

WENTO-MET / WENTO-IND / WENTO-NAV

The ideal combined Wind, Weather and Ship Sensors:

- ▶ Compact and extremely robust Wind / Weather / Ship Sensor:

WENTO-MET for measuring wind direction and wind speed

WENTO-IND for measuring wind direction, wind speed, air temperature, relative humidity, barometric pressure and dew point temperature (calculated value)

WENTO-NAV for measuring wind direction and wind speed, especially on ships with true wind-calculation

- ▶ **WENTO-IND** has connectivity for precipitation sensors (15189, 15188 - 2 cm³...)
- ▶ Qualitatively ambitious and cost-effective solution
- ▶ Reliable wind measuring also under extreme weather conditions
- ▶ Seawater resistant materials and surface finishes for long-life applications also under harsh conditions
- ▶ Quick and easy pipe mounting, connection with one cable only



Figure: WENTO-IND

Features and advantages

- More than 150 years of experience in classic meteorology and in professional ship meteorology
- Frictionless data acquisition by means of contact-free measuring principle
- WENTO-IND with integrated weather module for measuring of air temperature, relative humidity, barometric pressure as well as exact evaluation and readout of dew point temperature
- Highest reliability by means of precision ball bearings and measuring elements with high quality
- Seawater resistant surface finishes for high durability
- Low starting value of 0.3 m/s
- Very high measuring range from 0.3...75 m/s
- Easy installation by pipe mounting and bayonet connector
- Integrated, regulated heater for optimal heating of the sensor heads
- Thermal separation between sensor heads and the housing
- Inherently stable wind vane and break-proof three-armed cup anemometer made of seawater resistant aluminium for highest load
- Sensor head with integrated obstacles prevent infiltration of water
- QUATRO-compatible interface
- Digital NMEA-output (RS 422 – Talker-Mode)
- ASCII-data protocol according NMEA 0183
- The compact design of the WENTO-IND reduces the effort with regard to components and their mounting times compared with classical solutions with single instruments
- WENTO-NAV with true wind-calculation



1 Introduction

The sensors of the WENTO family are very robust, compact and extremely reliable. When developing these sensors particular consideration has been given to highest quality for fulfillment of meteorological requirements.

The sensors embody the experience of more than 140 years of development and production of LAMBRECHT wind sensors.

The system acquires the horizontal air flow and processes the measuring data to the meteorological parameters wind speed and wind direction. Furthermore the weather-module of the WENTO-IND acquires the meteorological parameters air temperature, relative humidity and barometric pressure. Based on the measured data WENTO-IND calculates the dew point temperature and provides for its serial output along with the measuring data. WENTO-IND disposes of a pulse input point for connecting the LAMBRECHT precipitation sensors (15189, 15188, 1518H3 - 2 cm³).

The sensors and further system components are mounted in a splash water- and dustproof metal housing.

The measuring data are automatically transmitted via serial interface RS 422 in talker mode, when power supply is switched on.

Due to their shock- and vibration proof construction the sensors WENTO-MET / -IND and / -NAV are particularly qualified for use under severe environmental conditions. The housing and the measuring elements are made of seawater resistant aluminium alloys. The housing, the cup rotor and the wind vane are anodized, the housing is lacquered silver-grey (RAL 9006).

An electronically controlled sensor heating device allows for operating the sensor over the wide range from -30 up to 70°C.

2 Setting to work

Wind can be represented by a vector quantity. For a complete description of the wind it is necessary to specify its speed and direction. The two components are subject to spatial and temporal variations; thus, strictly speaking, they are valid only for the site where the measuring instrument is installed. We therefore recommend selecting the place of installation very carefully.

2.1 Installation conditions

2.1.1 Generally

For professional wind measurements location and height of the wind sensor are important for accurate, correct results and representative wind conditions. Ideally, the sensor should be installed in 10 m above the ground on a mast without any influence affecting wind flow within a radius of 150 m around the sensor. This may be buildings, trees, tall towers, lifting cranes, moving vehicles, aircrafts, helicopters and other obstructions. In case of mobile measurements at vehicles often above mentioned conditions are not practicable. Then you have to find compromises.

Generally, wind measuring instruments should not measure the specific wind conditions of a limited area, but indicate the typical wind conditions of a wider area. The values measured at different places must be comparable. Thus, when installing the sensor you should make sure the place of installation is not under the lee of great obstacles. The distance between the obstacles and the sensor should be 10 times the height of the obstacles (this corresponds to the definition of an undisturbed terrain).

If an undisturbed terrain of this kind does not exist the sensor must be put up at a height of at least 5 m above the obstacle height.

If the sensor must be installed on a roof top the place of installation must be in the middle of the roof to avoid predominant wind directions. If you want to measure both wind direction and wind speed, the sensors should be avoided. The sensors WENTO-MET, WENTO-IND and WENTO-NAV easily meet this requirement.



The sensor must not be installed onto transmitting plants or antennas or close to them. A minimum distance of 2 m is to be kept for interference-free signal transfer.

2.1.2 Ships

For operation on ships you should select a mounting place with little interferences of obstacles such as masts, antennas and chimneys. In most cases the sensor will be mounted on the ship's highest mast.



For wind measurements on board of ships locations and heights of the wind sensor are important for representative and accurate measuring results. The sensors should be ideally located in the top of the mast, without any influences of obstacles. If this is not possible, the sensors should be installed at a mast traverse of min. 1.5 m length, on Port side of the ship.

2.2 Tools and installation aids

There are no special tools or materials required for the installation works. All work can be carried out with standard tools available in a regular workshop.



2.3 Unpacking the sensor

The sensor is packed in a separate box, carefully protected against mechanical influences during transport. When securely installed, the sensor can withstand the shock and vibration normally occurring on ships.

Please verify that the following parts and documents are enclosed:

- 1 sensor WENTO (MET, IND resp. NAV)
- 1 operating manual

Accessories: (depend on order size, in all cases separately packed)

Connecting cable with plug and core cable ends

2.4 Goods inspection

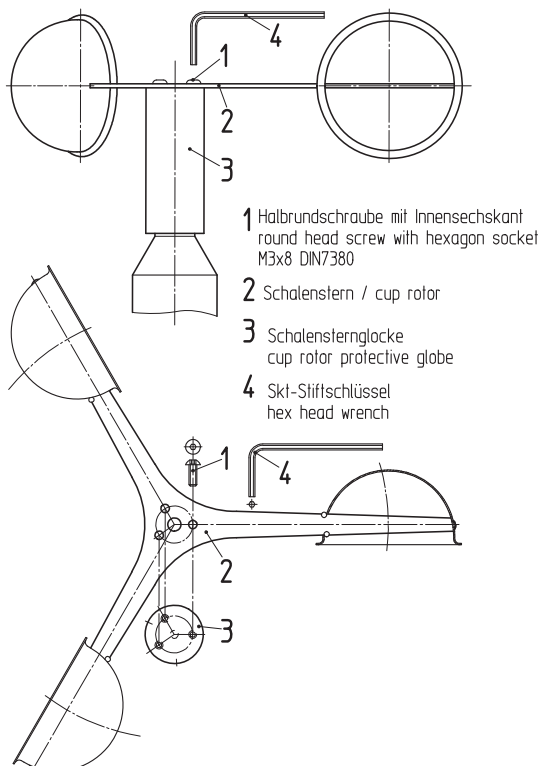
Please thoroughly check the delivery with regard to completeness and eventual transport damages. In case of eventual claims please contact us in writing immediately.

2.5 Power supply

The sensor requires at the input connector a 24 volt nominal DC power source for operation. The sensor-heating has to be supplied with 24 volt DC and has a power consumption of 2x9W.

2.6 Mounting of the cup rotor at the wind speed sensor

The bores at the cup rotor are provided in such a way that the cup rotor can be installed only in a certain, clear position. All 3 screws must be used and the cup rotor with it be fastened. Thus the correct direction of rotation is guaranteed. The necessary wrench is included in the delivery.



2.7 Installation procedure (short instruction)

The installation of the sensor involves 3 steps:

- (1) Mounting the cable at the sensor and if necessary draw the cable through the mast.
- (2) Mounting the sensor at the mast, but before tightening the screws you must align the sensor to the north.
- (3) Attaching the cable to the power supply and the signal acquisition system.

2.8 Mounting

The sensor can be installed on a standard pipe with an outer diameter of 50 mm and an inner diameter of maximum 40 mm. Before tightening the two 8 mm-socket screws and attaching the sensor you have to draw the cable through the pipe and align the sensor into driving direction.

For this purpose the housing is marked accordingly (see drawing). Before the screws of the sensor are tightened, the sensor is adjusted to north. Please pay attention to a firm mounting of the sensor at the mast!

In addition the sensor has a pin for the north direction. You can put this pin into the nick at the mast (if available). If needed you can turn in or unscrew the pin by means of allen key.

2.8.1 North alignment of wind vane

For wind direction measurements the north mark on the sensor must be aligned with the geographical north direction.

To adjust the wind sensor in a firm and correct manner into the north direction this item is equipped with an integrated mounting aid. Inside the inner bottom of the sensor a small bolt pointing to the north is integrated to be set into a corresponding slot of the mounting pipe (if available). Thus the sensor is safely attached. If needed you can turn in or unscrew the pin by means of allen key.

You have to turn the marking exactly over the marking at the sensor shaft. When you have aligned the marks, you may fix the wind vane with e.g. a piece of adhesive tape.

After alignment the adhesive tape has to be removed. When you have fixed the wind vane you can locate the reference point by aiming at it over the axis. Now you must turn the sensor casing on the mounting tube until the tip of the wind vane points to the reference point in the north.

To set up the sensor's north orientation select a landmark which is as far as possible up north with regard to the final position of the wind direction sensor.

The reference point can be selected using a topographical map (1:25000). The exact position of the reference point is determined using an amplitude compass that can be adjusted horizontally on a stand.



Compass declination has to be considered!



To align the sensor ahead (on ships) locate a point outside the ship in the landscape which is located in the ship ahead direction respectively in the centre line or in case of the sensor is mounted far away from the middle line a line parallel to the centre line.

The sensor finally can be fastened by means of the two hexagonal screws when the tip of the wind vane points to the northern reference point. Finally the earth screw has to be connected to the ship's ground. Acid-free contact grease is recommended to protect contact surfaces against corrosion.

A functional check at three rotated 90° directions is recommended.



Note: Follow all safety instructions while setting up the sensor onto a mast.

2.8.2 Power and signal connection

If the sensor is mounted in correct manner and connected with the right cable (accessory), you can attach the wires to power supply and signal outputs to data acquisition equipment (computer).

The WENTO sensor requires a 12-pole CONINVERS plug connector of the series designation „TC“ (Ordering No.: TC-12S1N128055). The cable shield should be connected with both ends at the ground wire (PE).

To reduce the risk of inductive interference the sensor must be properly grounded (screening on both sides).



The external connection is via central connector which is located in housing base. For further details about electrical connection please see chapter „Connecting diagrams“.

The typical power supply requirements of the sensor WENTO are 24 Volts with a current drain of 50mA. The input range is 11...28 V_{DC}. The maximum current drain is 120mA. The heater of the WENTO is to supplied with 24 V_{DC} and has a current drain of lower than 0.8A at heating power of 2-9W.

Under most climatological conditions the heating prevents blocking of the moving sensor parts. The cup rotor or the wind vane are not heated. In case of icing or formation of ice at the moving sensor element the function is restricted for the period of icing.

The serial digital output of the sensor uses differential line drivers with high common mode noise rejection. The signal levels and timings conform to the requirements of EIA/RS-422 / Talker. The line drivers are capable of transmitting data over cable lengths up to 1,220 meters (4,000 feet). This maximum distance will vary depending upon the operational environment, the wire gauge used, and the baud- rate of the attached devices.

When the power supply of the sensor is switched on, the sensor automatically sends cyclic data.

2.8.3 Safety regulations



Because the wind sensor often is mounted on exposed locations in dangerous heights the installation personnel has to pay attention to the relevant safety regulations for such works. During the electrical installation and termination works the external circuit-breaker must be switched off.

It is not permitted to open those housings by unauthorized persons!

3 Maintenance

3.1 Regular maintenance and calibration

The sensors WENTO-MET and WENTO-IND are service reduced and designed for a very long lifetime. Recommended a regular visual check regarding dirt of surface caused by the weather and if so, to clean up.



If reference measurements should be necessary stringently must be noted that a comparability of the measured values is given only if the measurements take place under same conditions. I.e. the reference equipment must be used very closed to the sensor!

The sensor is a measuring instrument and thus apply user specific standards regarding period of recalibration. Recommendation: 2 years.

For the long-term assurance of the function and accuracy of the proposed components, we are pleased to offer you our professional maintenance and calibration services.

3.2 Visual check and cleaning

The use of the sensor under the respective environmental conditions requires certain steps. It is thus recommendable to clean the outside of the housing and shelter within specific intervals. The intervals are dependant on the environmental conditions and the degree of soiling. We recommend a regular sight and functional check.

In case you should be faced with any specific problems please contact the LAMBRECHT-Service under:

Tel.: +49-(0)551-4958-0

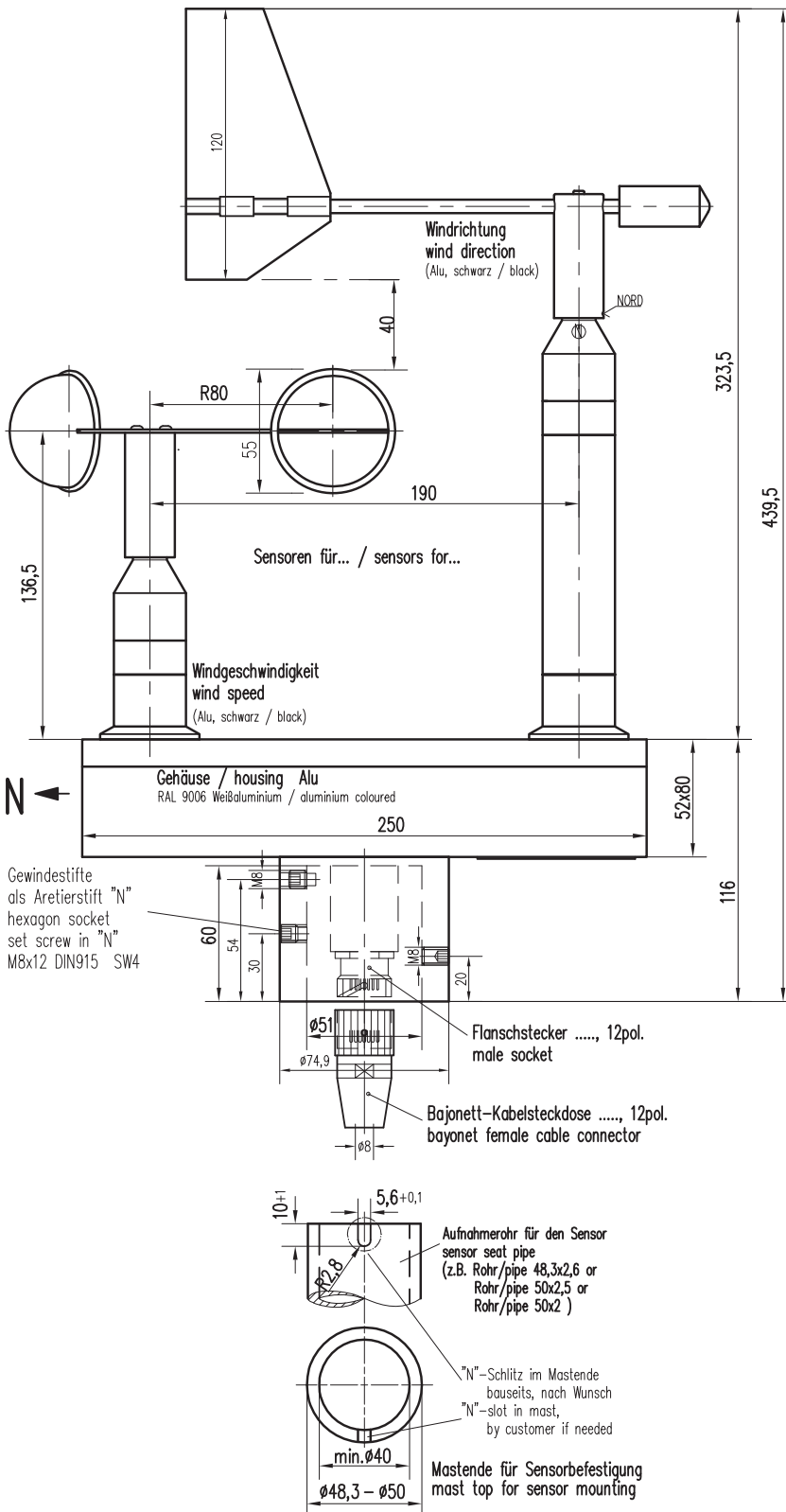
Fax: +49-(0)551-4958-327

E-Mail: support@lambrecht.net

4 Transports

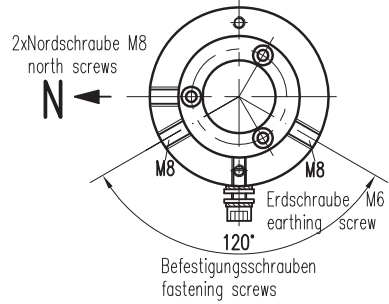
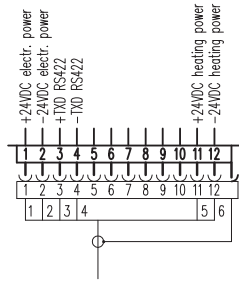
In case it is necessary to ship or to transport the sensor WENTO must be carefully packed to prevent damages during transport.

5 Dimensional drawings and electrical connections WENTO-MET *



AWG-cable colorcode

1	blk-black
2	brn-brown
3	red-red
4	ora-orange
5	yel-yellow
6	grn-green



Ansicht von unten

Gewicht : ca. 2,3kg
 weight : approx. 2.3kgs
 Maßstab/scale : 1:3

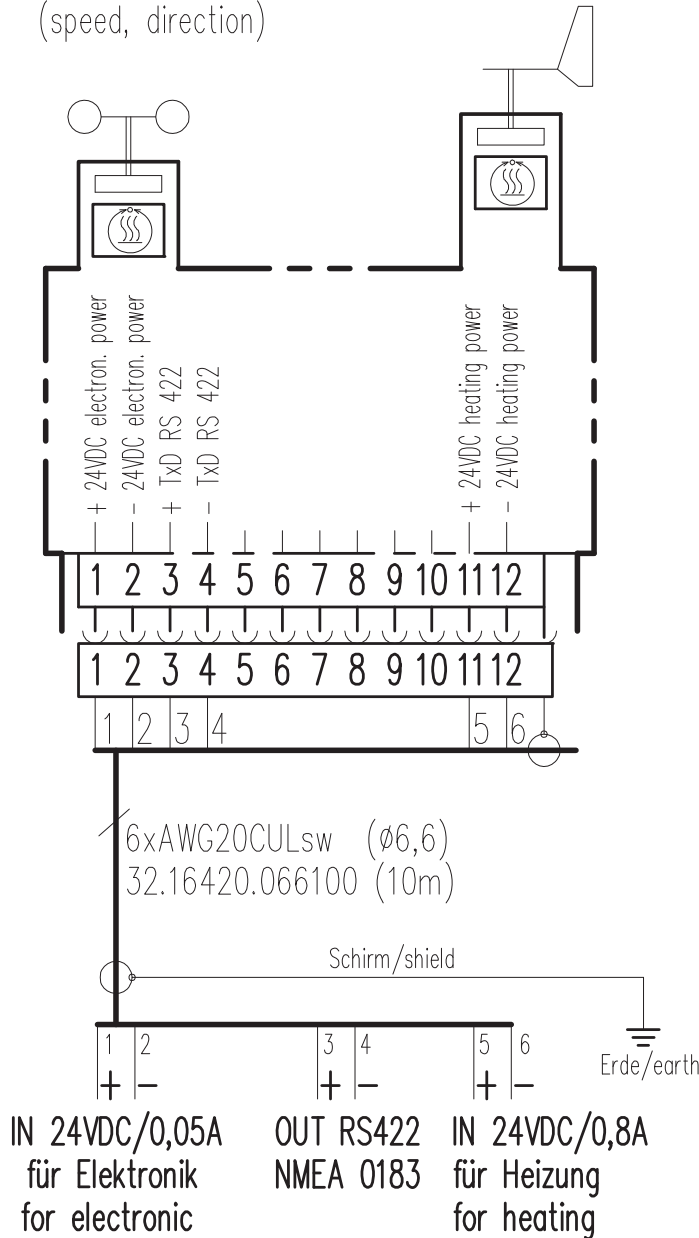
(* similar to WENTO-NAV)



Electrical connection WENTO-MET

Kombinierter Windsensor – Wento–MET –
combined windsensor – Wento–MET –
00.14516.010001

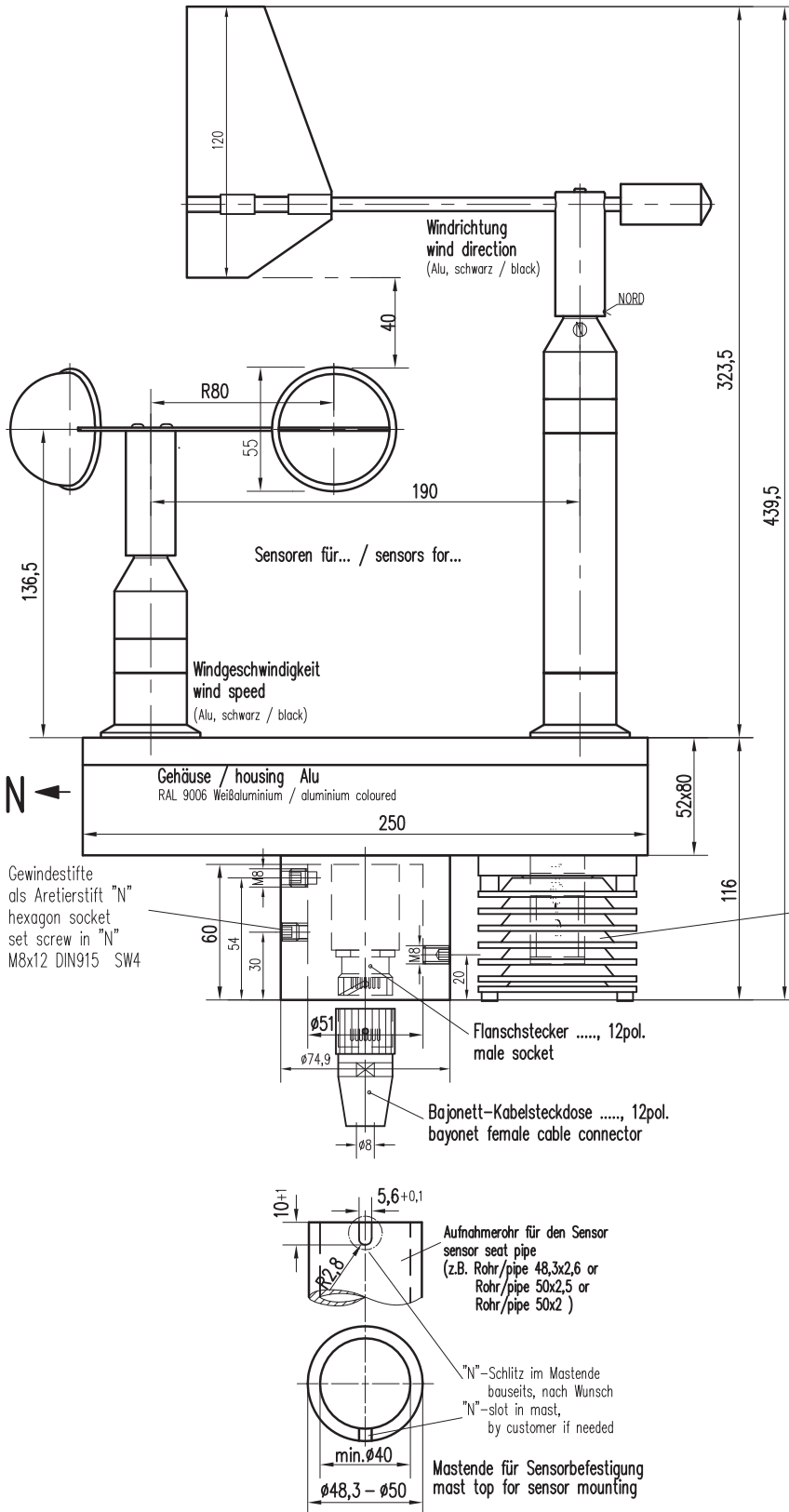
(Geschwindigkeit, Richtung)
 (speed, direction)



AWG-cable colorcode	
1	blk-black
2	brn-brown
3	red-red
4	ora-orange
5	yel-yellow
6	grn-green
7	blu-blue
8	vio-violet
9	gry-grey
10	wht-white
11	wht/blk
12	wht/brn

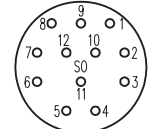


6 Dimensional drawings and electrical connections WENTO-IND

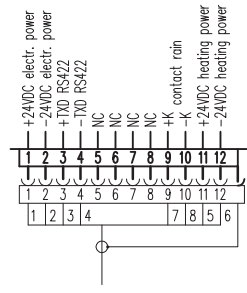


AWG-cable colorcode

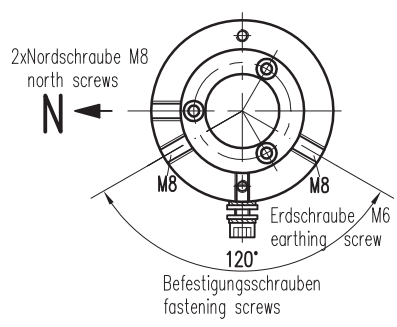
1	blk-black
2	brn-brown
3	red-red
4	ora-orange
5	yel-yellow
6	grn-green
7	blu-blue
8	vio-violet



Steckerbelegung
pin assignment



Sensor Temperatur, rel.Feuchte und Luftdruck in Schutzhütte
sensor temperature, rel.humidity and air pressure in protective screen



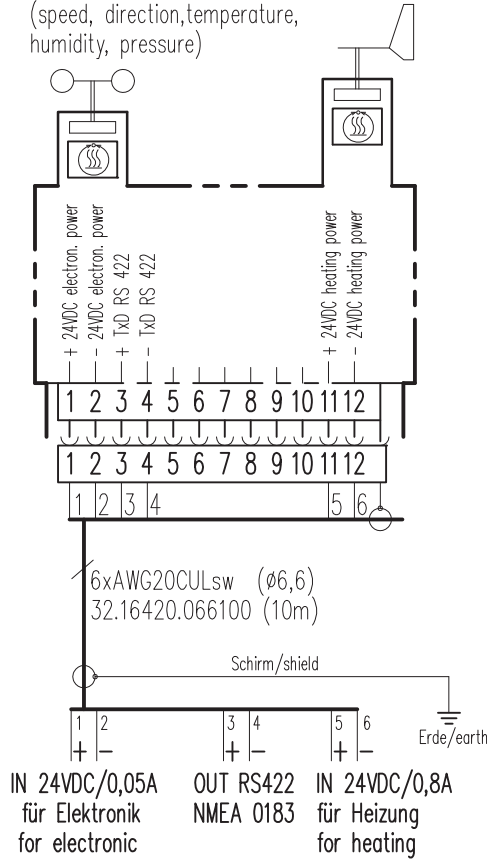
Ansicht von unten

Gewicht : ca. 2,4kg
 weigth : approx. 2.3kgs
 Maßstab/scale : 1:3

Electrical connection WENTO-IND

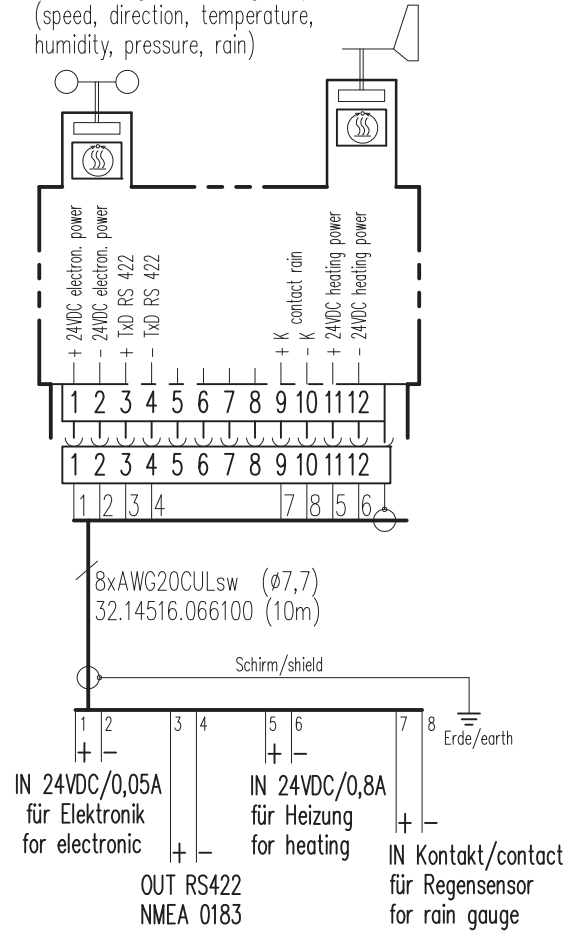
Kombinierter Windsensor – Wento-IND –
combined windsensor – Wento-IND –
00.14516.210001

(Geschwindigkeit, Richtung, Temperatur, Feuchte, Druck)
 (speed, direction, temperature, humidity, pressure)



Kombinierter Windsensor – Wento-IND (+N) –
combined windsensor – Wento-IND (+N) –
00.14516.210001

(Geschwindigkeit, Richtung, Temperatur, Feuchte, Druck, Niederschlag)
 (speed, direction, temperature, humidity, pressure, rain)



AWG-cable colorcode

- 1 blk-black
- 2 brn-brown
- 3 red-red
- 4 ora-orange
- 5 yel-yellow
- 6 grn-green
- 7 blu-blue
- 8 vio-violet
- 9 gry-grey
- 10 wht-white
- 11 wht/blk
- 12 wht/brn



7 Data protocols WENTO-MET / WENTO-IND

7.1 Message string WIMWV at WENTO-MET / WENTO-IND

Wind direction and wind speed

Example of data sequence with comma separated

fields: \$WIMWV,357.0,R,5.2,M,A*CS<CR><LF>

field delimiter: , (comma)

header: \$WIMWV

wind direction: 0.0 to 360.0

R: relative wind direction

wind speed: 0.3 to 75.0

M metric units m/s

status A (valid) / V (not valid)

stop delimiters: <CR> <LF>

error code: WD 999.9

error code: WS 99.9

7.2 Additional data protocols WENTO-IND

Message string WIMTA air temperature

Example of data sequence with comma separated

fields: \$WIMTA,-25.0,C*CS<CR><LF>

field delimiter: , (comma)

header: \$WIMTA

temperature: -30.0 to 070.0

C: °C

stop limiters: <CR> <LF>

error code: 999.9

Message string WIMMB barometric pressure

Example of data sequence with comma separated

fields: \$WIMMB,,,1050.0,B*CS<CR><LF>

field delimiter: , (comma)

header: \$WIMMB

barometric pressure: 600.0 to 1100.0

B: air pressure in hPa

stop limiters: <CR> <LF>

error code: 9999.9

Message string WIMHU relative humidity

Example of data sequence with comma separated

fields: \$WIMHU,100.0,-40.0,C*CS<CR><LF>

field delimiter: , (comma)

header: \$WIMHU

rel. humidity: 000.0 to 100.0

dew point temp.: -30.0 to 070.0

C: °C

stop limiters: <CR> <LF>

error code: 999.9

7.3 Data protocol WENTO-IND

Data protocol WIXDR precipitation

On request the corresponding protocol can be activated by LAMBRECHT.

Id-no. for activating the protocol: **97.14516.000 000**
(Please indicate when ordering!)

Example of data sequence with comma separated

fields: \$WIXDR, PR, 0.2, M, 01*CS <CR><LF>

field delimiter: , (comma)

header: \$WIXDR

Precipitation: Dependant on connected LAMBRECHT precipitation sensor.

Each impulse increases the value by 0.1. If the value 10 is exceeded, the value is reset to 0.1. The momentary amount of precipitation is always the difference of predecessor value and current value. This is valid for sensors with a 2 cm³-tipping bucket. With sensors with a 4 cm³-tipping bucket the instantaneous value is to be multiplied by 2.

M: identifier for precipitation

01: transducer ID

stop delimiters: <CR> <LF>

Important! Please note:

Field length

The development of a NMEA decoder should not be proceeded from firm field lengths. The NMEA definition proceeds from a variable field length. The comma character (",") serves as field disconnecting switch. Numeric values in a field can be presented differently. In case a field is not sent, it has a length of 0 characters (,) [comma-comma].

Check sum

The check sum "CS" is covered to two ASCII characters hexadecimal value. "CS" calculated by XOR operation of each character in the sentence between "\$" and "*", but excluding "\$" and "*".

Error code

In case, that the sensor cannot generate a measuring value because e.g. a sensor element is defect or implausible (raw) values are collected the sensor outputs in the corresponding data protocol the above mentioned error code (e.g. 999.9) and sets the status from "A" (valid) to "V" (not valid).

Example: \$WIMWV,999.9,R,999.9,M,V*37<CR><LF>

Particular characteristics wind direction value

Theoretically the value for the wind direction can take any value between 0.0° and 360.0°. It should be noted, that in a full circle the values "0.0" and "360.0" are describing the same direction. According to the international valid recommendations of the WMO (World Meteorological Organization) in the "Guide to Meteorological Instruments and Methods of Observation" (WMO-No.8) the wind direction value 0.0° just has to be output at calm. The EOLOS follows the recommendation of the WMO and outputs at wind from the north the value "360.0" respectively "0.0" at calm (lull).



8 Technical data

WENTO-MET	Id-No. 00.14516.010 001
WENTO-IND	Id-No. 00.14516.210 001
WENTO-NAV	Id-No. 00.14516.110 001

Parameters

WENTO-MET: Wind direction in ° • Wind speed in m/s

Add. parameters

WENTO-IND: Barometric pressure • Air humidity • Air temperature

Range of application: Temperature -30...+70 °C heated* • Wind speed 0...80 m/s • humidity 0...100 % r.h.

Protocols: NMEA 0183 • WIMWV

Add. protocols

WENTO-IND: WIMTA • WIMMB • WIMHU

Supply voltage: (sensor) 11...28 V_{DC}/ 50 mA at 24 V_{DC}, max. 120mA • heater electronically controlled 24 V_{DC}/2-9 W

Housing: saltwater-proof aluminium especially-anodized, protective paint (RAL 9006) • IP65 in upright position

Dimensions: See dimensional drawings

Weight: Approx. 2.3 kg

Interface: Serial RS 422/ Talker Baud rate 4800 • 1 Hz (at measuring cycle 10Hz) • 8 N 1

Parameter wind direction (WENTO-MET / -IND / -NAV)

Meas. range	0...360°
Accuracy:	± 1 %
Resolution:	< 1°
Starting value:	< 0.3 m/s
Damping ratio:	0.5...0.6

Parameter wind speed (WENTO-MET / -IND / -NAV)

Meas. range	0.3...75 m/s
Accuracy:	± 2 % FS at 0.3...50 m/s
Resolution:	< 0.1 m/s
Starting value:	< 0.3 m/s
Delay distance:	4 m

Additional parameters WENTO-IND

Parameter barometric pressure (WENTO-IND)

Meas. range	600...1100 hPa
Accuracy:	± 2 hPa at -30...70 °C
Resolution:	0.1 hPa



Quality System certified by DQS according to DIN EN ISO 9001:2008 Reg.No. 003748 QM08

*) [Remark: In case of icing and formation of ice at the movable sensor measuring element the function is restricted for the period of icing. For installation sites with high risk of icing LAMBRECHT provides for specially heated sensors.]

Parameter air temperature (WENTO-IND)

Meas. range	-30...+70 °C
Accuracy:	± 0.8 °C ¹
Resolution:	0.1 °C

Parameter relative humidity (WENTO-IND)

Meas. range	0...100 % r.h.
Accuracy:	± 3 % r.h. at 10...90 % r.h. • ± 4 % r.h. at 0...100 % r.h. ^{2,3}
Resolution:	0.5 % r.h.

Parameter dew point temperature (WENTO-IND)

(Calculated value)	
Meas. range	-30...+70 °C

The parameter precipitation (WENTO-IND)

is dependant on connected LAMBRECHT Precipitation Sensor. On request the corresponding NMEA-protocol can be activated by LAMBRECHT. Id.-no. for activating the protocol: 97.14516.000 000 (Please indicate when ordering!)

¹ Temperature influence of the shelter: accuracy +1.5 °C at v>2m/s and intensive solar radiation

² Temperature influence of the shelter: ±0.1 % r.h. at +10...+40 °C

³ Shelter inaccuracy: <4 % r.h. dependant on v>2m/s and solar radiation

Special feature WENTO-NAV: (Further information on request!)

True wind-calculation

Accessories: (please order separately)

(1642 U66) Sensor Cable, 10 m, 12-pole bayonet plug Ident-no. 32.16420.066 100 (other lengths possible)

For acquisition of precipitation: (14516 U66) Sensor Cable, 10 m, 12-pole bayonet plug Ident-no. 32.14516.066 100 (other lengths possible)

Options:

(9339) Visualization software „SSDL“ Ident-no. 36.09339.000 000

(9337) Visualization and evaluation software „MeteoWare-CS-SSDL“, Ident-no. 36.09337.001 000

(95666) Meteo LAN Communicator MLC Ident-No. 00.95666.400 000

For integration of WENTO into the house-internal network (LAN), incl. visualization software *as well as*

Indicator unit: (14742) Meteo-LCD

Data logger: (95665) SYNMET-LOG

Mast and power supply unit (60 W)

Standards

- Standard of construction: VDE 0100
- Low voltage guideline: 72/23 EWG
- EMC/EMI: EN 60945
- Protocol format: NMEA 0183
- VDI 3786 part 2
- WMO No. 8
- EIA RS 422 Interface