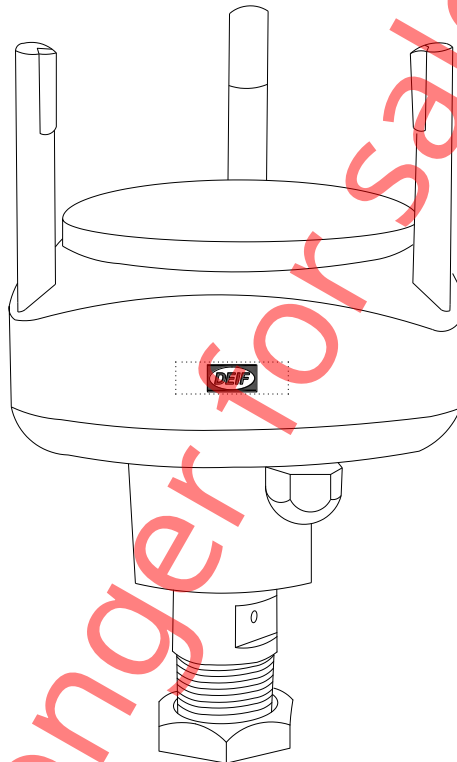# Ultrasonic wind measuring system

**DEIF**

## Type WSDI, WSI, WSS or WSS-L

*4921250063A*

- *Sea-waterproof construction*

- *Accurate read-out of wind direction and wind speed*

- *WSS with built-in heater for freezingly cold conditions*

- *WSS-L where freezingly cold conditions is not an issue*

- *NMEA data output*

- *1-3 displays per sensor*

- *Based on ultrasonic principle – no moving parts*

**DEIF A/S**

CE

### *Application*
The wind measuring system is a fast responding and accurate system designed for measurement of wind speed and wind direction on-board ships. The wind measuring system is classified for residential, commercial and light industry plus industrial environment.

This system offers the advantage of reading the measuring results from several locations on-board, e.g. at control desks both on the bridge and on the bridge wings.

The WSDI displays* are provided with data output for serial transfer of measuring values to the navigation computer of the ship and/or to a personal computer via NMEA protocol.

The system indicates relative wind speed and wind direction. If indication of absolute wind speed and wind direction is required, these values must be calculated separately.

### *Construction*
The wind measuring system consists of three components: A **wind sensor** (WSS or WSS-L), an **interface box** (WSI) and 1-3 **displays** (WSDI) for indication of wind speed and wind direction.

### *Wind sensor type WSS or WSS-L*
The sensor is based on 3 ultrasonic transducers arranged in a triangle for measuring of wind speed and wind direction by measuring the time it takes the ultrasound to travel from one transducer to the other two.
The **WSS** has a built-in heater that is automatically activated when the temperature drops to a level increasing the risk of icing. The **WSS-L** does not have a heater and should not be used where stable operation below the freezing point is required.

| | |
|---|---|
| Placing: | 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 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. |
| 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 may be extended by using a standard connecting box. Optional: "IP66 connection box kit" or "IP67 connector kit" can be ordered together with the transducer and used to connect the fixed transducer cable with an extension cable. (Note: IP67 connectors are for soldering). |
| Installation cable: | 4 x 0.75mm$^2$ screened cable, e.g. UL2464 18AWG4C+AE, length max. 300 metres, capacity max. 70nF between signal conductors. Optional: a suitable extension cable can be ordered with the transducer in length from 1 to 300 meters. |
| Mounting: | The sensor is delivered with a mounted steel tap. The tap is fastened on the mast using e.g. a pole/tube with an inner ¾" RG thread. |

### *WSS interface box type WSI*
The interface box is connected between the WSS/WSS-L sensor and the WSDI display. The interface box is supplied from an 18…32V DC supply and will then supply the ultrasonic transducers and the built-in heating element and at the same time convert the data signal for wind direction and wind speed into a TTL signal intended for the display. This is to make it possible to replace an existing wind sensor type 879.3c with our new sensor type WSS, and to be able to connect the sensor to the existing display type 879.50/879.521. Please note that the new name for the display is WSDI. Besides, the already mounted cable for the sensor can still be used.

### *Display type WSDI*
The WSDI display is equipped with a display for read-out of wind speed plus a circle of red LEDs for indication of wind direction. On the display a ship's symbol plus graduation lines are printed.

The keyboard on the front of the display is provided with 3 push-buttons at the right for setting of:

| | |
|---|---|
| Light intensity: | The light intensity is adjusted to a suitable level by pressing the up-arrow (▲)/down arrow (▼) keys to increase/decrease the light intensity (8 levels) |
| Read-out in "m/s" or "knots": | The "MODE" push-button is used to change the measuring unit for the wind speed between reading in m/s or knots. A red LED at the centre of the display is lit, indicating the selected measuring unit. |

*Note: WSDI is no longer for sale. Please buy XDi-N (wind) instead.

## *Technical specifications*

**Wind sensor type WSS and WSS-L**

**Sensor generally:**

| | |
|---|---|
| - Power supply: | 12V DC ±20% (max. 1.1A) |
| | 24V DC ±20% (max. 0.6A) |
| - Temperature: | Working range: |
| | WSS:            -52...+60°C (Class-approved: -25...+60°C) |
| | WSS-L:       0...+60°C (WSS-L is without heater, which means that there is no prevention of icing. Operation below 0°C is weather-dependent) |
| | Storage:       -60...+70°C |
| - Relative humidity: | 0…100% |
| - Pressure: | 600…1100hPa |
| - Electrical connection: | 2m 4 x 0.75mm$^2$ screened cable type UL2464 18AWG/4C+DW+AL/MY+Jacket. The 2m cable is fixed mounted on the sensor and is open-ended. |
| - Materials: | Wind sensor housing:     Polycarbonate +10% glass fibre |
| | Mounting tap:           Corrosion-resistant stainless steel |
| | Weight:                0.8kg |
| - Compass minimum distance: | 20 cm (8 inch) |
| - Protection: | IP66, to EN 60529 |
| - Electromagnetic compatibility: | EN 61326: 1997 + Am 1:1998 + Am 2:2001 |

**Wind speed section:**

| | | |
|---|---|---|
| - Measuring range: | 0...99.9 KTS | |
| - Resolution: | 0.1 KTS | |
| - Linearity: | 0...68 KTS: | ±0.6 KTS or ±3%, whichever is greater |
| | 68...99.9 KTS: | ±5% |
| - Response time: | 1.0 s | |

**Wind direction section:**

| | |
|---|---|
| - Measuring range: | 0...360° continuously |
| - Resolution: | 1° |
| - Accuracy: | ±3° in relation to the wind direction |
| - Response time: | 1.0 s |

**Communication port:**

| | |
|---|---|
| - RS485: | NMEA 0183 protocol. For further information, see specific manual |

**Installation options:**

| | | |
|---|---|---|
| - IP66 Connection box kit | IP66 Connection box w/cable glands and screw terminals | 20 35 00 00 08 |
| - IP67 Connector kit | 1 pcs, Plug Male 7 pin. IP67, for soldering | 10 22 00 00 52 |
| | 1 pcs, Screw cap for male plug | 10 29 92 00 02 |
| | 1 pcs, Plug female 7 pin. IP67, for soldering | 10 22 00 00 53 |
| | 1 pcs, Screw cap for female plug | 10 29 92 00 03 |
| - Extension cable | 1 to 300 meters 4x0.75mm$^2$ cable (1m steps) | 10 20 23 00 16 |

**WSS interface box type WSI:**

| | |
|---|---|
| - Power supply: | 24V DC +30% -25% reverse polarity protected (working voltage 18…32V DC) |
| - Power consumption: | Max. 0.9A at 24V DC (1.25A at 18V DC). A 2A fuse is recommended as protection for the supply input |
| - Galvanic separation: | Between supply and the rest: 600V |
| - Output for WSS supply: | 30V DC 0.6A to WSS |
| - Output for display WSDI: | TTL. 5V wind speed and direction |
| - Input from WSS wind sensor: | RS485 communication for wind speed and direction |
| - EMC: | According to EN 61000-6-1/2/3/4 |
| - Protection: | Housing: IP40. Terminals: IP20 to IEC 529 and EN 60529 |
| - Temperature: | Operating:     -25°…70°C to EN 60051 |
| | Storage:       -50°…90°C |
| - Material: | Polycarbonate (30% GFR)      UL94V0 |
| - Mounting: | Mounted on a 35mm DIN rail or by means of two 4mm screws according to DIN 46277 and DIN EN50022 |
| - Vibration: | 3…13.2Hz:    2mm (peak-peak)     EN 60945 |
| | 13.2…100Hz:  0.7g               DNV Class A |
| - Weight: | 0.45kg |

**Display type WSDI:**

| | |
|---|---|
| - Number of LEDs in circle: | 64 pcs. |
| - Display: | 2½ digit luminous 7-segment displays, height 14mm |
| - m/s or knots: | Indication of m/s or knots is changed by means of the "MODE" push-button |
| - Power supply: | 110 or 220V AC, 50-60Hz |
| - Power consumption: | 6W |
| - EMC: | According to EN 61000-6-1/2/3/4 |
| - Protection: | Housing: IP52. Terminals: IP20 to IEC 529 and EN 60529 |
| - Material: | All plastic parts are self-extinguishing to UL 94 (V0) |
| - Weight: | 0.8kg |
| - Data-out (serial): | NMEA 0183 (EIA/RS422), version 2.x-3.0 or IEC 61162-1<br>Optional: NMEA-0183 version 1.5 |

Transmission speed:     4800 Baud
Number of bits:            8
Number of parity bits:   0
Number of stop bits.     1
Transmission interval:    1 s

- Protocol NMEA 0183 ver. 1.5:     $IIMWD,xxx,T,,,yy.y,N,,*zz<CR><LF>
Wind direction (0…360°) xxx
Wind speed (0.0…99.9 KTS) yy.y
Hexadecimal check sum zz
(XOR of all characters until the "*"-character (not included))
End of transmission (EOT) <CR><LF>

- Protocol NMEA 0183 ver. 2.x-3.0:     $WIMWV,xxx,x,R,yy.y,N,A*zz<CR><LF>
Wind direction (0…360°) xxx.x
Wind speed (0.0…99.9 KTS) yy.y
Hexadecimal check sum zz
(XOR of all characters until the "*"-character (not included))
End of transmission (EOT) <CR><LF>

- Connection:     Terminal "A" signal, terminal "B" return (0V). Use a 2-wire screened cable

- Signal levels for NMEA 0183
  (EIA/RS422):     The NMEA 0183 standard requires the following signals levels:

"1" between -15V and +0.5V          |Isink| ≥ 0mA
"0" between +15V and +4V            |Isource| ≥ 15mA @ +4V

The display type WSDI releases the following levels:

"1" -9.5V ±0.5V                          |Isink| ≥ 1mA @ -8V
"0" +9.5V ±0.5V                          |Isource| ≥ 15mA @ +8V

Please notice that NMEA does not request that the output may settle power in "1" condition, but it is permissible. This is used in WSDI in order to make it compatible with RS-232C/V24.
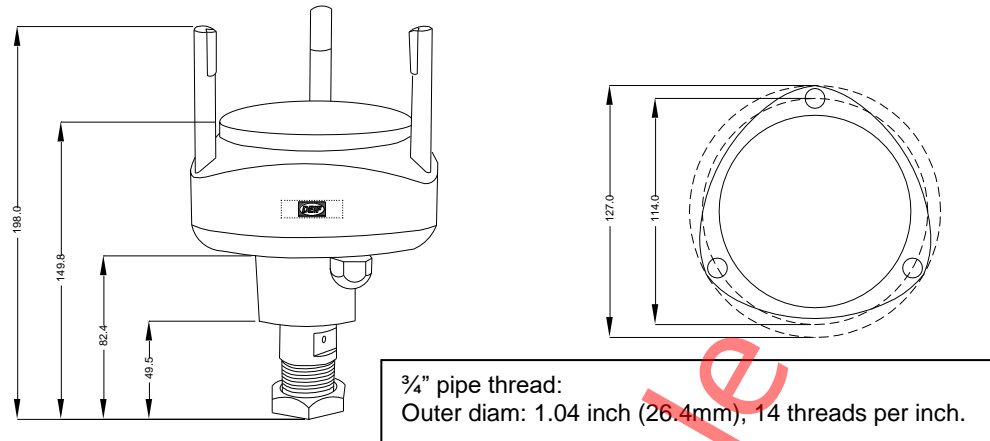
The NMEA 0183 signal is inverted like RS232.

The "A" and the "B" signals are galvanically separated as prescribed by NMEA. An RS232C receiver may be connected. Applicable would be a PC with the following configuration:

Transmission speed:     4800 Baud
Number of data bits:      8
Parity bits:                  None
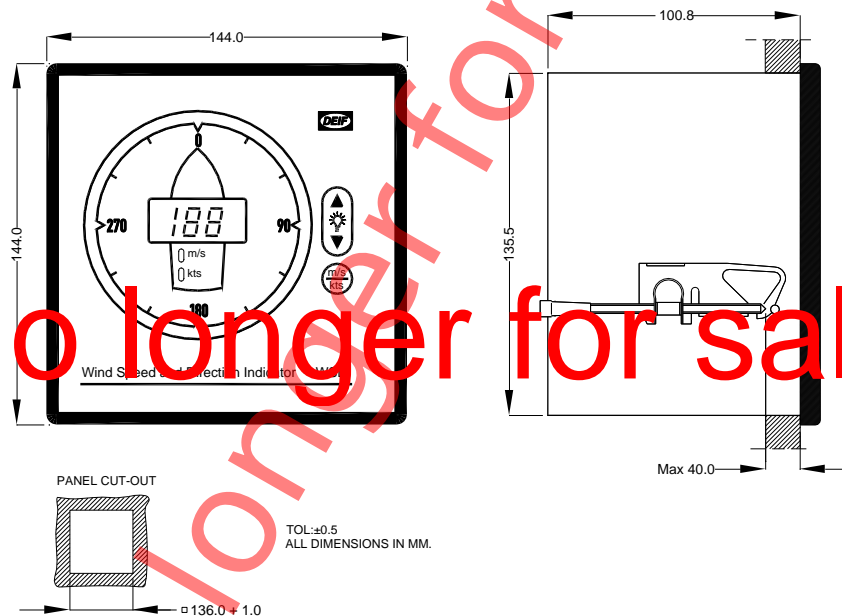Number of stop bits:      None

## Dimensions, wind sensor WSS

All dimensions in mm
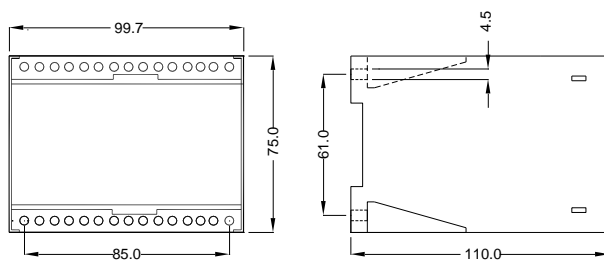
198.0
149.8
82.4
49.5

127.0
114.0

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

**WSS**

## Dimensions, display

All dimensions in mm

144.0

144.0

100.8

135.5

Max 40.0

270    0    90

_188_

m/s
kts

180

Wind Speed and Direction Indicator, WSDI

PANEL CUT-OUT

TOL:±0.5
ALL DIMENSIONS IN MM.

□ 136.0 + 1.0

**WSDI**

## WSS interface box type WSI

| Dimensions | Front panel |
|---|---|

99.7

75.0

4.5

61.0

85.0

110.0

| | | | WSS interface box | DEIF |
|---|---|---|---|---|

Item no. 2035000006     CE ⚠ 100V  CAT III. ☒

| | DISPLAY | | WSS | | POWER |
|---|---|---|---|---|---|
| | WSDI | | Supply | Input | 18-32V |
| | – | D | S | – | + | – | B | A | + | – |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

## *Connections*

**WSS interface box WSI**

| Pin no. | Function | | Note |
|---------|----------|-----|------|
| 1 | Supply voltage | - | 24V DC supply for the interface box |
| 2 | | + | |
| 3 | | NC | |
| 4 | RS485 comm. | A | Wind speed and direction data from the wind sensor |
| 5 | | B | |
| 6 | | GND | |
| 7 | Power supply out | + | 30V DC supply for the wind sensor |
| 8 | | NC | |
| 9 | | - | |
| 10 | Wind speed | TTL out | Wind speed and direction data to the display type WSDI |
| 11 | Direction | TTL out | |
| 12 | Common | GND | |
| 13 | | NC | Do not connect |
| 14 | | NC | |
| 15 | | NC | |

⚠️ **IMPORTANT!**
The WSS stainless steel mounting base shall be connected to ships earth cable (or steel hull).

**Display WSDI**

| Pin no. | Function | | Note |
|---------|----------|-----|------|
| AC | Supply | 220V AC or 110V AC | To change from 220V AC to 110V AC or vice versa, see the manual for WSS |
| AC | | | |
| GND | EARTH | | The ship's hull, it is not necessary to connect this terminal |
| 1 | AUX +5V DC | External mode control | For external dimmer and read-out of m/s or KTS in the display |
| 2 | 0V | Input from WSS interface box | Terminal 12 on the WSS interface box |
| 3 | Wind speed | | Terminal 10 on the interface box |
| 4 | Direction | | Terminal 11 on the interface box |
| 5 | Screen | | The cable screen. Do not connect the other end |
| A | Signal | NMEA | NMEA0183 version 1.5 or 2.x-3.0 |
| B | Return | | |
| | Screen | | The cable screen. Do not connect the other end |
| 9 | Mode shift | m/s or KTS | Read-out in the display |
| 10 | Dimmer | ▼ | Decrease illumination |
| 11 | Dimmer | ▲ | Increase illumination |

**Wind sensor WSS**

| Cable colour | Function | | Note |
|--------------|----------|-----|------|
| Black | Supply voltage | - | 30V DC supply for the WSS wind sensor |
| Red | | + | |
| Orange | RS485 comm. | A | Wind speed and direction data output |
| Brown | | B | |

**IP67 Connector kit assembly instruction (OPTIONAL)**

| WSS/WSS-L cable (black)<br><br>Male (CON1) connector | | Connector pin no. | WSS extender cable xx meters<br><br>Female (CON2) connector | | Signal comments |
|---|---|---|---|---|---|
| Black (-) | ● | 1 | Black (-) | ● | 30V DC Supply for WSS/WSS-L |
| Red (+) | ● | 2 | Red (+) | ● | |
| Orange | ● | 3 | Orange | ● | RS485 Comm. From WSS/WSS-L |
| Brown | ● | 4 | Brown | ● | |
| Screen | ● | 5 | Screen | ● | Cable screen |

Each connector must be soldered to respective cable (detailed information is available in the installation instruction).

## Connection diagram

**IMPORTANT !**
Ship's earth cable
(or steel hull)

2 meters of cable - part of WSS

Alternatively use the IP67
connector kit option

Connection
box

| 9 | 7 | 5 | 4 | 6 |
|---|---|---|---|---|

4 x 0.75mm²
cable lenght
max. 300m

| | | WSS | WSS interface box |
|---|---|---|---|
| 1 | – | Power 18-32V | |
| 2 | + | | |
| 3 | | | |
| 4 | A | Input | |
| 5 | B | | |
| 6 | – | | |
| 7 | + | Supply | |
| 8 | – | | |
| 9 | – | | |
| 10 | S | Display WSDI | |
| 11 | D | | |
| 12 | – | | |
| 13 | | Not used | |
| 14 | | DO NOT connect | |
| 15 | | | |

D = wind Direction
S = wind Speed

The WSS box has to be mounted indoor,
recommended is close to the indicator.

220V AC

| ~ | ~ | ⏚ | 1 | 2 | 3 | 4 | 5 | A | B | ⏚ | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

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

1
11
10
9

EXTERNAL
CONTROL

MODE

## Order specifications

| | Type | Power supply |
|---|---|---|
| Example: | WSS | 220V AC |

Due to our continuous development we reserve the right
to supply equipment which may vary from the described.