Operating Instructions

021408/04/14

Winddisplay LED

Ship Version
4.3251.0x.001 / 002 / 902
V6.0

Contents

Figures

Tables

1 Model

Description	Order - No.	Equipment	Operating voltage
Wind indicator LED	4.3251.00.001	6 x RS422 or 5 x RS 422 1 x RS 485 - Firmware for Log/Gyro- system	230 V AC / 24 V AC / 16…35 V DC
Wind indicator LED	4.3251.01.001	6 x RS422 or 5 x RS 422 1 x RS 485 - Firmware for Log/Gyro- system	115 V AC / 24 V AC / 16…35 V DC

Wind indicator LED	4.3251.00.002	6 x RS422
		or
		5 x RS 422
		1 x RS 485
		
		1 x Dual analog IF
		  with pressure sensor
		
		- Firmware for
		  Log/Gyro- system
			230 V AC / 24 V AC / 16…35 V DC

Wind indicator LED	4.3251.01.002	6 x RS422
		or
		5 x RS 422
		1 x RS 485
		
		1 x Dual analog IF
		  with pressure sensor
		
		- Firmware for
		  Log/Gyro- system
			115 V AC / 24 V AC / 16…35 V DC

Wind indicator LED	4.3251.00.902	6 x RS422
		or
		5 x RS 422
		1 x RS 485
		
		1 x Dual analog IF
		  with pressure sensor
		
		- Firmware for GPS-
		  system 212520
		
		- supply for
		  GPS system 212520
			230 V AC / 24 V AC / 16…35 V DC

Wind indicator LED	4.3251.01.902	6 x RS422
		or
		5 x RS 422
		1 x RS 485
		
		1 x Dual analog IF
		  with pressure sensor
		
		- Firmware for GPS-
		  system 212520
		
		- supply for
		  GPS system 212520
			115 V AC / 24 V AC / 16…35 V DC

Table 1: Model

2 Use

The wind display LED is a modern, data processing measuring and indicating instrument for representation and serial output of the **wind direction and wind velocity** as „**True**" or „**Rel.**" value on ships.

„True Wind" is the wind, which can be observed while the ship is standing still. It is calculated on the basis of the received data in reference to the ship's movement and the measured relative wind. Depending on the setting (refer to chapters **7.3** and **7.4** for interfaces, as well as chapter **9** for representation on the indicator), the direction of the True Wind either corresponds to geographic North or to the direction of the ship's bow.

„Rel. Wind" is the wind measured on the moving ship. The direction of the relative wind corresponds to the direction of the ship's bow.

For ships (for ex. ferries) with changing forward or backward course the reference direction of the wind direction display can be turned by 180°.. For shifting the reference direction there is a gate input on the back side of the display (see chapter **6.2.4**).

The wind display LED offers a high level of reliability and flexibility, as well as optimal display of the wind parameters.

Coloured light emitting diodes (LED's), which permit easy readability under a wide variety of lighting conditions and from various distances, are used for representation. The brightness is adjustable. Two levels of brightness can be stored via an enhanced dimming function, thus allowing quick access to individual settings for daytime and night time brightness levels.

Depending on the model, the wind display is equipped with an additional analogue interface and a Baro transmitter. This permits connection of additional measurement transducers for Rel. humidity and temperature. The measured values of temperature, Rel. humidity and atmospheric pressure are displayed serially. The parameters are not displayed.

Depending on the model the wind display is equipped with a firmware for a Log/Gyro system or with firmware for a GPS system.

2.1 Functions:

4.3251.0x.001	• Measurement of the „Relative Wind" via the wind interface or RS422 / RS 485 (ultrasonic) • Reception of NMEA 0183 telegrams with the parameters heading and ship's speed. • Calculation of the „True Wind" • Optional indication of „True Wind" (**True**) or „Relative Wind" (**Rel.**) on the display • Output of NMEA 0183 telegrams for PC and other equipment (NACOS and CUSTOMER) • Output of NMEA 0183 telegrams for actuation of external Winddisplay LED • Im „Master / Slave" mode, up to 10 further Winddisplay LED's can be connected over a maximum distance of 1000 m. • Flexible power supply for the Wind display with 230VAC or 24VAC / 16 - 35V DC (optional 115VAC). • In addition to front-side operation, external operating buttons can also be connected via connecting terminals on the rear panel of the Wind display LED. • A 180 ° wind direction correction can be carried out via a connecting terminal on the back side (ship forward or backward)
4.3251.0x.002	Same as 4.3251.0x.001, however additionally: • Measurement of the atmospheric pressure and conversion into different measuring units for data output. • Measurement of the Rel. humidity and conversion into different measuring units for data output. • Measurement of the air temperature for data output.
4.3251.0x.902	• Measurement of the „Relative Wind" via the wind interface or RS422 / RS 485 (ultrasonic) • Reception of NMEA 0183 telegrams with the parameters heading and ship's speed of a GPS- SYSTEM 212520. • Calculation of the „True Wind" • Optional indication of „True Wind" (**True**) or „Relative Wind" (**Rel.**) on the display • Output of NMEA 0183 telegrams for PC and other equipment (NACOS and CUSTOMER) • Output of NMEA 0183 telegrams for actuation of external wind display LED • In the „Master / Slave" mode, up to 10 further wind display LED's can be connected over a maximum distance of 1000 m. • Flexible power supply for the wind display with 230VAC or 24VAC / 16 - 35V DC (optional 115VAC). • In addition to front-side operation, external operating buttons can also be connected via connecting terminals on the rear panel of the wind display LED. • A 180 ° wind direction correction can be carried out via a connecting terminal on the back side (ship forward or backward) • Measurement of the atmospheric pressure and conversion into different measuring units for data output. • Measurement of the Rel. humidity and conversion into different measuring units for data output. • Measurement of the air temperature for data output. • Electrical supply of a GPS system 212520. • Electrical supply of a Level Converter 9.1720.50.000

2.2 Equipment:

4.3251.0x.001	• 1 x wind interface for connection of different types of wind transmitters • 3 x RS422 (1 x RS 485 *) input interfaces • 3 x RS422 output interfaces
4.3251.0x002	Same as 4.3251.0x.001 however, additionally: • 2 x analogue inputs (temperature, rel. humidity) • 1 x integrated pressure sensor (atmospheric pressure)
4.3251.0x.902	• 1 x wind interface for connection of different types of wind transmitters • 3 x RS422 (1 x RS 485 *) input interfaces • 3 x RS422 output interfaces • 2 x analogue inputs (temperature, rel. humidity) • 1 x integrated pressure sensor (atmospheric pressure) • Connection for voltage supply (2x12 VDC) of the external GPS system 212520 and interface transducer

* COM1: Selectable between RS 422 und RS 485

3 Display

The wind velocity is displayed as instantaneous value and the wind direction as delayed value (factory setting).

The wind direction can be displayed in four different versions, by means of a change of operating mode setting (refer to chapter **7.1**).

1. The setting „WD instantaneous" indicates the instantaneous wind direction.

2. The setting „WD delayed" indicates the delayed wind direction after an e- function ($\mathcal{T}$ = 6 sec).

3. The setting „WD instantaneous & variation" indicates the instantaneous wind direction and its variation, whereby the variation band follows the instantaneous value of the wind direction during connection establishment. Disconnection of the variation band takes place with a timing cycle of 1 second in 5° steps.

4. The setting "WD delayed & variation" indicates the delayed wind direction and its variation, whereby the „variation band" follows the delayed wind direction during connection establishment. Disconnection of the „variation band" takes place with a timing cycle of 1 second in 5° steps.

3.1 „Rel." Wind (Relative Wind)

- Definition refer to chapter 4

Wind velocity (WV):

The wind velocity is shown as an instantaneous value on the three-digit red LED display.

Units of measurement are m/s, km/h, kn and Beaufort. A red illuminated status status LED shows the selected unit of measurement.

The values measured by the wind velocity transmitter are directly consulted without conversion to display the **wind velocity**.

Wind direction (WD):

A circular arrangement of 72 rectangular LED's indicates the wind direction and its variation.

Display of the **wind direction** relates to the ship's longitudinal axis, whereas **0°** is assigned to the ship's bow. The values measured by the wind direction transmitter are used directly without conversion.

- The wind direction is indicated by means of a green LED on the starboard side.
- The wind direction is indicated by means of a red LED on the port side.
- With 0 and 180 °, indication takes place via a yellow LED.
- The variation is shown by means of an LED band, in "green" on the starboard side and in "red" on the port side, in which case the LED that marks the wind direction, in the LED band, lights up yellow.
- Operating mode „Rel. Wind" is indicated by a status LED (Rel.).

Scale is 0...180° for starboard and 0...180° for port side.
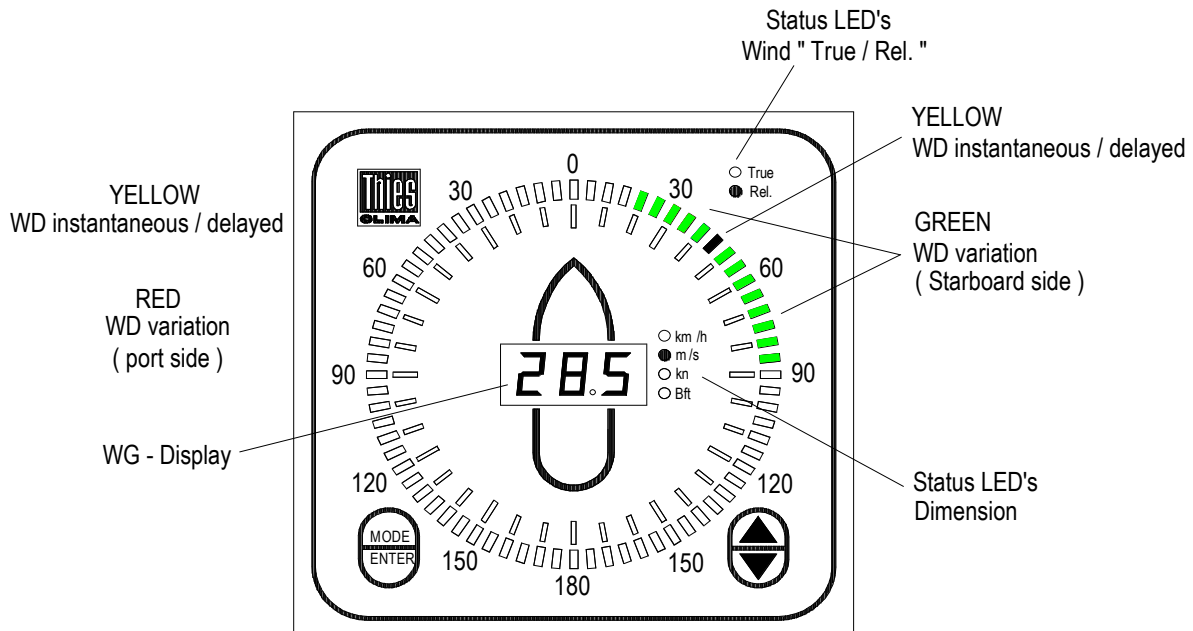
Figure 1: Display

3.2 „True" Wind

- Definition refer to chapter **4**

Wind velocity (WV):

The wind velocity is indicated as an instantaneous value on the three-digit red LED display.

Units of measurement are m/s, km/h, kn and Beaufort. A red illuminated status LED shows the selected unit of measurement.

The **wind velocity** is calculated on the basis of the relative wind and the ship's movement.

Wind direction (WD):

A circular arrangement of 72 rectangular LED's indicates the wind direction and its variation.

The wind direction is calculated on the basis of the relative wind and the ship's movement. Depending on the setting (refer to chapters **7.3** and **7.4** for interfaces, as well as chapter **9** for representation on the indicator), the direction of the True Wind either corresponds to geographic North or to the direction of the ship's bow.

Since the scale 0...180° for starboard and port side is printed, 180° ...360°, instead of 0...180°, must be assumed with the „True Wind" indication for the port side.

- The wind direction within the range 0...180° is indicated by means of a green LED.

- The wind direction within the range 180...360° is indicated by means of a red LED.

- The wind direction at 0°, 360° and 180° is indicated by means of a yellow LED.

- The variation is shown by means of an LED band, in "green" within the range 0...180° and in "red" within the range 180°...360°, in which case the LED that marks the wind direction, in the LED band, lights up yellow.

- Operating mode „True Wind" is indicated by a status LED (True).

Attention:
A wind direction scale of 0…360° must be assumed in the event of indication „True".

3.3 Course: 180° Wind display Shifting

- **Forward:** With its north marking, the wind direction transmitter resp. the combined wind transmitter is aligned normally to the bow of the ship , which is identical to the symbol on the display (bow = 0°, rear = 180°, course = forward).

- All calculations to the display of the „relative wind" or „true wind" refer to this constellation. **Backward:** If the ship goes „backward", all calculations for displaying the „relative wind" or „true wind" must be corrected (bow = rear, rear = bow, backward = forward).

- **Shifting:** Shifting of the course is done by closing the contact RES. at the strip terminal REMOTE (see chapter **6.2.5**). Afore, this switching function has to be activated by MODE 7-1 (see chapter **9**)..

  The function status of the contact RES. Is displayed by activating the button INFO& RESET (see chapter **9**).

  When shifting the course to „backwards" the received parameter wind direction is turned by 180°. Thus, the presentation of the wind is done furthermore in course (rear becomes bow).

  The shifting of the course affects, moreover, all outgoing telegrams.

  - o Telegrams via COM1 for the external wind displays (Slave)
  - o Telegrams via COM4 (NACOS) and COM5 (CUSTOMER)

4 Operational Characteristics

Definitions:

The „Relative Wind", the heading and the ship's speed must be available for calculation of the „True Wind". The "Relative Wind" is measured by means of a wind transmitter installed on the ship's bow. Heading and ship's speed are received via the following NMEA telegrams:

NMEA telegram	Interface	Heading* GYRO	Ship's speed * LOG	Remark
VBW	COM 3	---	2	SOG > SOW **
VHW	COM 3	2	3	---
VTG	COM 3	---	1	---
HDT	COM 2	1	---	---
VTG	COM 3	X	X	only with 4.3251.0x.902

*: Priority (Top: 1)

** With the VBW telegrams the SOG values („speed over ground") have priority before the SOW values („speed over water")

- *True Wind*

  Reference direction of the *True Wind* is geographic North. Zero degrees corresponds to wind from the north with an increasing angle in a clockwise direction.

- *Relative Wind*

  Reference direction of the *Relativen Wind* is the ship's longitudinal axis. Zero degrees is indicated in direction of the ship's bow and corresponds to wind from the front. The angle of *relative wind direction* increases in a clockwise direction.

Conversion of the parameters at hand into „True Wind" takes place as follows:

Calculation of True Wind

The vector *Relative Wind Velocity* (RWV) is made up of the two vectors S*peed Over Ground* (SOG) and *True Wind Velocity* (TWV).

$$RWV = SOG + TWV$$

The relative wind velocity (RWV) is hereby measured by means of an anemometer and a vane on the ship, the *Speed Over Ground* is transmitted via a serial interface and the *True Wind Velocity* is calculated:

$$TWS = RWS - SOG$$

This vector subtraction is carried out in an orthogonal coordinate system, which is connected to the ship.

The individual calculation steps are as follows:

- Break the vectors down into orthogonal components, if necessary.

- Subtract the appropriate components,
- convert into polar coordinates.

The calculation result is the sum of true wind velocity and relative wind direction (TWDS). The true wind direction in reference to north (TWDE) is calculated by adding the heading (HDG):

$$TWDE = TWDS + HDG$$

Approximations

The vector of *speed over ground* (SOG) is made up of the two vectors *speed over water* (SOW) and *water movement* (WM):

$$SOG = SOW + WM$$

The vector of *speed over ground* (SOG) is specified in telegram VBW with the components longitudinal and transversal speed over ground.

- If vector SOG is invalid (or lacking), the True Wind is calculated by approximation by replacing SOG with SOW. This procedure is permissible, if the water movement WM is marginal in consideration of the speed over water SOW. However, this condition cannot be verified.

The vector of speed over water (SOW) is specified in telegram VBW with the components longitudinal and transversal speed over ground.

- If vector SOW is invalid (or lacking), the True Wind is calculated by approximation by replacing SOG with the longitudinal component of SOW or SOG and disregarding the transversal components of SOW or SOG. This procedure is permissible, if the water movement WM is marginal in consideration of the speed over water SOW and the transversal components are marginal in consideration of the longitudinal components. However, this condition cannot be verified.
- The longitudinal component of vector SOW is specified in telegram VHV with the longitudinal speed over water (Log). The longitudinal component of vector SOG is specified in telegram VTG with the longitudinal speed over ground.

5 Recommended Choice of Location

The device is designed for indoor installation. An additional outer casing with a respective protection class is required in the event of outdoor use.

> **Note:**
>
> *Please adhere to the permitted temperature range of use when choosing the location.*

6 Installation

> **Attention:**
>
> ***The device may only be installed and wired by a qualified technician who is familiar with and adheres to the generally accepted engineering rules and the respectively valid regulations and standards.***

> **Note:**
>
> *The device settings may have to be adjusted prior to installation (refer to chapter **7**).*

6.1 Mechanical Assembly

The Winddisplay LED is designed for switchboard installation. The required switchboard cut-out must measure 138 x 138 mm. Two mounting profiles are included in delivery. Upon installation of the device into the switchboard, the mounting profiles are inserted into the rear panel of the casing and screwed into place.

6.2 Electrical Assembly

All connector pins are located on the rear panel (refer to **Figure 2: Rear panel 4.3251.0x.001**

Figure 3: Rear panel 4.3251.0x.x02
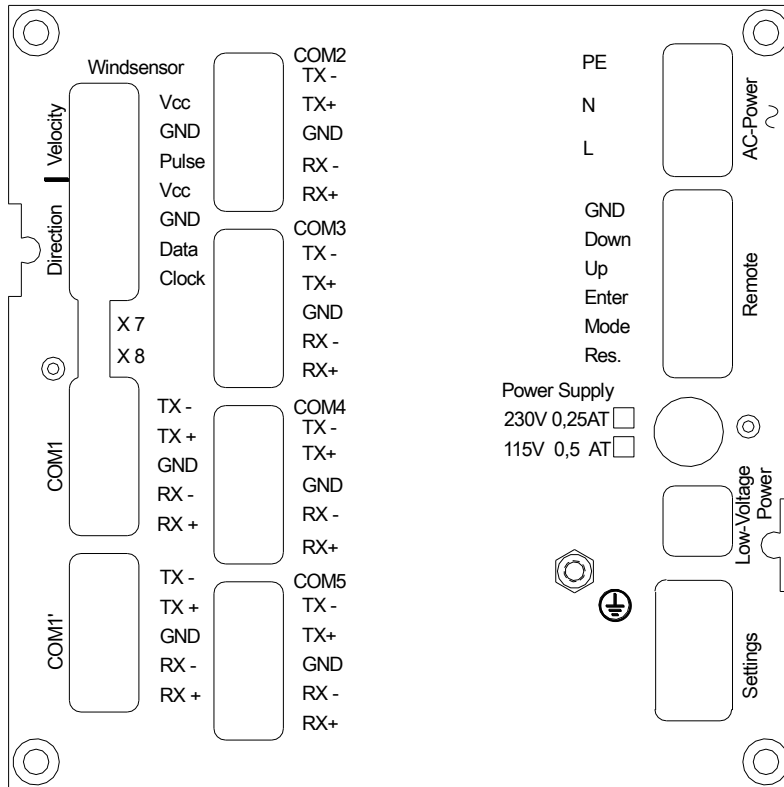
Figure 2: Rear panel 4.3251.0x.001
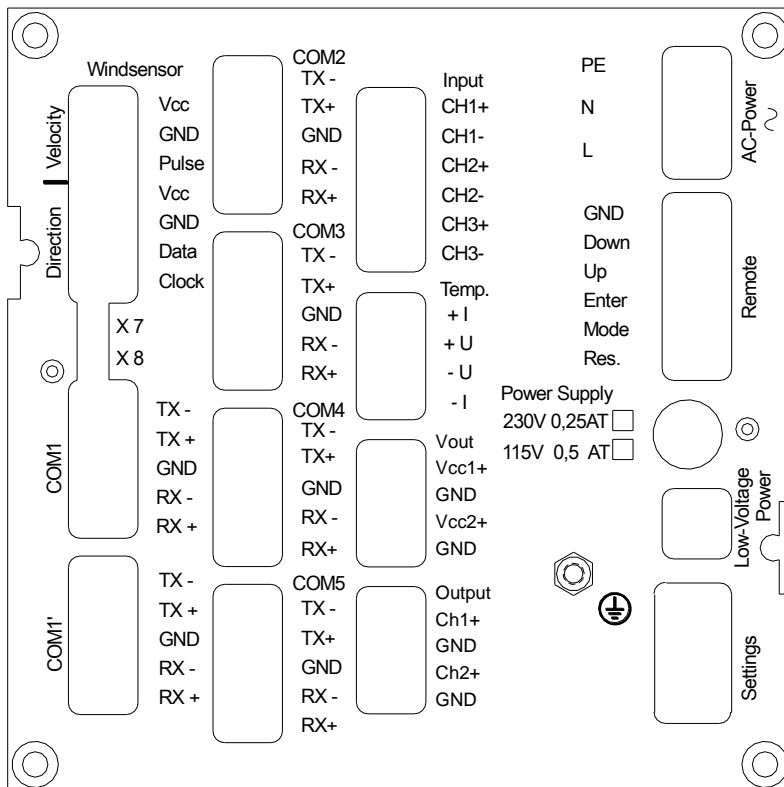
Figure 3: Rear panel 4.3251.0x.x02

6.2.1 Connection Wind Transmitter

- For wind transmitter types: Classic, Compact, First-Class (refer to table 2).

The wind transmitters are connected to the clamp connector „Wind Sensor". On connection, it must be observed that pairing of the wind transmitter types (direction and speed) must take place according to chapter 7.2 (Wind Transmitter Type).

Des.	Clamp connector: Wind Sensor
Vcc	Velocity / wind velocity
GND	Velocity / wind velocity
Pulse	Velocity / wind velocity
Vcc	Direction / wind direction
GND	Direction / wind direction
Data	Direction / wind direction
Clock	Direction / wind direction

Transmitter-No.	PIN						
	Vcc (WV)	GND	Pulse (WV)	Vcc (WD)	GND	DATA (WD)	CLOCK (WD)
4.3336.21.000 4.3336.31.000 4.3336.21.001 4.3336.21.008 4.3336.31.008	1	2	3	4	---	6	5
4.3336.22.000 4.3336.22.001 4.3336.22.008 4.3336.32.000 4.3336.32.001 4.3336.32.008	1	2	3	4	---	6	5
4.3129.00.000	---	---	---	1	2	3	4
4.3129.60.000	---	---	---	1	2	3	4
4.3519.00.000	1	2	3	---	---	---	---
4.3303.22.000	1	2	3	---	---	---	---
4.3303.22.007	1	2	3	---	---	---	---
4.3303.22.008	1	2	3	---	---	---	---
4.3303.22.018	1	2	3	---	---	---	---
4.3125.32.100 4.3125.32.101	---	---	---	1	2	3	4
4.3125.33.100 4.3125.33.101	---	---	---	1	2	3	4
4.3351.00.000 4.3351.10.000	3	2	1	---	---	---	---
4.3150.00.000 4.3150.10.000	---	---	---	3	2	5	4

Table 2: Wind Transmitter Connection Table

6.2.2 Connection Serial Interface RS422 / RS485

The following interfaces are available

- COM 2,3 Input NMEA Interfaces

- COM 4,5 Output RS422 Interfaces

- COM 1 selectable between RS422 (full-duplex) und RS485 (half-duplex)

Ultrasonic Anemometer →	**Winddisplay LED**	→ Ext. Winddisplay

```
Ultrasonic Anemometer  ──►  COM 1, COM 1'    COM 1, COM 1'  ──►  Ext. Winddisplay

HDT message            ──►  COM 2                    COM 4  ──►  NACOS telgram

VBW, VHW or VTG message ──► COM 3                    COM 5  ──►  CUSTOMER telegram
```
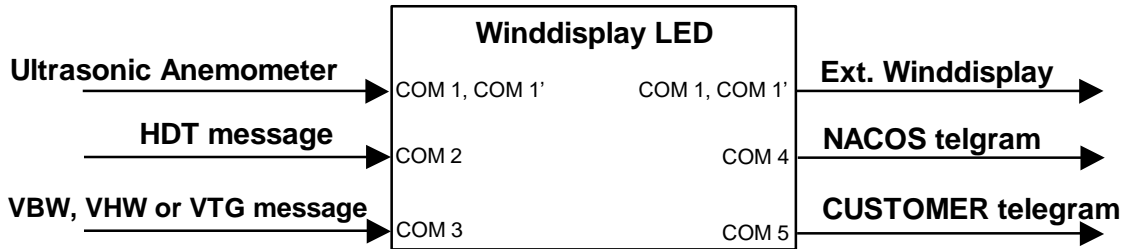
The baud rate setting of the interfaces takes place via DIP switches 7 and 8 on the rear panel (refer to settings chapter 7.5). The setting applies to all interfaces.

Default setting **4800 baud**

The following interface specification is permanently set for the outputs (8N1):

8 data bit
NO parity
1 stop bit

A special interface specification is not necessary for the inputs, which may have the following interface specification:

- COM1   8N1, 7E1

- COM2 + COM3: 8N1

6.2.2.1 COM 1 and COM 1'

- For wind transmitters with serial data transfer (Ultrasonic- Anemometer 4.38xx...., Wind Direction Transmitter First Class 4.3150.x0.400) and other external Winddisplay LED's (Slaves).

The connection is established via clamp connectors „COM1" / „COM1' ". The two clamp connectors of the interface are connected in parallel.

Des.	Clamp connector: COM1	Clamp connector: COM1'
TX- (RX-)	transmitter (receiver)	transmitter (receiver)
TX+(RX+)		
GND	ground	ground
RX-	receiver	receiver

Interface configuration

RS422   RS485
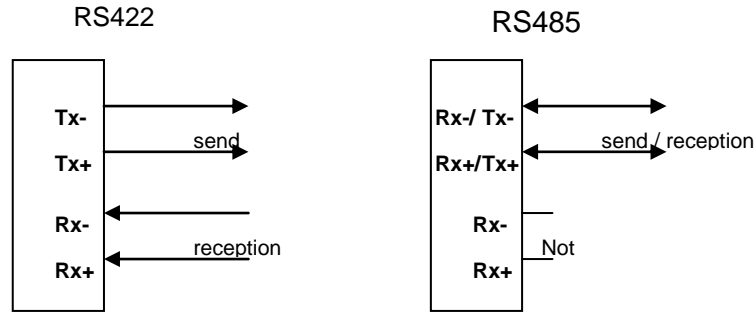
The selection of the interface configuration is carried out via the key mode (see **9** „operation"). In the operation mode RS485 the output of the requirement protocol is carried out cyclically for the reception of the VDT-telegram from the ultrasonic.

Contact pins X7 that can be bridged with a jumper are located on the rear panel of the Winddisplay, for termination in case of long lines (refer to **Figure 4: Example of Connections**
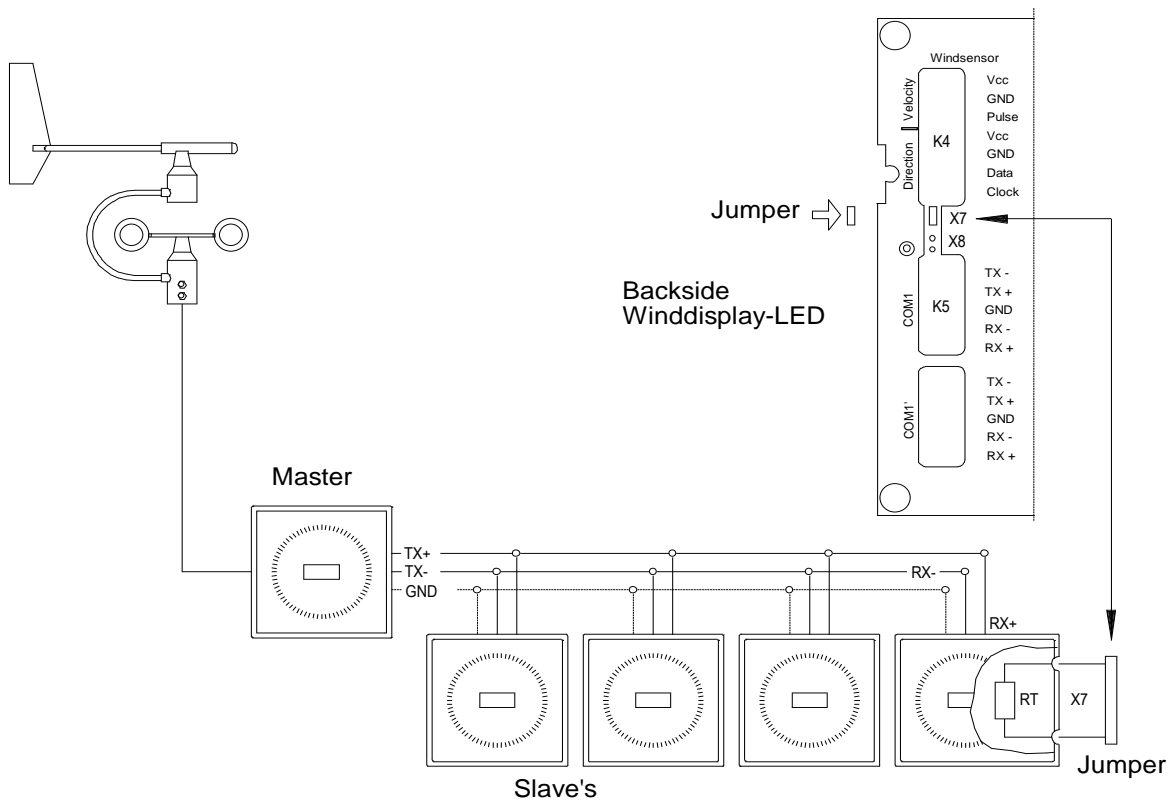
Figure 4: Example of Connections

Advice for RS422:

Interferences on long lines can affect serial transmission. Excess voltage can destroy the serial interface. We therefore recommend:

- The transmission line should be screened. The screen must be connected to central earth potential.

- For cable connections exceeding 100 m in length, twisted cable pairs should be used for signal lines +RX/-RX and +TX/-TX.

- The ground pins (GND) should be connected in addition to the twisted signal lines. If major differences in potential between transmitter and receiver result in high compensating currents, interface adapters for potential separation must be used.

- The cable must at all events be terminated with is characteristic impedance (100 Ω to 600 Ω according to cable). In the event of several Winddisplay LED's (Slaves), the resistor must be fitted to the receiver that is the farthest away from the transmitter.

- The integrated termination resistor (RT=200Ω) can be activated (**Figure 3: Rear panel 4.3251.0x.x02**) through use of a Jumper (X7) on the receiver (slave).

6.2.2.2 COM 2, 3, 4, 5

- COM2: input HDT message
- COM3: input VBW, VHW or VTG message
- COM4: output NACOS telegram
- COM5: output CUSTOMER telegram

Description of the NMEA-inputs and the output telegrams refer to chapter 8

Connection respectively takes place via the clamp connectors labelled COM 2-5.

Des.	Clamp connector: COM 2, 3	Clamp connector: COM 4, 5
TX-	Not used	Transmitter RS485
TX+		
GND		Ground
RX-	Receiver NMEA	Not used
RX+		

Output cycle (NACOS , CUSTOMER):

The output cycle for the respective telegram package of NACOS and CUSTOMER interface takes less than 1 second. The output cycle of maximum1 second is warranted with the default baud rate of 4800 Bd or higher.There are intervals of respectively at least 15ms between the individual telegrams.

Output cycle (external Winddisplay LED)

The telegrams „True Wind" and „Relative Wind" are issued every second. With baud rates less than 4800 Bd, it may be impossible to terminate output within one second, owing to circumstances. The subsequent telegram is started upon complete output of the previous telegram.

6.2.3 Connection Analog Inputs

- Applies only for model 4.3251.0x.002 / 902
- For external measurement transducers for recordation of relative humidity and temperature with the following parameters:

Parameter	Measuring range	Input range	Pin designation
Rel. humidity	0% – 100%	0 – 1V	CH3+ , CH3-
Temperature	-30°C – +50°C	4-conductor circuit	+I , +U , -U , -I

Des.	Clamp connector: input (Rel. humidity)
CH1+	------------
CH1-	------------
CH2+	------------
CH2-	------------
CH3+	0 ... 1 V
CH3-	0 ... 1 V

Des.	Clamp connector: temp. (Temperature)
+I	
+U	Pt100 in 4- conductor circuit
-U	
-I	

Note:

The barometric air pressure is recorded by the integrated Baro transmitter on the analog interface.

Calculation of parameters for NACOS and CUSTOMER telegrams

Atmospheric pressure (MMB)	Humidity (MHU)	Temperature (MTA)
in bar	Rel. humidity in %	Temperature in °C
in inch of mercury	Absolute humidity in g/m^3	
	Dew point in °C	

6.2.4 Connection Power Supply

- For Winddisplay 4.3251.**00**. x0x

Des.	Clamp connector: AC - Power
PE	Protective conductor
N	230V AC
L	230V AC

or

Des.	Clamp connector: low voltage Power
1	24V AC/DC
2	24V AC/DC

- For Winddisplay 4.3251.**01**.x0x
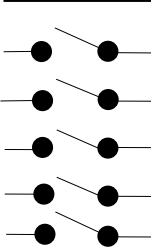
Des.	Clamp connector: AC - Power
PE	Protective conductor
N	115V AC
L	115V AC

or

Des.	Clamp connector: low voltage Power
1	24V AC/DC
2	24V AC/DC

6.2.5 Connection Remote Control

Des.	Clamp connector: Remote		Remote control
--	GND		GND
--	Down		Down
--	Up		Up
--	Enter		Enter
--	Mode		Mode
--	Res.		Reset / course *

*Double pin assignment of the clamp connector „Res.".

        Mode 7-0 (see chapter **9**) reset function

        Mode 7-1 (see chapter **9**) course

Enter current course of the ship:

        Switch OFF = course forward

        switch ON   = course backward

6.2.6 Connection Sensor Supply only (with 4.3251.0x.902)

Des.	Clamp connector: Vout
Vcc1+	12 VDC
GND	
Vcc2+	12 VDC
GND	

6.2.7 Optional connection (Analogue output)

Des.	Clamp connector: Output
Ch1+	Analogue out
GND	
Ch2+	Analogue out
GND	

7 Settings

An **8-fold DIP switch (settings) S1…S8** is located on the rear panel of the device (refer to fig. 2 **Figure 2: Rear panel 4.3251.0x.001**) for basic setting of different parameters.

Note:

A restart, which is effected via actuation of the key „Info Reset" or via interruption of the power supply, must be carried out upon change of switch setting.
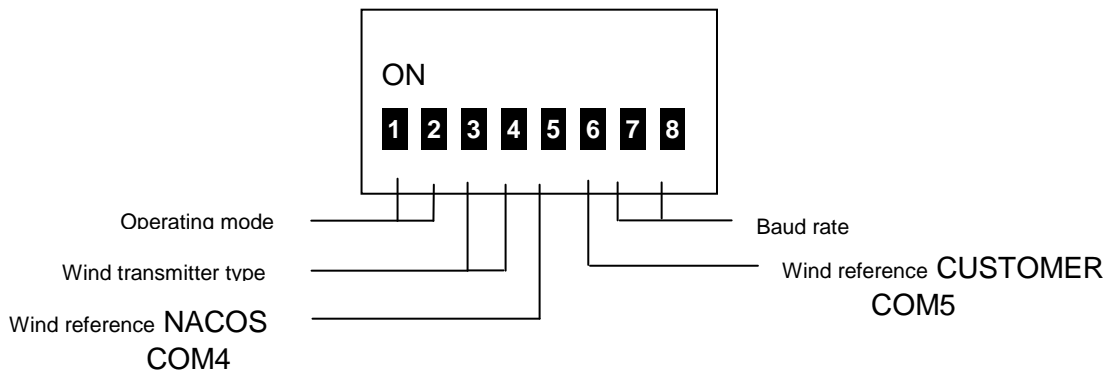
Figure 5: DIP switch

7.1 Setting Operating Mode
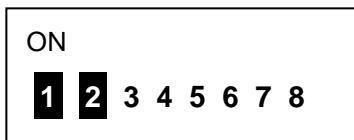
Operating mode	S1	S2
WD instantaneous	on	on
WD delayed	off	on
WD inst. & variation	on	off
WD delayed & variation *	off	off

* = Delivery status

Attention:
> ***The setting is only accepted after a restart!***

7.2 Setting Wind Transmitter Type

```
ON

1  2  ▉3▉  ▉4▉  5  6  7  8
```
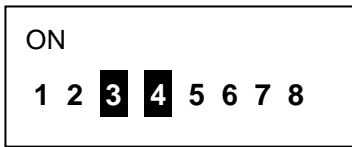
Wind transmitter type (Wind transmitter pairing)	S3	S4
Wind transmitter type "Classic" 4.3336.21.000 / 001 4.3336.31.000 / 001 4.3336.22.000 / 001 4.3336.32.000 / 001 4.3303.22.000 with 4.3125.32.100 / 101 4.3303.22.007 with 4.3125.32.100 / 101 4.3303.22.000 mit 4.3125.33.100 / 101 4.3303.22.007 mit 4.3125.33.100 / 101 **Wind transmitter type „Compact"** 4.3129.00.000 with 4.3519.00.000 4.3519.00.000 mit 4.3129.60.000	on	on
Wind transmitter type "Classic" 4.3336.21.008 4.3336.31.008 4.3336.22.008 4.3336.32.008 4.3303.22.008 with 4.3125.32.100 4.3303.22.018 with 4.3125.32.100	off	on
Wind transmitter type „First-Class" 4.3351.x0.000 with 4.3150.x0.000	on	off
Wind transmitter type „WD-First-Class" with Wv-signal acquisition 4.3150.x0.400 **Note:** Is valid only with supply from the Wind display LED	Off	Off

If a wind transmitter is connected to the Winddisplay LED, the type must be programmed via switches S3 and S4. The delivery status respectively corresponds to the provided wind transmitter type.

Note:

Wind transmitter types WR- Classic and WR- Compact are automatically identified and set upon a restart.

7.3 Setting Wind Reference NACOS (COM 4)

```
ON

1 2 3 4 [5] 6 7 8
```

Wind reference NACOS	S5
Relative (Rel.) wind *	on
True Wind	off

* = Delivery status

Setting of the wind reference in the MWV telegram (refer also chap. 8)

7.4 Setting Wind Reference CUSTOMER (COM 5)

```
ON

1 2 3 4 5 [6] 7 8
```

Wind reference CUSTOMER	S6
Relative (Rel.) wind *	on
True wind	off

* = Delivery status

Setting of the wind reference in the MWV telegram (refer also chap. 8)

7.5 Setting Baud Rate:

```
ON

1 2 3 4 5 6 [7] [8]
```

Baud rate	S7	S8
1200	on	on
2400	off	on
4800 *	on	off
9600	off	off

* = Delivery status

Attention:
The setting is only accepted after a restart!

8 Data Protocol

The following input/output protocols can be processed

Abbreviations:

„*"	= identifier for check sum
„,"	= separator
„H"	= check sum high
„L"	= check sum low
<**STX**>	= start of text
<**CR**>	= carriage return
<**LF**>	= line feed

COM1 Input (Ultrasonic Anemometer)

The COM1 interface is reserved for reception of an ultrasonic anemometer with the following protocol.

Type	Protocol	Format	Data specification
Pn1	Ultrasonic	<STX>xx.x xxx xxx.x xx*HL<CR><ETX>	8N1

```
       | | | |   |     |
       | | | |   |     |——Unused
       | | | |   |————————Wind direction (<°)
       | | | |——————————————Wind velocity (m/s)
```
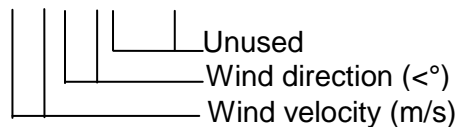
In the operation mode COM1 = RS485 the following requirement telegram is sent to the ultrasonic.

VDT (Ultrasonic)

00TR00002<CR>

```
| | | | |   |
| | | | |   |————————(VDT) telegram no.
| | | |———————————————Command identific.
| |———————————————————Identification no.
```
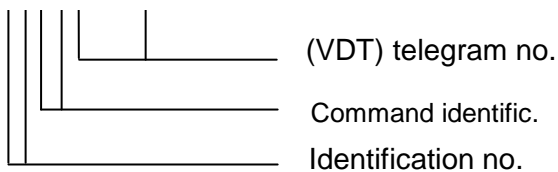
COM1 and COM1' Output (External Winddisplay LED)

Output of the telegrams for display of Rel./True Wind on the external Winddisplays takes place via COM1. Output of the telegrams „Relative Wind" [**R**] and „True Wind" [**T**] takes place alternately with an interval of at least 50 ms.


```
$WIMWV,ddd.d,R,ss.s,M,A*HL<CR><LF
                           Status: A(a)=valid, V=invalid
                           Unit: m/s
                           Value of wind velocity in m/s
                           R = relative wind  /  T = true wind
                           Value of wind direction in degrees
```

The status controls the output of Rel. / True Wind values on the external Winddisplays. An „a" in the status of either of the sent telegrams renders compulsory the display of wind values with an „a" in the protocol. An „A" in the status of both telegrams permits Rel./True Wind transfer to the external Winddisplays. The status setting takes place in connection with the Mode function MODES 3 & 2 (refer to chapter 9).

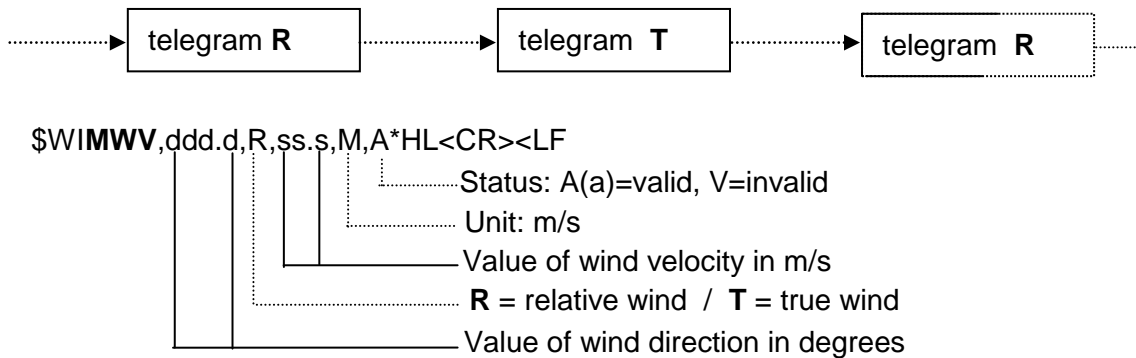| Mode 3 (Remote)	Mode 2 (Rel./true)	MWV Rel.-protocol	MWV True-protocol
3-0	True	$WIMWV………A…	$WIMWV………a…
3-0	Rel.	$WIMWV………a…	$WIMWV………A..
3-1	No influence	$WIMWV………A…	$WIMWV………A...

General to receive NMEA-telegrams (COM2 + COM3):

- Maximum length of the telegrams: 64 characters

- Recommended minimum distance between the ends (<LF> - character) of all NMEA-telegrams: 20ms

- The telegram identification can be changed between all 5 characters (instrument and data record ID) or only between the last 3 characters (data record IC) – refer to chapt. 9 MODE 5.
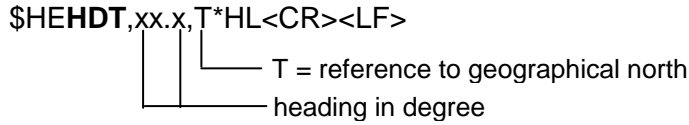
  Example for HDT-telegram:

  - Setting MODE 5-0 (3-digit filter mask without instrument-ID):

    Telegram must contain „$__HDT"

  - Setting MODE 5-1 (5-digit filter mask with instrument-ID):

    Telegram must contain „$HEHDT"

COM2 Input (HDT protocol) :

NMEA 0183 V2.0

Receipt of the HDT protocol with the heading contained

$HE**HDT**,xx.x,T*HL<CR><LF>

- T = reference to geographical north
- heading in degree

COM3 Input (VBW, VHW and VTG Protocol)

NMEA 0183 V2.0

Receipt of protocols VBW, VHW and VTG with the therein contained heading and the ship's speed.

$VD**VBW**,xx.x,xx.x,A,xx.x,xx.x,A,xx.x,A,xx.x,A*HL<CR><LF>

- Unused
- Transversal speed over ground in knots
- Longitudinal speed over ground in knots
- Transversal speed over water in knots
- Longitudinal speed over water in knots
- Status: A=valid, every other character = invalid

$VH**VHW**,xxx.x,T,,M,xx.x,N,,K*HL<CR><LF>

- Unit: knots
- Speed over water in knots
- T = Heading in reference to geographical north
- Heading in degrees

$GP**VTG**,x.x,T,,M,xx.x,N,,K,X*HL<CR><LF>

- Operation mode: A,B,E = valid
- Unit: knots
- Speed over ground in knots
- T = Heading in reference to geographical north
- Course over ground in degrees

COM4 + COM5 Output (NACOS + CUSTOMER)

NMEA 0183 V2.0

Outputs NACOS + CUSTOMER interface with following output telegrams are issued in succession, in the order described below.

1: Air humidity

$**WIMHU**,hhh.h,aaa.a,ddd.d,C*HL<CR><LF>

- Unit: °C
- Value dew point temperature in °C
- Value absolute humidity in g/m^3
- Value relative humidity in %

2: Air pressure NMEA

$WIMMB,ii.ii,I,b.bbb,B,*HL<CR><LF>

         Unit: bar
        Value barometr. Pressure in bar
       Unit: inch Hg (mercury)
      Value barometr. pressure in inch Hg (mercury)
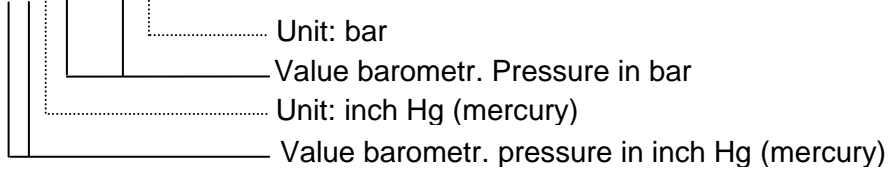
3: Air temperature

$WIMTA,ttt.t,C*HL<CR><LF>

      Unit: °C
     Temperature value in °C

4: Apparent wind (wind values referred to axis of ship)

$WI**MWV**,ddd,R,ss.s,M,A*HL<CR><LF>

        Status: A=valid data, V=invalid data
       Unit: m/s
      Value wind velocity in m/s
     R = relative wind / T = true wind *
    Value wind direction in degrees
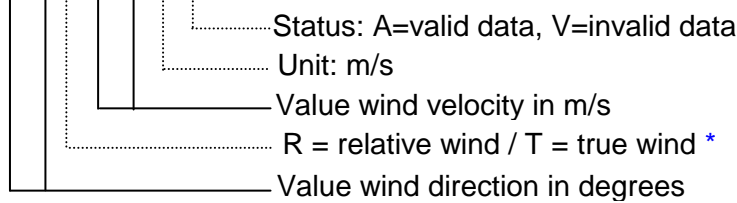
  *: The wind reference can be set in the MWV telegram by means of DIP switches 5 and 6 (refer to chapter **7.3 and 7.4**).
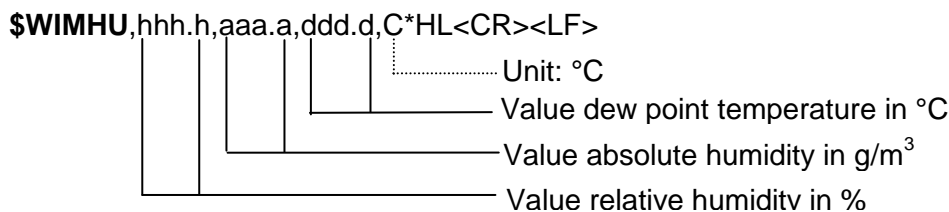
    R: Wind values of wind transmitter

    T: Wind values considering the ship velocity

5: True wind (wind values referring to true north)
  $WI**MWD**,ddd.d,T,,M,sss.s,N,sss.s,M,A*HL<CR><LF

        Status: A=valid data, V=invalid data
       Value
      Value rel. wind velocity in m/s
     T = true wind
    Value rel. wind direction in degrees
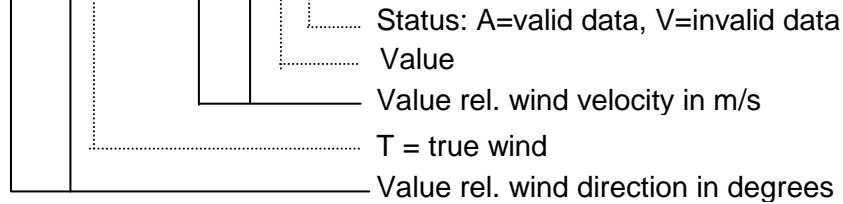
6: Air pressure THIES

    With its special identification, the following telegram is intended for the „weather display", and includes the air pressure in hPa.

  $TH**IES**,aaaa.a,*HL<CR><LF>

      Air pressure in hPa

9 Operation

The Winddisplay LED is operated from the front by means of 5 buttons, as shown in the diagram below. A short beep acknowledges the actuation of any button.

The Winddisplay LED can additionally be operated via the clamp connector „Remote" located on the rear panel of the device, as well as via external buttons. The remote control buttons are not included in delivery.

Figure 6: Operation

Button Functions:

Button "▲"(UP) and **Button "▼" (DOWN)** :

The select functions in **MODES 0 to 5** are selected via buttons ▲ and ▼**.**

Button „ENTER" :

The respective setting is accepted in **MODE (1 to 5)** via the **ENTER** button. The display is subsequently reset to **MODE 0.**

Button „ MODE":

The **MODE button** effects onward switching to the next MODE set function. The corresponding status LED or the „-" sign in the WT-display flashes.

Note:

*The display is automatically reset to **MODE 0** after a restart.*

MODE	
MODE 0	**Adjustment of brightness:** The brightness of the LED display is dimmed in 18 steps via buttons ▲ & ▼. **Adjustment of MAX and MIN brightness:** The previously set brightness can respectively be stored as MAX or MIN value via simultaneous actuation of buttons ▲ or ▼ and the „Enter" button. **Retrieval of MAX and MIN brightness:** The stored brightness values are retrieved by pressing buttons ▲ or ▼ for 3 seconds.
MODE 1	**Adjustment of the wind velocity dimension:** The wind velocity dimension (km/h, m/s, kn and Beaufort) is set by means of buttons ▲ & ▼
MODE 2	**Adjustment of the wind display:** The display of REL or TRUE Wind is set via buttons ▲ & ▼
MODE 3	**Activation of the wind (rel/true) remote control for external wind display(s)** The remote control is activated or deactivated via buttons ▲ & ▼ Following signs are additionally shown in the WT-display (minus flashes): **3−0** Remote control **ON** * **3−1** Remote control **OFF**
MODE 4	**Adjustment of the wind reference for the Winddisplay and ext. Winddisplay(s)** The wind reference of the True Wind of the Winddisplay(s) is adjusted via buttons ▲ & ▼ Following signs are additionally shown in the WT-display (minus flashes): **4−0** **Reference to the ship's axis** * **4−1** **Reference to geographic North**
MODE 5	**Telegram filter adjustment** The respective telegram filter for the NMEA protocols is selected via buttons ▲ & ▼ Following signs are additionally shown in the WT-display (minus flashes): **5−0** 3-digit filter mask * **5−1** 5-digit filter mask **$xxMMM....** e.g. **$xxVBW** **$MMMMM.......** e.g. **$VDVBW**
MODE 6	**Setting of the COM1 (RS422 / RS485)** Through the buttons ▲ & ▼ the interface function is set. **6−0** :COM1 = RS422 (full-duplex) standard **6−1** :COM1 = RS485 (half-duplex). Requiring the VDT-tel. from Ultrasonic
MODE 7	**Setting function of clamp connector** Through buttons ▲ & ▼ function of the clamp connector „Res." is set. **7− 0** :INFO & RESET **7− 1** :Entering course of the ship

* = Delivery status

Button „INFO & RESET":

An LED test is started by pressing the button **INFO & RESET**.

- All LED's illuminate
- Display of device parameters (refer to table 3)
- Restart of the Winddisplay LED.

Example

Device parameters	Display
Software	
Version No. (e.g.)	r 1.1
Input type	
Wind transmitter input	An0
COM- interface	An1
Hardware options	
UART-interface	Au-
UART & ANALOG-IF	AuA
Wind transmitter type	
Classic	CL1
Classic	CL2
Compact	CoP
First Class	F-C
NACOS telegram	
Wind reference North	C4E
Wind reference ship	C4S
CUSTOMER telegram	
Wind reference North	C5E
Wind reference ship	C5S
Winddisplay(s)	
Wind reference North	C1E
Wind reference ship	C1S
Remote Ext. Winddisp.	
Remote Enable	rLE
Remote disable	rLd
Remote Clamp C. Res.	
RESET- Function	rrE
Course Function	rFA
Display only when rFA	
Course forward	*r-F*
Course backward	*r-b*
Baud rate	
1200	b12
2400	b24
4800	b48
9600	b96

Table 3: Device parameters

10 Functional Test

The Winddisplay LED carries through some test procedures during a restart or upon actuation of the **INFO & RESET** button (refer to chapter 9). An error code appears in the display in the event of an error (refer to chapter 11). All wind transmitters must be disconnected in order to be able to perform a complete Windinterface test.

11 Error Message

If an error is detected during operation, the respective error code is shown in the display for at least 3 seconds or as long as the error is resident.

Error code	Error	Remark/action
E01	Internal Vcc 5V	Device faulty: Return for inspection
E02	Vcc Wind transmitter	Disconnect wind transmitter, restart device. If error is still displayed, return device for inspection. Otherwise alternately connect wind transmitters to determine the faulty wind transmitter.
E03	Icc WT	Check wind velocity transmitter connections and lines. If error message persists, wind transmitter is presumably faulty.
E04	Icc WD	Check wind direction transmitter connections and lines. If error message persists, wind transmitter is presumably faulty.
E05	WT-interface	Device faulty: Return for inspection
E06	WD-interface	Device faulty: Return for inspection
E07	WD-serial	Check data connection/line of the wind direction transmitter If error message persists, wind transmitter is presumably faulty
E08	WT-overflow	1.Check setting wind transmitter type 2. Check connection and line If error message persists, wind transmitter is presumably faulty
E09	COM1 Timeout	1. No reception – transmitter not active 2. Check setting of baud rate 3. Check connections of R422 /lines Rx+ & Rx- 4. **Test:** Connect Rx+ & Rx- with Tx+ & Tx- . If E11 -> interface OK otherwise COM1 defect
E10	COM1 SIN-buffer overflow	1. Check baud rate, word length 2. Exchange RS422 connections Rx+ & Rx-
E11	COM1 Protocol format	Wrong telegram
E12	COM1 Check sum	Check transmitted protocol
E13	WT & WD error	Wind transmitter, error in the telegram (for ex. Ultrasonic)
E14	WT "FF.F"	Wind speed error in the telegram (for ex. Ultrasonic)
E15	WD "FFF"	Wind direction error in the telegram (for ex. Ultrasonic)

E16	REL/TRUE error	Check transmitted protocol (error „a" appears twice in telegram)
E17	VDT protocol	No reception from ultrasonic - check connection (RS485 half-duplex)
E20 *	COM 3 Timeout	Timeout, no reception
E21 *	COM 3 error	1.Check Baud rate settings 2.Check R422 connections/lines Rx+ & Rx-
E22 *	LOG error (velocity)	No valid velocity values available in telegram Check protocol(s)
E23 **	COM 2 Timeout	Timeout, no reception
E24 **	COM 2 error	1.Check Baud rate settings 2.Check R422 connections/lines Rx+ & Rx-
E25 **	Gyro error (heading)	No valid heading values available in telegram Check protocol(s)
E50	Syntax error	Device faulty: Restart, if necessary
E99	Watchdog	Temporary interference, if a nonrecurring error message appears for 3 sec. If error message appears frequently, device faulty.

Table 4: Error message

*   These errors are output only when the display is set to "True" (see chap. 9 MODE 2-TRUE)

**   These errors are output only when the display is set to reference "North" (see chap. 9 MODE-1)

12 Maintenance

The Winddisplay LED is maintenance-free.

Cleaning
A damp cloth, free of chemical detergents, should be used to clean the screen and casing of the device.

Storage
A dry, dust-free room with temperatures ranging from –20...+ 50°C is compulsory for storage of the Winddisplay LED. We recommend box storage of the device.

Fuse
A mains fuse is located on the rear panel of the Winddisplay LED. The fuse holder can be opened with a screwdriver.

> **Attention:**
> *Strictly the following fuses may be used in the event of a fault:*
> *230V : 0,25 AT for Winddisplay 4.3251.00.001 / 002*
> *115V : 0,5 AT for Winddisplay 4.3251.01.001 / 002*

13 Technical Specifications

Description		
Wind transmitter inputs		
Wind direction	Input	Thies Seriell Synchron
	Type	Compact 4.3129.00.000 / 4.3129.60.000 Classic 4.3125.x2.100 / 101 Classic 4.3336.x1.00x / 4.3336.x2.00x First Class 4.3150.x0.000
	Sampling rate	10Hz
Wind velocity	Input	Frequency
	Level (Ua)	Ua ≤ 1V , Ua ≥ 3.3V
	Frequency (max)	Compact 1000 Hz Classic 1550 Hz Classic 850 Hz First Class 1600 Hz
	Type	Compact 4.3519.00.000 Classic 4.3303.22.000/007/008/018/4.3336.x1.00x 4.3336.x2.00x First-Class 4.3351.x0.000
	Sampling rate	1Hz
Wind transmitter power supply	Vcc WR / WG	5.1... 5.7 V
	Icc max	20mA
Interfaces		
Digital interfaces		6 serial interfaces (EN 61162-1)
	Type	RS422 (RS485) COM 2 +3: NMEA inputs
Data format	Input	(3 * RS422) 8N1 (COM1 : also 7E1, parity bit is disregarded Receipt of the NMEA telegrams VBW, VHW, VTG, HDT (see chap. **8)**
	Baud rate	1200, 2400, 4800, 9600 Bd
Analogue inputs	**Only with model**	**4.3251.0x.002**
Rel. humidity	Input	0 ... 1 V (= 0 ... 100% rel. humidity)
	Resolution	10bit
	Precision	± 0,1 %
Temperature	Input	Pt 100 (- 30 ... 50°C)
	Resolution	12bit
	Precision	± 0,2 K
Integr. Pressure sensor	**Only with model**	**4.3251.0x.002**
Barometr. air pressure	Measuring range	750 ... 1100 hPa
	Resolution	0,1 hPa
	Precision	± 1,5 hPa @ 25 °C
	Temperature influence	± 1,5 hPa at constant pressure

Voltage supply of external sensors	Only with model	4.3251.0x.902
	Output	2 x Voltage U (Vcc) 12V (is programmed on request)
	Icc (max)	$U1_{Vcc} + U1_{Vcc} < 110$ mA
	Fuse	Polyswitch ca. 140 mA
Operating voltage	mains	230V AC ±10% 50...60Hz (with 4.3251.00.x0x)
		115V AC ±10% 50...60Hz (with 4.3251.01.x0x)
	Mains fuse	0,25 AT (230V AC) resp. 0,5 AT (115V AC)
	Low potential voltage	16... 28 V AC
		12... 35 V DC
	Current consumption	Max. 1000mA with 16V DC
Display		
Wind velocity	Dimension	m/s, kn, km/h, Bft
	WT - display	3-digit LED, height 15mm
	Resolution	0,1 m/s 0,1 kn as of 100kn 1kn 1 km/h 1 Bft
Wind direction	Resolution	5 °
	LED's	72 pieces; 2 x 4mm, Colour: red, green
	Follow-up time of the variation	1 step /sec
	WD-delay	☐☐= 6 sec.
General		
	Temperature range	-10....+50 °C
	Humidity range	non-condensing
	EMV	EN 60945, EN 61000-6-2, EN 61000-6-3
	Oscillation	EN 60945, IEC 60068-2-6
	Environmental audit	EN 60945
	Compass safety distance	EN 60945 Standard magnetic compass 0.50 m Magnetic steering compass 0.35 m
	Low potential voltage	EN 61010
Casing		
	Material	aluminium
	Dimensions	144 x 144 mm depth: 119 mm
	Weight	1.5 kg
	Protection class	IP23; EN 60529

14 Dimension Diagram

144

144
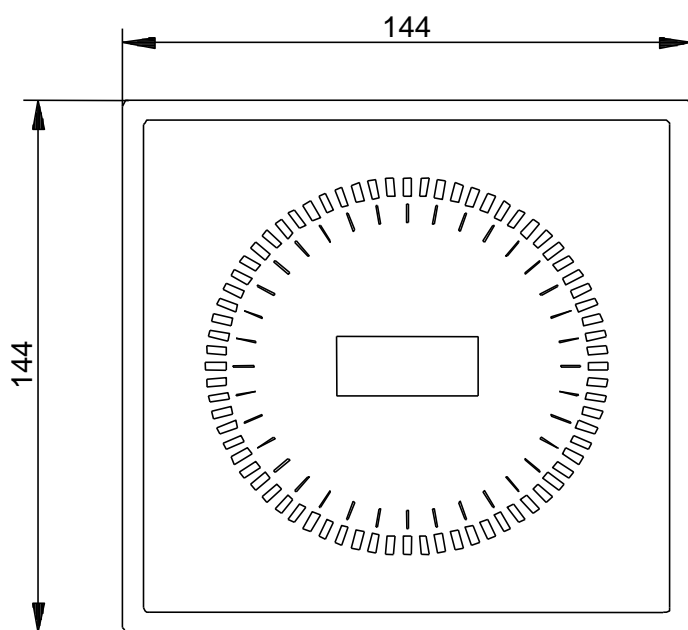
Control panel opening
as per DIN 43700
138^{+1} x 138^{+1}

□ 136

Terminals

14

2 fixing brackets
(left and right)

133

119

8.5
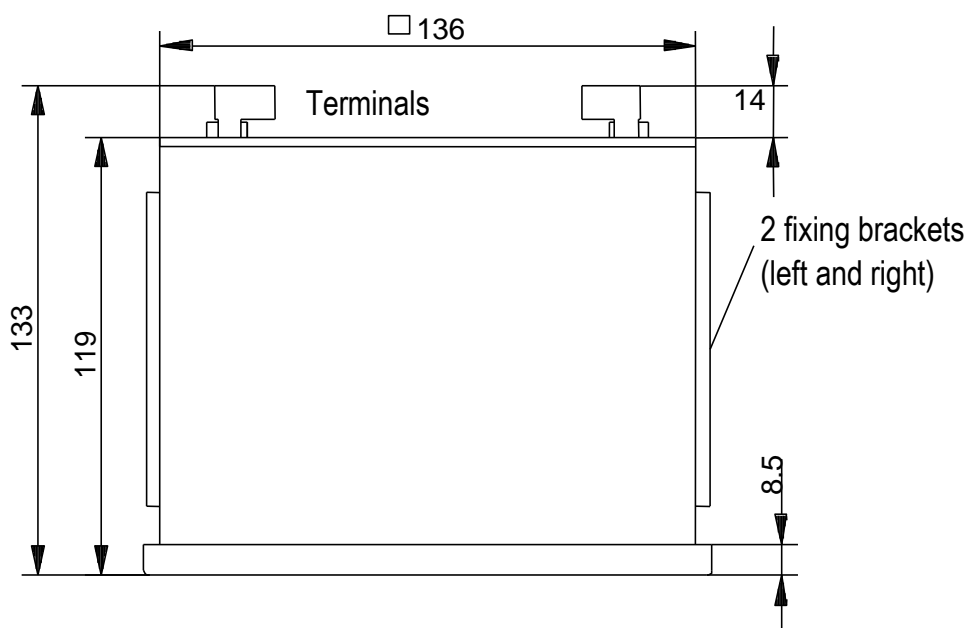
15 EC-Declaration of Conformity

Document-No.: **002003**　　　　　　　Month: 04   Year: 14

Manufacturer: **A D O L F   T H I E S   G m b H   &   C o. K G**

　　　　　　　Hauptstr. 76
　　　　　　　D-37083 Göttingen
　　　　　　　Tel.: (0551) 79001-0
　　　　　　　Fax: (0551) 79001-65
　　　　　　　email: Info@ThiesClima.com

Description of Product: **Wind Display LED**

Article No.	4.3250.00.000	4.3250.00.040	4.3250.00.041	4.3250.00.061
4.3250.00.073	4.3250.00.140	4.3250.00.141	4.3250.00.161	4.3250.00.173
4.3250.00.900	4.3250.01.040	4.3250.01.041	4.3250.01.061	4.3250.01.073
4.3250.01.000	4.3250.01.140	4.3250.01.141	4.3250.01.161	4.3250.01.173
4.3250.01.900	4.3251.00.000	4.3251.00.001	4.3251.00.002	4.3251.00.040
4.3251.00.041	4.3251.00.061	4.3251.00.073	4.3251.00.140	4.3251.00.141
4.3251.00.161	4.3251.00.173	4.3251.00.902	4.3251.01.000	4.3251.01.001
4.3251.01.002	4.3251.01.040	4.3251.01.041	4.3251.01.061	4.3251.01.073
4.3251.01.140	4.3251.01.141	4.3251.01.161	4.3251.01.173	4.3251.01.902

specified technical data in the document:　　021386/01/09; 021342/01/00; 021407/04/14; 021459/07/05; 021626/09/09

The indicated products correspond to the essential requirement of the following European Directives and Regulations:

2004/108/EC	DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC
2006/95/EC	DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits
2002/75/EC	COMMISSION DIRECTIVE 2002/75/EC of 2 September 2002 amending Council Directive 96/98/EC on marine equipment
552/2004/EC	Regulation (EC) No 552/2004 of the European Parliament and the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation)

The indicated products comply with the regulations of the directives. This is proved by the compliance with the following standards:

Reference number	Specification
IEC 61000-6-2: 2005	Electromagnetic compatibility Immunity for industrial environment
IEC 61000-6-3: 2006	Electromagnetic compatibility Emission standard for residential, commercial and light industrial environments
IEC 61010-1: 2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements
IEC 60945: 2002	Maritime navigation and radiocommunication equipment and systems Part 8.7 Vibration Part 8.12 Test Kb: Salt mist, cyclic (sodium, chloride solution) Part 9 Test of emission Part 10 Test of immunity Part 11.2 Safe distance to magnetic-compass Part 12.1 Degrees of protection provided by enclosures

Place: Göttingen　　　　　　　　　　　　Date: 14.04.2014

Legally binding signature:　　　　　　　　issuer:

....　　　　...
Wolfgang Behrens, General Manager　　　　Joachim Beinhorn, Development Manager