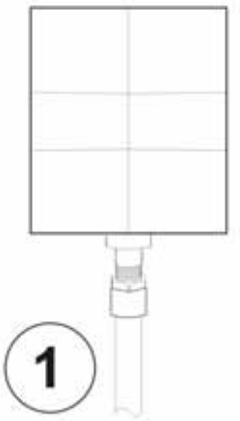
Ideally, the wind sensor should be placed far from large objects that might influence the measuring results; however, in practice this is normally not possible on-board a ship. The best result is achieved by placing the wind sensor at the top of a mast in the opposite end of the superstructure.

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.

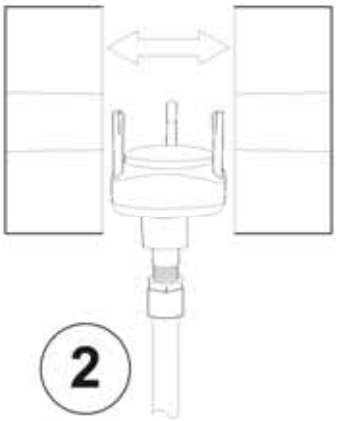
Keep away from the funnel.

The wind sensor is intended for installation on a vertical socket or a tube using the stainless steel tap mounting base. See the drawing below for dimensions of the tap. **The tap must not be removed from the wind sensor, as this will damage the waterproof sealing and the warranty will become void.**

Do not expose the plastic part of the wind sensor to any torque when mounting the sensor. The tools used for fastening are only to be applied on the actual tap.

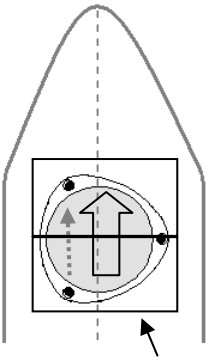


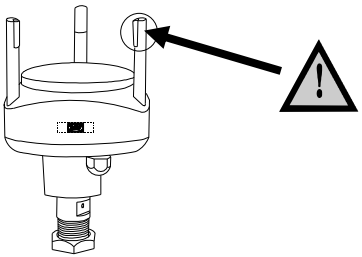
Mount the WSS



Remove the protective cap

To ensure that the display represents the precise wind direction relative to the ship, the wind sensor must be aligned correctly. That is, when mounting the wind sensor, the arrow on top (and bottom) of the white protection cap must point ahead towards the stem of the ship and be parallel with the centre axis of the ship.
Note: An arrow pointing ahead is also found on the bottom part of the sensor itself.





Do not hit, squeeze or try to remove the three black rubber hoods!

Do not expose the plastic part of the wind sensor to any torque when mounting the sensor; the tools used for fastening are only to be applied on the actual tap.

Bird avoidance kit

The bird avoidance kit is designed to reduce the risk of birds landing on the WSS 500 series sensors and thereby interfering with measurements, or even damaging the sensitive ultrasonic transducer heads. The black rubber heads are known to attract some birds' attention because of the click-sound they give off.
The bird avoidance kit is mounted as standard on the WSS 500 series and can be purchased as an optional extra to mount on previous WSS versions.

Note that the kit does not provide complete protection against birds, but especially large sea birds will not be able to land, while small birds may still be able to squeeze inn. Small birds may interrupt the wind measurement, but will not be able to damage the sensor.
The shape and location of the spikes has been designed so that the interference with wind measurements is negligible.

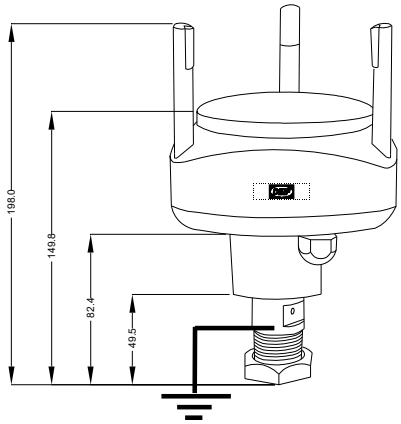
When the WSS 500 series is mounted on a horizontal mast or surface, it must be raised at least 0.7 metres to avoid birds sitting next to it – eating the sensor heads!

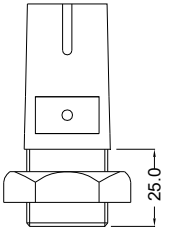
When the kit is mounted on the WSS 500 series sensor, more snow may be able to accumulate on top of the sensor, and it may melt slower.

Installation of the kit (retrofit only)

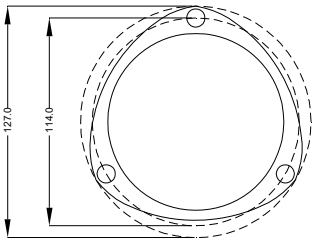
1. Position the metal ring with spikes around the stainless steel top plate of the WSS 500 series sensors. Position it so that the spikes do not block the direct paths between the three black rubber heads; see picture.
2. Secure the metal ring using the M3x6 screw provided. It is recommended to secure the screw from loosening due to vibrations with a drop of Loctite® super glue or equivalent (not included in the kit) and tighten the screw all the way in.

3. Check that the kit sits tightly on the WSS 500 series sensor.





¾" pipe thread:
Outer diameter: 1.04 inch
(26.4 mm), 14 threads per inch



IMPORTANT!
The stainless steel mounting base on the WSS 500 series sensor must be connected to earth (for example the steel hull).

3. Cable connections

The wind sensor is supplied with 2 metres fixed cable. From factory, the cable is connected to the sensor via a waterproof gland, and this must not be replaced by another cable. The cable can be extended by using the connection box kit or the IP67 connector kit (both optional).

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 instrument is installed in a metal panel, this panel has to be carefully earthed, as well as the instrument itself.

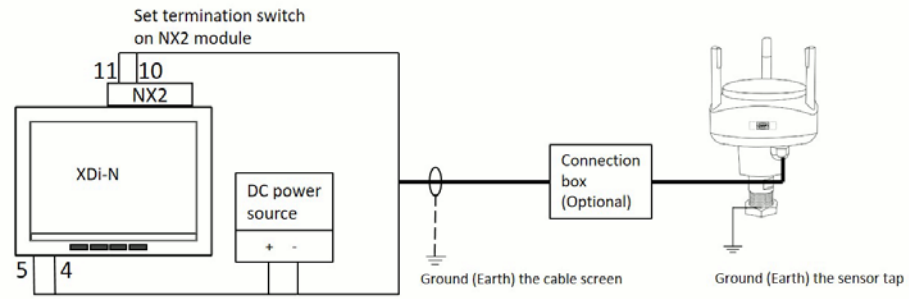
Suitable extension cable is available from DEIF. Alternatively, an installation cable, for example UL2464 18AWG4C + AE, 4 × 0.75 mm^2 screened, can be used. The maximum length is 300 m, and maximum 70 nF capacity between the signal conductors.

WSS 500 series wind sensor cable connections

Cable colour	Function		Note
Black	Supply voltage	-	9 to 31 V DC supply for the WSS 500 series wind sensor
Red		+	
Orange	RS-485 comm.	A	Wind speed and direction data output
Brown		B	
Shield	Cable shield		Is connected to the stainless steel tap inside the WSS.

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

Connecting a WSS 500 series sensor to an XDi-N indicator



WSS 500 series cable colour	Terminal number		Description
	XDi-N	NX2 module	
Black (-)	5. 0 V		Aux. voltage: 0 V
Red (+)	4. +24 V		Aux. voltage: +24 V DC
Orange (A)		11. RX/TX2 - A	RS-485 data communication Termination with 120 Ω internally (switchable)
Brown (B)		10. RX/TX2 - B	
Screen			Do not connect [1)]

[1)]: Cable screen can be connected to ground/earth in case of problems with electrical noise.

Set up NMEA input to show wind data

The initial setup of XDi-N is easily performed with the wizard; you will be guided through the setup of NMEA with automatic scan of NMEA sentence. Setup of the needed NMEA data is described below.

1. Run Auto scan.
2. Accept and save the found NMEA sentence.
3. XDi-N will return to the NMEA input setup menu.
   If no further changes are needed, select Return until the wind indicator mode is shown on the display.
   If offset adjustment is needed, jump to step 4.

Offset to wind direction

4. Select Manual input configuration.
5. Select Wind group, then select Wind direction and find the offset menu.
6. Offset is entered as degrees with a resolution of 0.1.
   An offset of +10 degrees is entered as 100 in the menu.
7. Return to indicator mode where the wind indicator is shown on the display.

True wind

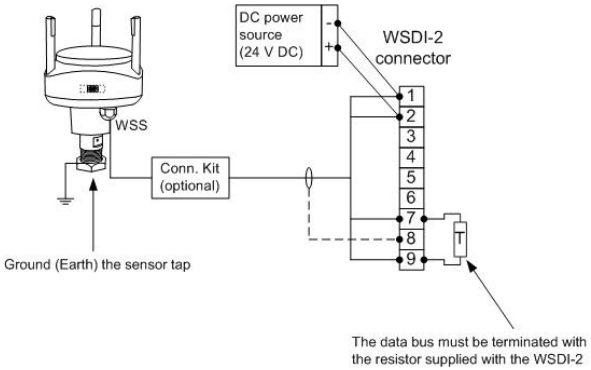
True wind can either be an actual value, or it can be calculated from the speed. Which method to use depends on the VI-Setup profile that has been selected in the setup wizard.
If an indicator with true wind is selected, the following valid NMEA sentence for true wind can be used: MWV, MWD only for wind speed true.

True wind can be calculated by the XDi-N, based on the speed from the following valid NMEA sentence: VHW, VBW, VTG, RMC.

Connecting a WSS or WSS-L to a WSDI-2 display

WSS/WSS-L

WSDI-2



Wind sensor WSS/WSS-L Cable colour	**Display WSDI-2 Terminal no.:**	**Description**	**Comments**
Black (-)	1. 0 V	Aux. voltage: 0 V	Aux. voltage to WSDI-2 and WSS is parallel-coupled in the terminal block
Red (+)	2. VCC	Aux. voltage: +12 or 24 V DC	
Orange (A)	7. A	Data A	RS-485 data communication
Brown (B)	9. B	Data B	
Screen	8. (Data GND)	Cable screen	Normally, cable screen must not be connected *)

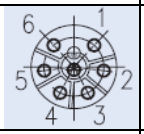
*) The screen should only be connected to WSDI-2 terminal 8 in case of problems with electrical noise.

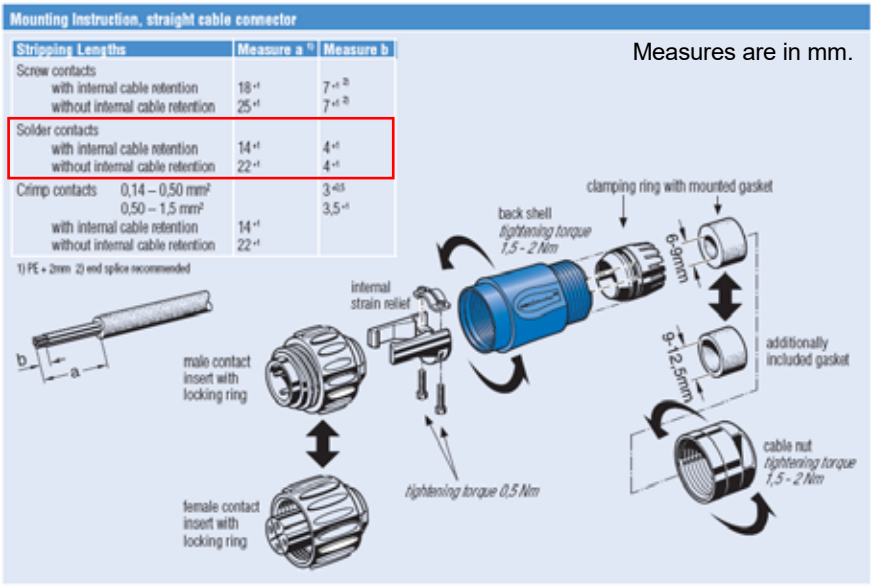
Connection of other equipment

One standard NMEA0183 input for a VDR or integrated navigation system can be connected to terminal A and B.
It is recommended to use an NMEA-buffer or NCI-1 if more than one NMEA input has to be connected. (See also WSDI-2 User's Manual/Installation Note no. 4189350032).

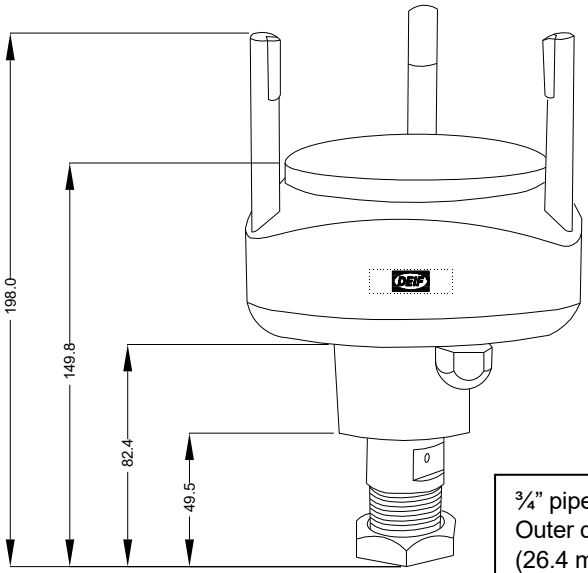
IP67 connector kit assembly (optional)

The connectors must be soldered onto the cable according to the following instructions:

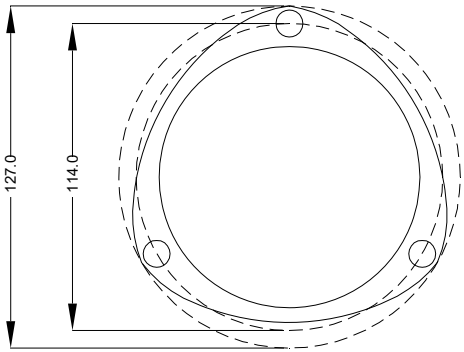
WSS 500 series fixed cable **Male connector**	**Connector pin no.**	**WSS 500 series extension cable** **Female connector**	**Signal comments**
Plug Male 7 pin. 10 22 00 00 52		Plug female 7 pin. 10 22 00 00 53	
Screw cap male, 10 29 92 00 02		Screw cap female, 10 29 92 00 03	
Black (-) ●	1	Black (-) ●	30 V DC supply for WSS 500 series
Red (+) ●	2	Red (+) ●	
Orange ●	3	Orange ●	RS-485 comm. from WSS 500 series
Brown ●	4	Brown ●	
Screen ●	5	Screen ●	Cable screen


Mounting instruction, straight cable connector
Measures are in mm.
Stripping Lengths
Measure a 1)
Measure b
Screw contacts
with internal cable retention
without internal cable retention
Solder contacts
with internal cable retention
without internal cable retention
Crimp contacts 0,14 – 0,50 mm²
0,50 – 1,5 mm²
with internal cable retention
without internal cable retention
1) PE + 2mm 2) end splice recommended
clamping ring with mounted gasket
back shell
tightening torque
1,5 - 2 Nm
6-9mm
9-12,5mm
additionally
included gasket
internal
strain relief
male contact
insert with
locking ring
female contact
insert with
locking ring
tightening torque 0,5 Nm
cable nut
tightening torque
1,5 - 2 Nm
b
a

4. Dimensions



¾" pipe thread:
Outer diameter: 1.04 inch (26.4 mm), 14 threads per inch.



Troubleshooting a WSS 500 series/XDi-N installation

Flashing data and symbols on the XDi-N indicate that data is missing. Using the XDi-N NMEA monitor makes it easy to see the NMEA data received on the COM ports of the NX2 module.

No.	Fault symptom on XDi-N	Cause/solution
1	Yellow pop-up box in upper left corner with text message "NMEA S2 Data lost!" Digital readout and symbol for wind direction are flashing.	No data is received from the wind sensor on the connected port of the NX2 module mounted on the XDi-N. Start up the NMEA monitor in the service menu[1] NMEA data should be received once every second. If no data is received, check the supply voltage to the sensor and the cabling. Check the termination of the system. On the NX2 module this is possible by means of a switch located beneath the terminal block.
2	Yellow pop-up box in upper left corner with text message "NMEA S2 Data lost!" Data for wind speed is flashing.	There is no valid data for the wind speed. Start up the NMEA monitor in the service menu[1] Check the termination of the system. On the NX2 module, by means of a switch, it is possible to set a 120 ohm termination on the RS-485 port. The switch is located beneath the terminal block.
3	Yellow pop-up box in upper left corner with text message "CAN Data lost!" and "NMEA S2 Data lost!" No true wind data is available, arrow and true wind data are flashing.	The message "CAN Data lost!" refers to an internal calculated value which is not present because input is missing. If true wind is calculated and no NMEA data of the speed is available, this message will appear. Start up the NMEA monitor in the service menu[1] Make a scan on dedicated port for speed, or use the scan for all ports. If no NMEA data is available, check the cabling at the COM port of the NX2 module, or check if NMEA speed is present from the transmitter.
4	Yellow pop-up box in upper left corner with text message "CAN Data lost!" and "NMEA S2 Data lost!" No data is flashing.	An indicator with multiple screens is selected, and the active screen does not present the missing data. Step through the different screens until a screen with flashing data appears (up to four screens are possible) and select this. Start up the NMEA monitor in the service menu[1]

[1] Accessing the NMEA monitor: See next page.

		If no NMEA data, check transmitter or cabling.
5	Yellow pop-up box in upper left corner with text message "CAN Data lost!" New NMEA data sentence MWD has been activated. Symbol and data for geographic true wind are still flashing.	The NMEA sentence MWD has been activated in the system and is also shown in the NMEA monitor, cabling is correct, but geographic true wind symbol and data are still flashing. Each time a change is made to the NMEA data received, an auto scan or manual input setup is required. Perform an auto-scan by entering the NMEA setup menu, select NMEA input setup and make an auto-scan. Select Accept selection and save, and then return to indicator mode.

XDi-N NMEA monitor

The NMEA monitor in the service menu is a powerful tool that makes it easy to see NMEA data received on the selected COM port. You can see data from a specific COM port, or from all COM ports simultaneously.
To access the NMEA monitor: First, access the User menu, then the Install menu, and subsequently enter the Service menu. The NMEA monitor is selected in the Service menu.

Menu/function	Button 1 (left)	Button 2	Button 3	Button 4 (right)
User menu	•			•
Install menu		•	•	

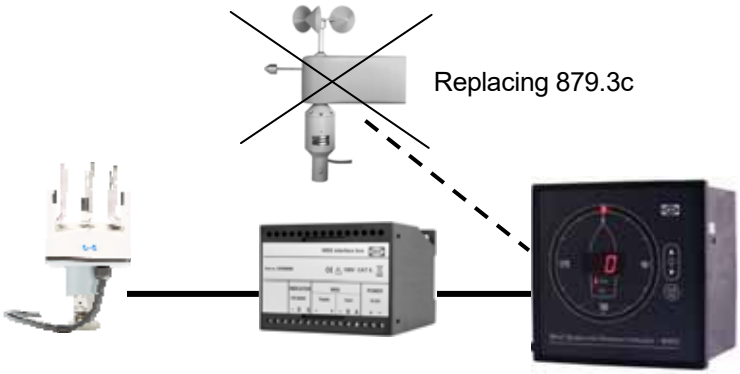
Access the relevant menu above by pressing the two indicated buttons simultaneously for 3 to 5 seconds.
The Install menu can only be accessed from the User menu.

Troubleshooting a WSS/WSDI-2 installation

No.	Fault symptom on WSDI-2	Cause/solution
1	No light in LEDs, backlight or display	Aux. voltage is not available (18 to 31 V DC), or the WSDI-2 is damaged.
2	Orange Error LED is flashing	The WSDI-2 is defective, contact DEIF or a sales/service representative.
3	Wind speed is "----" and direction is not changing	Cause: There is no valid wind data via RS-485 from the wind sensor. Check if the RS-485 port on the WSDI-2 is terminated. See the 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: - 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. If there is no data communication: - Check voltage from WSDI-2 terminals 7-8 and 9-8, it must be 2 to 3 V DC on both. If not, the COM port may be damaged in the WSS or WSDI-2 (lightning stroke, insufficient lightning protection?), or - Check the cable connection (broken or short-circuited).
4	Wind speed and direction is dropping out periodically	- Bad connection. - The WSS is not grounded correctly on stainless mounting tap. - Heavy electrical noise or insulation error in the ship's electrical system (AC or DC). - The WSS is not able to calculate valid data - snow, ice, extreme rain or defective sensor head (lightning, bird attack?).
5	Wind speed and direction is dropping out or instable when outdoor temperature is dropping below 5 °C	- The sensor is a WSS-L without heating - ice? - The aux. power supply is not able to supply current enough to drive the WSS heater. (24 V DC power supply >2 A is recommended).
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)	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 an NCI-1 NMEA converter (out) or an NMEA buffer to solve the problem.
7	Wind direction is wrong	Check that the sensor is aligned correctly. The arrow at the bottom must point ahead and be parallel with the ship's

		centre line (see chapter 2).
8	No data on the NMEA output	There must be correct wind data on the WSDI display. NMEA data may be in the wrong NMEA format (see the WSDI manual for more details).

5. Replacement of an old wind sensor type 879.3c by the WSS 500 series



The special upgrade kit should be used when an existing 879.3c dynamic wind sensor is to be replaced with a new WSS 500 series sensor and connected to a display type 879.50/879.521 or WSDI.
The interface box type WSI is needed to translate the RS-485 data signal from the WSS 500 series into a speed and direction TTL signal appropriate for the 879.50/879.521 or WSDI display.

Remove the tap for the old sensor 879.3c and mount the new sensor. Notice that the tap is fixed on the new sensor and is not to be removed.

Follow the instructions in chapter 2 to mount the new WSS 500 series sensor correctly.

The existing cable can be used. Before mounting the new sensor using the existing cable, remember to disconnect the cable from the wind display and check that the cable is not damaged.

The sensor is equipped with a 2 m cable, this cable is connected to the existing cable using a junction box (normally already mounted).

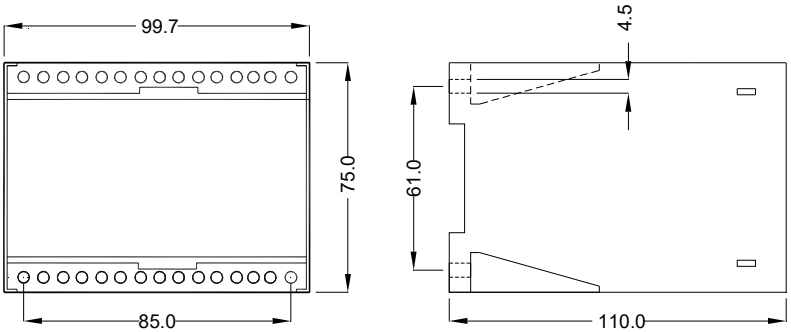
The interface box can be mounted anywhere between the sensor and the display(s), but the following must be taken into consideration: The interface box has to be supplied from a 24 V DC/1.25 A source and mounted indoor, for which reason it is recommended to mount the interface box close to the existing display(s).

Wind sensor WSS 500 series Cable colour	**Interface box WSI Terminal no.:**	**Display WSDI Terminal no.:**	**Comments**
Black (-)	9 - WSS supply		30 V DC supply for the WSS 500 series
Red (+)	7 + WSS supply		
Orange (A)	4 Input A		RS-485 comm. from WSS
Brown (B)	5 Input B		
Screen	6 -		Shall not be connected *)
	1 – Power		Aux. supply 18 to 32 V DC, 1.25 A
	2 + Power		
	12 - (0 V)	2 0 V	Wind direction (D) and wind speed (S)
	11 D	4 Direction	
	10 S	3 Speed	
		5 Screen	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 document no. 4189350009
		10	
		11	

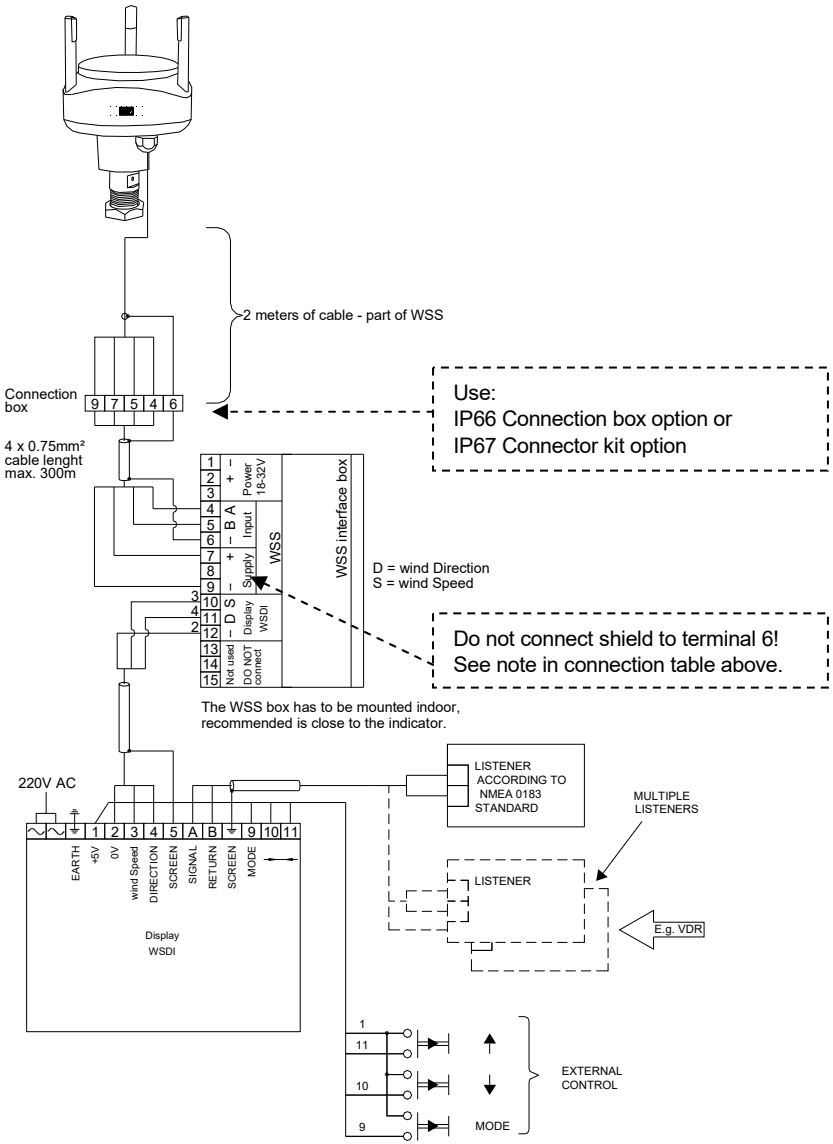
*) The screen should only be connected to WSDI-2 terminal 8 in case of problems with electrical noise.

IMPORTANT!
The stainless steel mounting base of the WSS 500 series sensor must be connected to earth (for example the steel hull).

WSI interface box dimensions:



Before the replacement is carried out, it is recommended to carefully read the User's Manual/Installation Note (this document).


2 meters of cable - part of WSS
Connection box
9 7 5 4 6
4 x 0.75mm² cable lenght max. 300m
Use:
IP66 Connection box option or
IP67 Connector kit option
WSS interface box
Power 18-32V
Input
Supply
WSS
Display WSDI
Not used
DO NOT connect
D = wind Direction
S = wind Speed
Do not connect shield to terminal 6!
See note in connection table above.
The WSS box has to be mounted indoor, recommended is close to the indicator.
220V AC
EARTH
+5V
0V
wind Speed
DIRECTION
SCREEN
SIGNAL
RETURN
SCREEN
MODE
Display WSDI
LISTENER ACCORDING TO NMEA 0183 STANDARD
MULTIPLE LISTENERS
LISTENER
E.g. VDR
EXTERNAL CONTROL
MODE

Troubleshooting an installation upgrade

No.	Fault symptom on WSDI	Cause/solution
1	No light in LEDs or 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 500 series.
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 when outdoor temperature is below 5 °C	The aux. supply is not able to supply enough current to drive the WSS 500 series heater. (24 V DC power supply >2 A is recommended).
5	Direction LED jumps 0-90-180-270-0 deg. and wind speed is 0	The connection from WSI to WSDI is most likely OK. Cause: WSI is not receiving data from WSS. Check aux. supply between WSI term 1(-) and 2(+): 18 to 31 V DC Check WSS 500 series supply voltage from WSI terminal 7(+) and 9(-), it must be 30 V DC +/-2 V. If not, replace the WSI box. Check voltage between WSI terminal 4(A) and 6(-) respectively 5(B) and 6(-), both 2 to 3 V DC (may fluctuate due to data packages). If voltages are not OK – possible causes: - Bad cable connection from WSS 500 series to WSI (disconnected or short-circuited). - RS-485 COM port is damaged in WSS 500 series or in WSI (close to lightning strike, insufficient lightning protection?) If voltages are OK – possible causes: - Bad connection. - WSS 500 series not grounded correctly on stainless mounting tap. - Heavy electrical noise or insulation error in the ship's electrical system (AC or DC). - The WSS 500 series is not able to calculate valid data - snow, extreme rain or defective sensor head (lightning, bird attack?). - WSS sensor head is damaged, or tower is broken.
6	Wind direction is wrong	Check that the sensor is aligned correctly. The arrow at the bottom must point ahead and be parallel with the ship's centre line (see chapter 2).
7	No data on the NMEA output	There must be correct wind data on the WSDI display. NMEA data may be in the wrong NMEA format (see the WSDI manual for more details).

6. References

For more details, see the following documents:

- WSDI-2 User's Manual/Installation Note, document no. 4189350032.
- WSS 500 series appendix to user's manual, document no. 4189350076.

Documentation is available on www.deif.com.