USER MANUAL

EOLOS-IND

Static Weather Sensor

aem | LAMBRECHT meteo

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1. Introduction

The EOLOS sensors 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 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 EOLOS-IND acquires the meteorological parameters air temperature, relative humidity, and barometric pressure. Based on the measured data EOLOS-IND calculates the dew point temperature and provides for its serial output along with the measuring data.

The EOLOS-IND has a pulse input for connecting the LAMBRECHT precipitation sensors (15189). The sensors and further system components are mounted in a splash water- and dust proof 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 sensor EOLOS-IND is particularly qualified for use under severe environmental conditions. The housing is made of anodized seawater resistant aluminium. An electronically controlled heating device enables the sensor to operate in between the wide range of -40 up to 70 °C.

1.1. Warranty

Please note the loss of warranty and non-liability by unauthorised manipulation of the system. You need a written permission of the LAMBRECHT meteo GmbH for changes of system components. These activities must be operated by a qualified technician.

The warranty does not cover:

1. Mechanical damages caused by external impacts (e. g. icefall, rockfall, vandalism).
2. Impacts or damages caused by over-voltages or electromagnetic fields which are beyond the standards and specifications in the technical data.
3. Damages caused by improper handling, e. g. by wrong tools, incorrect installation, incorrect electrical installation (false polarity) etc.
4. Damages which are caused by using the device beyond the specified operation conditions.

1.2. Advantages of the static measuring principle

The sensor EOLOS-IND is a modern system to carry out precise and reliable measurements under hardest application and environmental conditions. The wind measurements take place according to the principle “TAV“ (thermal aura field variation), i. e. static, without moving parts.

Static measuring principle for wind measurements means:

- Determination of data works without moving measuring elements, i.e. none abrasion, least maintenance and none recalibration because of this method.
- The wind parameter can be measured also in winter time accurate and precise, because of the electronic controlled heating for the immovable measuring elements. This heating is particularly effective against ice and snow in all climatic zones.
- Lightweight mass and immovable measuring elements to enable very low starting values, distance- and attenuation constants as well as a very high repetition accuracy.
- The compact sensor is easy to install. Minor deviations from the vertical (pitch) can be neglected with this measurement principle.

Advantages of the sensor:

- Additional integrated sensors for air temperature, relative humidity, and barometric air pressure. The dew point temperature is calculated accordingly.
- EOLOS-IND offers connectivity for LAMBRECHT precipitation sensors (15189):
- The built-in test function of the station, enabled by the tight integration of the meteorological sensors into the enclosure, can perform cyclic self-testing and notify the user of erroneous data or failure.
- The compact design of this sensor with 5 meteorological parameters is eliminating the traditional cabling and installation work significantly. Distribution boxes, power supply units; and other accessories can be reduced to a minimum expense.

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. General installation conditions

For professional wind measurements according to meteorological standards (e. g. VDI 3786, Part 2) location and height of the wind sensor are important for representative and accurate results. 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. To obtain results which are representative for a wider area and comparable to values measured at different places, the sensor must not be mounted under the lee of higher obstacles. The distance to any obstacle should be at least 10 times the obstacle's height (corresponding to the definition of an undisturbed area). In general a measuring height of 10 m above ground is regarded ideal.

If an undisturbed terrain of this kind does not exist the sensor have to be put up at an height of at least 6 m above the obstacle height. If the above mentioned requirements are not feasible e. g. on mobile measurements at vehicles or at measuring containers compromises have to be found and documented.

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, it is recommended to mount both sensors at the same spot, where any interaction between the sensors should be avoided. The sensor EOLOS-IND easily meets this requirement.

The place of installation should **not** be in the operation fields of radar devices (radar scanners or radar transmitters), generators or antennas. We recommend a minimum distance of 2 m to these installations. Furthermore a minimum distance of 5 m to MF-/ HF- and Satcom- (e. g. Inmatsat, VSat) antennas has to be kept. The maximum electric field intensity may not exceed 10 V/m (tested according to EMC standard). When indicated a greater distance should be kept.

To avoid possible measurement errors due to heat sources as hot or warm fumes, hot surfaces etc. next to the sensor, the mounting site should be chosen accordingly.

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.

Please verify that the following parts and documents are enclosed:

- 1 x sensor EOLOS-IND
- 1 x user 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 compact sensor requires 24 V DC as a power supply for the electronics. The sensor heating must be supplied with 24 V DC and has a power consumption of 70 W (max. 3 A)

2.5.1. Power input

The power input of the EOLOS reaches its peak in the start-up period (activation phase). The maximum of the power input is 2.5 A. In normal operation the average power input is significantly lower (see table). The power input mainly depends on the flow rate.

Wind speed	**Ø Power input**
0 m/s	500 mA
5 m/s	650 mA
20 m/s	900 mA
38 m/s	1100 mA
Measured at a supply voltage of 24 V DC and 20 °C (without heating)	

2.5.2. Protection

Generally it is not necessary to protect the secondary side (24 V DC) of the EOLOS. Normally only the primary side has to be protected. However, if additional protection for the supply is desired, we recommend using a micro-fuse 3.15 A - medium time-lag.

2.6. 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.

2.7. 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. 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.

Please pay attention to a firm mounting of the sensor at the mast!

2.7.1. North alignment of wind sensor

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.

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.

Once the sensor is adjusted, it can be fixed with the two hexagonal screws. 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.

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

2.7.2. Power and signal connection

The EOLOS-IND sensor requires a 12-pole bayonet plug connector. 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". 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 typical power supply requirements of the EOLOS-IND sensor are 24 Volts with a maximum current drain of 2.5 A. The input range is max. 18... 32 V DC.The heater of the EOLOS-IND is to supplied with 24 V DC and has a heating power of 70 W (max. 3 A).

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, after 30 seconds (in order to reach operating temperature) the sensor cyclically starts sending data protocols.

2.7.3. Safety regulations

Since the sensor is often installed at high altitudes, the relevant safety regulations must be observed during installation work. During electrical installation work, the corresponding circuits must be de-energized.

The housing may only be opened by authorized personnel

3. Maintenance

3.1. Regular maintenance and calibration

The EOLOS-IND sensor is designed to be low-maintenance and to have a long service life. It is recommended that you perform regular visual inspections for weather-related surface contamination and, if necessary, carry out cleaning. Regular visual and functional checks of the wind sensors are also recommended

If reference measurements are required, it is essential to ensure that comparability of the measurement values is only possible if the measurements are taken under the same conditions. This means that the reference device must be used in close proximity to the sensor!

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

We recommend to have the filter cap of the humidity-temperature sensor every two years exchanged in our plant. Depending on the application shorter maintenance cycles could be necessary.

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 meteo service under:

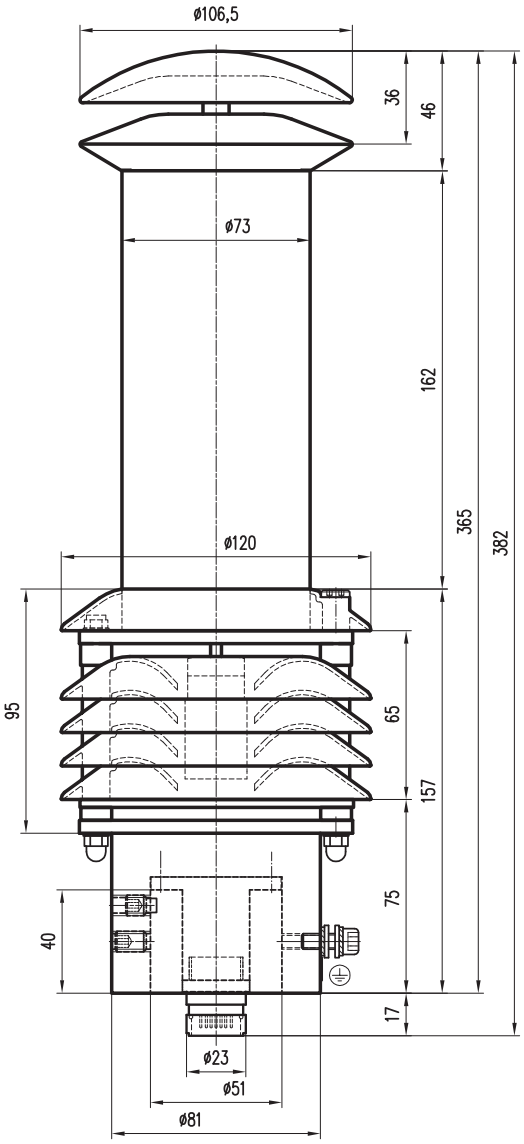
Tel: +49-(0)551-4958-0

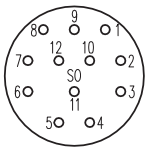
E-mail: support-lambrecht@aem.eco

4. Transports

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

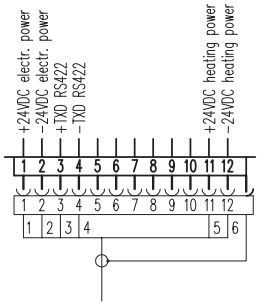
5. Dimensional drawings and electrical connections

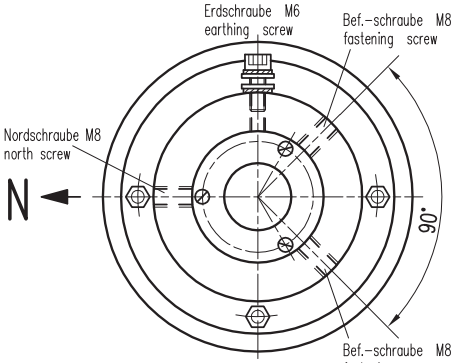




Steckerbelegung
pin assignment

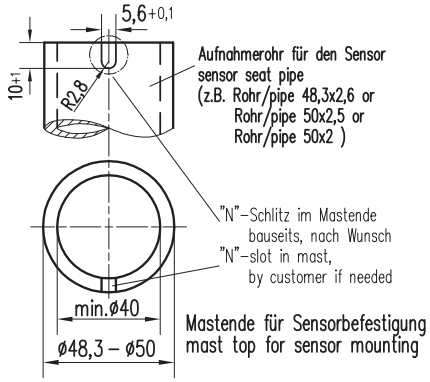
AWG-cable colorcode	
1	blk-black
2	brn-brown
3	red-red
4	ora-orange
5	yel-yellow
6	grn-green
7	blu-blue
8	vio-violet



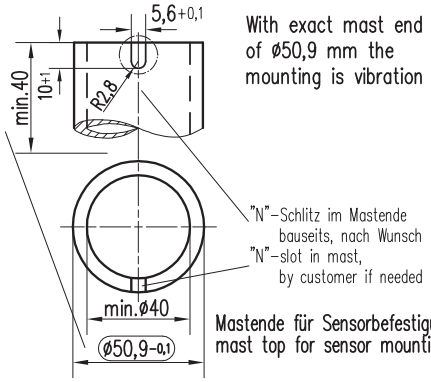


Ansicht von unten
bottom view

Bei exaktem Mastende
von ø50,9 mm ist die
Befestigung vibrationsgeprüft.

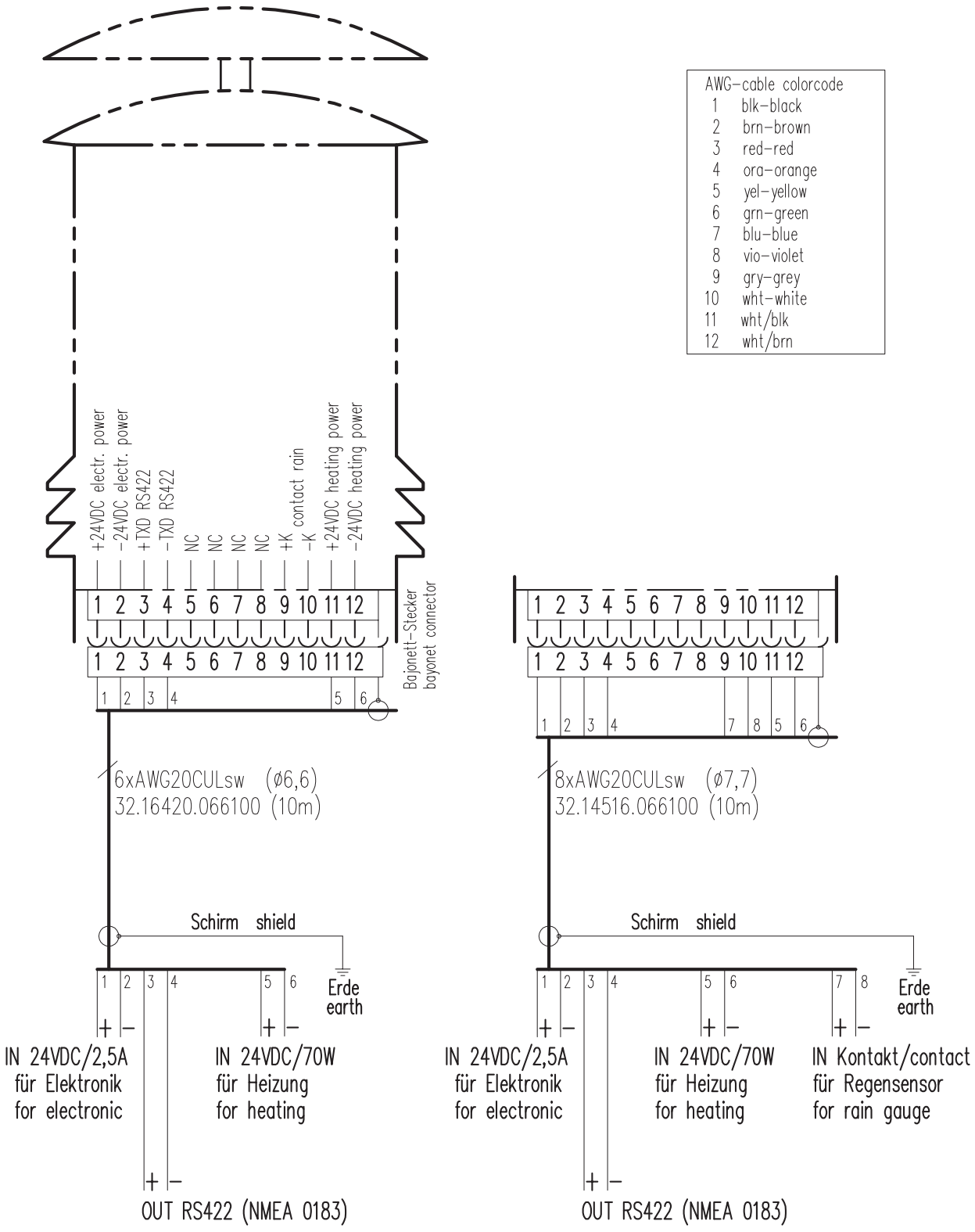


Mastende für Sensorbefestigung
mast top for sensor mounting



Mastende für Sensorbefestigung
mast top for sensor mounting

With exact mast end
of ø50,9 mm the
mounting is vibration proved.


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
+24VDC electr. power
-24VDC electr. power
+TXD RS422
-TXD RS422
NC
NC
NC
NC
+K contact rain
-K
+24VDC heating power
-24VDC heating power
1 2 3 4 5 6 7 8 9 10 11 12
Bajonett-Stecker
bayonet connector
1 2 3 4 5 6
6xAWG20CULsw (ø6,6)
32.16420.066100 (10m)
Schirm shield
Erde
earth
IN 24VDC/2,5A
für Elektronik
for electronic
IN 24VDC/70W
für Heizung
for heating
OUT RS422 (NMEA 0183)
1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 7 8 5 6
8xAWG20CULsw (ø7,7)
32.14516.066100 (10m)
Schirm shield
Erde
earth
IN 24VDC/2,5A
für Elektronik
for electronic
IN 24VDC/70W
für Heizung
for heating
IN Kontakt/contact
für Regensensor
for rain gauge
OUT RS422 (NMEA 0183)

6. Data protocols

<table>
<tr>
<td>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...360.0
R: relative wind direction
wind speed: 0.1...85.0
M metric units m/s
status A (valid) / V (not valid)
stop delimiters: <CR> <LF>
error code: WD 999.9
error code: WS 999.9</td>
<td>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: -40.0...+70.0
C: °C
stop limiters: <CR> <LF>
error code: 999.9</td>
</tr>
<tr>
<td>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...1100.0
B: air pressure in hPa
stop limiters: <CR> <LF>
error code: 9999.9</td>
<td>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...100.0
dew point temp.: -40.0...+70.0
C: °C
stop limiters: <CR> <LF>
error code: 999.9</td>
</tr>
<tr>
<td colspan="2">Optional precipitation data protocol EOLOS-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 cm^3-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></td>
</tr>
</table>

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*0E<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).

7. Disposal

LAMBRECHT meteo GmbH is listed and registered at the Stiftung Elektro-Altgeräte Register ear under:

WEEE-Reg.-Nr. DE 45445814

In the category of monitoring and control instruments, device type: "Monitoring and control instruments for exclusively commercial use".

Within the EU

The device has to be disposed according to the European Directives 2002/96/EC and 2003/108/EC (Waste Electrical and Electronic Equipment). Do not dispose the old device in the household waste! For an environmentally friendly recycling and disposal of your old device, contact a certified disposal company for electronic waste.

Outside the EU

Please follow the regulations in your country regarding the appropriate disposal of waste electronic equipment.

8. Versions and technical data

(1643) Static Weather Sensor EOLOS-IND H – ID No. 00.16430.010002

Range of application: Temperature -40...+70 °C heated; wind speed 0...100 m/s; 0...100 % r. h.

PARAMETERS

Wind direction

Measuring range:	0...360°
Accuracy (RMS):	± 3°
Resolution:	1°

Wind speed

Measuring range:	0.1...85 m/s
Accuracy (RMS):	± 0.5 m/s ± 5 % of the measuring value
Resolution:	0.1 m/s

Air temperature

Measuring range:	-40...+70 °C
Accuracy:	± 0.8 °C (v > 2 m/s) [1]
Resolution:	0.1 °C

Relative humidity

Measuring range:	0...100 % r. h.
Accuracy:	± 3 % (10...90 %) r. h. [2][3]; ± 4 % (0...100 %) r. h.
Resolution:	0.5 % r. h.

Barometric pressure

Measuring range:	600...1100 hPa
Accuracy:	± 2 hPa (-40...+85 °C); ± 0.5 hPa at 25 °C
Resolution:	0.1 hPa

Protocols:	NNMEA 0183, WIMWV, WIMHU, WIMMB, WIMTA
Supply voltage:	18...32 V DC[4] ; max. 2.5 A heating: 24 V DC/ 70 W (max. 3 A) electronically controlled
Housing:	Aluminium, anodized, IP 66
Dimensions:	H 382 mm, Ø 120 mm; mast adapter Ø 50 mm for mounting on standard pipe
Weight:	Approx. 2.5 kg
Interface:	Serial, RS-422/ talker, Baud rate 4800, 1 Hz (measuring cycle of 4 Hz), 8 N 1

VERSION

(1643) Static Weather Sensor EOLOS-IND unheated – ID No. 00.16430.000002

Range of application: -30...+70 °C (under non-icing conditions)

STANDARDS

- NMEA 0183
- Standard of construction: VDE 0100
- Low voltage guide line: 72/23 EWG
- EMC/ EMI: DIN EN 60945 and DIN EN 61000-4-2, 3, 4, 6, 11
- Salt fog: EN 60945
- Protection class: DIN EN 60529
- Vibration: BV 0240

[1] Temperature influence of the shelter: accuracy +1.5 °C at v < 2 m/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 > 2 m/s and solar radiation
[4] At sensor connector; when connected to a LAMBRECHT standard cable (15 m) the supply voltage range on the side of the power supply switches to 18.7...32 V DC. When using other cables and cable lengths the individual voltage drop has to be considered.

The precipitation parameters (EOLOS-IND) depend on the connected LAMBRECHT precipitation sensor. The corresponding NMEA protocol is activated at the factory if required.
ID No. for activating the protocol: 97.14516.000 000
(Please indicate when ordering!)

ACCESSORIES (PLEASE ORDER SEPARATELY)

ID 32.16420.066100	Sensor cable, 10 m, 12 pole bayonet plug
ID 32.14516.066100	Sensor cable, 10 m, 12 pole bayonet plug for acquisition of precipitation

OPTIONS (PLEASE ORDER SEPARATELY)

ID 00.95800.010000	Data logger met[LOG]
ID 00.14742.401002	Display unit METEO-LCD/IND

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1643x_IND_b-de.indd 47.24

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