USER MANUAL

u[sonic]WS6 Modbus

Weather Sensor

aem | LAMBRECHT meteo

Content

1	The perfect weather sensor	3
2	Advantages at a glance	3
3	Warranty	3
4	Introduction	4
5	Start up	4
6	Installation conditions	5
6.1	General	5
6.2	Tools and installation material	5
6.3	Unpacking the sensor	5
6.4	Incoming inspection	6
7	Power supply	6
8	Installation work (short description)	6
8.1	Mounting the sensor	6
8.2	North alignment of wind sensor	6
8.3	Power supply and signal cable	7
8.4	Safety regulations	8
8.5	Download of updates	8
9	Maintenance	8
9.1	Regular maintenance and calibrations	8
9.2	Visual checks and cleaning	8
10	Transports	8
11	Dimensional drawing and connection diagram	9
12	Modbus protocol	10
12.1	General	10
12.2	Data encoding	10
12.3	Standard configuration (default)	10
12.4	Available Modbus commands	11
12.5	Instantaneous values / real-time values (Input Register)	11
12.6	Period data; average, maximum, and minimum (Input Register)	12
12.7	Descriptive sensor parameter registers (Holding Register)	13
12.8	Configuration registers (Holding Register)	13
13	Autoconfiguration	14
14	Technical data	15
15	Disposal	16

1 The perfect weather sensor

- For industrial applications as well as use under extreme environmental conditions
- Six parameters in one and at the same time
  - ▷ Wind direction
  - ▷ Wind speed
  - ▷ Air temperature
  - ▷ Relative humidity
  - ▷ Barometric pressure
  - ▷ Dew point temperature (calculated value)
- With independent, integrated sensors for high accuracies of each parameter
- No moving measuring elements, i.e. no wear, low maintenance, and very service-friendly

2 Advantages at a glance

- Extremely robust, compact weather sensor with high-quality, pollutant-resistant housing made of anodized aluminium
- Ideal for use in extreme environmental conditions, e.g. deserts, tropics, high mountains
- Version with integrated heating system for year-round icing-free operation
- Lamella shelter for accurate measurements of the temperature-humidity sensors
- Modbus data protocol
- Simple visualization of the measured values via Meteo-LCD indicators
- Storage, evaluation and display of the measured values using the “MeteoWare CS” evaluation software
- Easy, space-saving mounting on 50 mm standard pipe

3 Warranty

Please note the loss of warranty and non-liability by unauthorized 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 (e.g. false polarity) etc.
4. Damages which are caused by using the device beyond the specified operation conditions.

4 Introduction

The sensors of the u[sonic] family are very robust, compact, and extremely reliable. 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 u[sonic]WS6 acquires the meteorological parameters air temperature, relative humidity, and barometric pressure. Based on the measured data u[sonic]WS6 calculates the dew point temperature and provides for its serial output along with the measuring data.

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-485 in talker mode, when power supply is switched on. Due to their shock- and vibration proof construction the sensor u[sonic]WS6 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.

STATIC MEASUREMENT PRINCIPLE FOR WIND MEASUREMENT MEANS

- Determination of data works without moving measuring elements, i.e. no abrasion, least maintenance and no 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.
- The measuring principle allows very low starting values and high repeat accuracy.
- The compact sensor is easy to install. Due to the special measuring principle minor changes from the angle of pitch can be disregarded.

ADVANTAGES OF THE SENSOR

- Apart from the sensors for wind speed and direction the compact housing also contains built-in sensors for air temperature, relative humidity, and barometric pressure.
- 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 six 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.

5 Start up

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.

6 Installation conditions

6.1 General

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 has 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.

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.

6.2 Tools and installation material

There are no special tools or materials required for the installation works. All work can be carried out with commercially available tools such as screwdrivers and in-hex wrenches.

6.3 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:

- Sensor u[sonic]WS6 Modbus
- User manual

Accessories: (depend on order size, in all cases separately packed)
Connecting cable with plug and core cable ends

6.4 Incoming 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.

7 Power supply

The u[sonic]WS6 has a supply voltage range of 6...60 VDC. The sensor heater is to be supplied with 24 VDC and can be configured at the factory to 60 W, 120 W, or 240 W; with 240 W being the default setting.

8 Installation work (short description)

The sensor is installed in three steps:

1. Attach the cable plug to the sensor and, if necessary, pull 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

8.1 Mounting the sensor

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 M8x12 grub 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.

Use only the supplied fixing screws and do not tighten the north screw tightly. Please pay attention to a firm mounting of the sensor at the mast!

8.2 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 in-hex wrench.

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 grup 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.

8.3 Power supply and signal cable

The u[sonic]WS6 sensor requires a 8-pole M16 plug connector. The cable shield should be connected with both ends at the ground wire (PE).

The warranty for the device is excluded if damage occurs due to improper handling. This particularly includes the absence of proper grounding. Correct grounding according to DIN VDI/VDE 0100 is essential for the safety and functionality of the device. If you have any questions regarding installation, please contact us.

The external connection is via central connector which is located in housing base. For further details about electrical connection please see chapter „Dimensional drawing and connection diagram". 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 u[sonic]WS6 Modbus is 24 VDC with a typical current drain of 50 mA. The input range is 6...60 VDC or 12...42 VAC. The heater of the sensor has to be supplied with 24 V AC/DC. In standard configuration the heating power is 60 W with a current drain of 2.5 A at 24 VDC.

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 on the quality of the used cables. When the power supply of the sensor is switched on, after 2 seconds the sensor cyclically starts sending data protocols.

For use in environments with high electromagnetic interference (e.g. caused by motors/generators, frequency converters, or high-voltage power lines), the use of a galvanically isolated DC/DC converter (24 V DC → 24 V DC)* in combination with the u[sonic]WS6 Modbus is recommended in order to further ensure interference-free operation of the u[sonic]WS6 Modbus.

*) **Note:** As an example reference, a galvanically isolated DC/DC converter from a third-party manufacturer may be used, e.g. **Orion-Tr Smart 24/24-12 by Victron Energy (MPN ORI242428120)**.

The product reference is provided for information purposes only and does not constitute an approval, recommendation, or warranty. The selection, suitability assessment, and responsibility for the use of the third-party product rest solely with the user.

8.4 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!

8.5 Download of updates

On our website (https://www.lambrecht.net), the ***Free Software Tools & Firmware*** category can be found under ***Service*** in the ***Resources*** section. There you can easily download the latest firmware and the configuration software "Commander" for your product and benefit from ongoing improvements and new features.

9 Maintenance

9.1 Regular maintenance and calibrations

The sensor u[sonic]WS6 Modbus is service reduced and designed for a very long lifetime. Recommended is 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 close to the sensor!

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

9.2 Visual checks 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.

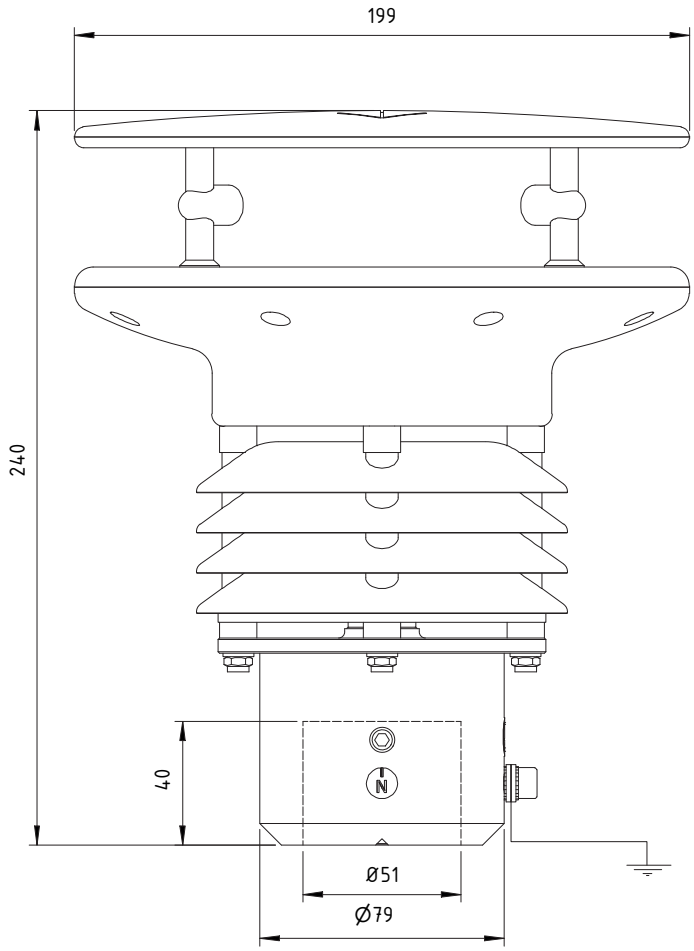
In case you should be faced with any specific problems please contact the LAMBRECHT meteo service under:

Tel: +49-(0)551-4958-0 E-Mail: support-lambrecht@aem.eco

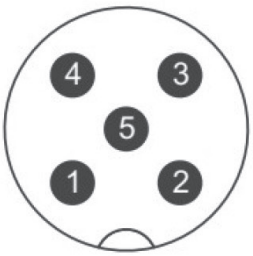
10 Transports

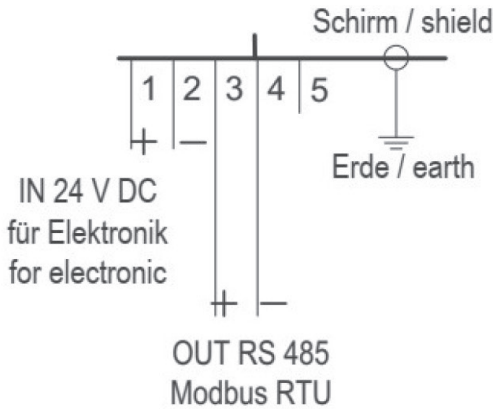
In case it is necessary to ship or to transport the sensor must be carefully packed to prevent damages during transport.

11 Dimensional drawing and connection diagram



Sensor-side plug (male) M12 4-pin (or 5-pin), shielded





PIN	color	Farbe
1	br	br
2	wt	ws
3	bl	bl
4	bk	sw
5	N/A	N/A

Cable-side socket (female) M12 4-pin, shielded

12 Modbus protocol

12.1 General

The LAMBRECHT meteo Modbus sensors follow the specification of the Modbus organization: "MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3" (see www.modbus.org).

12.2 Data encoding

Modbus uses the "Big-Endian" format for addresses and data. This means that if a value is transmitted with a number format which is larger than a single byte, that the "most significant byte" is sent first.

Example Big-Endian:
Register size value 16 - bits
0x1234 is transmitted in the sequence: 0x12 0x34.

To obtain the real measuring value, divide the received register value by the divisor.
Values of -9999 indicate an internal sensor error.

12.3 Standard configuration (default)

Baud rate: 19200 Baud
Byte frame: 8E1 (1 start bit, 8 data bits, 1 parity bit (even parity), 1 stop bit)
RTU Sensor address: 5

DEFAULT ADDRESSES OF THE LAMBRECHT METEO SENSORS

Address	Sensor
1	Wind speed
2	Wind direction
3	Precipitation rain[e]
4	THP
5	EOLOS-IND; u[sonic]WS6; u[sonic]WS6-NAV
6	com[b]
7	PREOS
8	ARCO
9	u[sonic]
10	Pyranometer 2nd Class
11	Secondary standard Pyranometer
12	PT100 to Modbus converter (temperature)
13	u[sonic]WS7

12.4 Available Modbus commands

The LAMBRECHT meteo Modbus sensors support the following commands:

- "Read Holding Register" command: 0x03 (descriptive sensor data registers)
- "Read Input Register" command: 0x04 (measured values registers)
  (every measured value is to be requested individually)
- "Write Multiple Register" command: 0x10 (Write to configuration registers)

12.5 Instantaneous values / real-time values (Input Register)

The following measured values are provided by the LAMBRECHT meteo sensors.

Register address	Parameter name	Unit	Divisor	Quantity of registers	Access type
30001	Wind speed	m/s	10	1	Read only
30201	Wind direction	°	10	1	Read only
30401	Air temperature	°C	10	1	Read only
30601	Relative humidity	% r. h.	10	1	Read only
30701	Dew point	°C	10	1	Read only
30801	Air pressure	hPa	10		Read only

Example: Retrieving the wind speed

0D	04	75	31	00	01	7A	C5	0D	04	02	00	1F	E8	F9

LEN 6	Transmission Query =>	Source Master	Dest Slave 13	Function Read Input Register (4)	Func Desk Address=30001, Quantity of Register=1	Checksum OK:C57A

LEN 5	Transmission Response <=	Source Slave 13	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 1F	Checksum OK:F9E8

12.6 Period data; average, maximum, and minimum (Input Register)

Register	Parameter name	Unit	Divisor	Quantity of registers	Access type
30002	Wind speed average	m/s	10	1	Read only
30003	Wind speed maximum	m/s	10	1	Read only
30004	Wind speed minimum	m/s	10	1	Read only
30202	Wind direction average	°	10	1	Read only
30203	Wind direction maximum	°	10	1	Read only
30204	Wind direction minimum	°	10	1	Read only
30402	Air temperature average	°C	10	1	Read only
30403	Air temperature maximum	°C	10	1	Read only
30404	Air temperature minimum	°C	10	1	Read only
30602	Relative humidity average	% r. h.	10	1	Read only
30603	Relative humidity maximum	% r. h.	10	1	Read only
30604	Relative humidity minimum	% r. h.	10	1	Read only
30702	Dew point average	°C	10	1	Read only
30703	Dew point maximum	°C	10	1	Read only
30704	Dew point minimum	° C	10	1	Read only
30802	Air pressure average	hPa	10	1	Read only
30803	Air pressure maximum	hPa	10	1	Read only
30804	Air pressure minimum	hPa	10	1	Read only

The data are valid for the period between the current request and the previous request. The maximum range of a period is 1 hour. Recalling the average value of a minimum, maximum and average group will erase the appropriate registers. Retrieve the values of a group in the sequence minimum, maximum, average.

Use command: 0x03

Example: Retrieve wind speed (min. max. avr.) and erase the register content

01	04	75	34	00	01	6A	08	01	04	02	00	00	B9	30	01
04	75	33	00	01	DB	C9	01	04	02	00	D6	38	AE	01	04
75	32	00	01	8A	09	01	04	02	00	14	B9	3F			

LEN 6	Transmission Query =>	Source Master	Dest Slave 1	Function Read Input Register (4)	Func Desk Address=30004, Quantity of Register=1		Checksum OK:86A
LEN 5	Transmission Response <=	Source Slave 1	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 00	Checksum OK:30B9
LEN 6	Transmission Query =>	Source Master	Dest Slave 1	Function Read Input Register (4)	Func Desk Address=30003, Quantity of Register=1		Checksum OK:C9DB
LEN 5	Transmission Response <=	Source Slave 1	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 D6	Checksum OK:AE38
LEN 6	Transmission Query =>	Source Master	Dest Slave 1	Function Read Input Register (4)	Func Desk Address=30002, Quantity of Register=1		Checksum OK:98A
LEN 5	Transmission Response <=	Source Slave 1	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 14	Checksum OK:3FB9

12.7 Descriptive sensor parameter registers (Holding Register)

Register	Parameter name	Quantity of registers	Remark	Access type
40050	Device identification number (15 characters)	8 (2 characters in each register)	The returned data are in form of a 16 byte null terminated string	Read only
40100	Serial number (11 characters)	6 (2 characters in each register)	The returned data are in form of a 12 byte null terminated string	Read only
40150	Firmware version (up to 25 characters)	13 (2 characters in each register)	The returned data are in form of a 26 byte null terminated string	Read only

Example: Retrieving the device identification number
(The identification number shown in the example is sensor-dependent. It is only used here for demonstration purposes).

0D	03	9C	72	00	08	CA	8B	0D	03	10	30	30	2E	31	36	□□□□□□□□□□□□□□□□
34	38	30	2E	30	30	31	31	33	30	00	E8	6B				00.16480.000130□□□

LEN 6	Transmission Query =>	Source Master	Dest Slave 13	Function Read Holding Register (3)	Func Desk Address=40050, Quantity of Register=8	Checksum OK:8BCA

LEN 19	Transmission Response <=	Source Slave 13	Dest Master	Function Read Holding Register (3)	Func Desk Byte count=16	Data 30 30 2E 31 36 34 38 30 2E 30 30 31 31 33 30 00	Checksum OK:6BE8

12.8 Configuration registers (Holding Register)

Register	Parameter name	Allowed values	Quantity of registers	Access type
40001	Modbus device address		1	Write only
40200	Baud rate	96 = 9600 192 = 19200 384 = 38400	1	Write only
40201	Parity	1 = even 0 = none	1	Write only

The device must be restarted after each change of a setting!

Example: Changing the RTU address from 4 to 1

05	10	9C	41	00	01	02	00	01	06	48	05	10	9C	41	00
01	7E	09													

LEN 9	Transmission Query =>	Source Master	Dest Slave 5	Function Write Multiple Register (16)	Func Desk Address=40001, Quantity=1	Byte count 2	Register values 00 01	Checksum OK:4806

LEN 6	Transmission Response <=	Source Slave 5	Dest Master	Function Write Multiple Register (16)	Func Desk Address=40001, Quantity=1	Checksum OK:097E

13 Autoconfiguration

All LAMBRECHT Modbus sensors offer the experienced user the possibility to implement an auto-configuration in his Modbus master based on additional information stored in the sensor. The necessary information can be found in the document “General instructions for LAMBRECHT meteo Modbus sensors”.

14 Technical data

Weather sensor u[sonic]WS6 Modbus	
ID	**00.16480.000130**
Range of application	-40...+70 °C (-50...+70 °C heated); 0...100 % r. h.
Parameter	
Wind direction	
Measuring principle	Ultrasonic
Measuring range	0...359.9°
Accuracy	< 2° (> 1 m/s) RMSE
Resolution	0.1°
Wind speed	
Measuring principle	Ultrasonic
Measuring range	0...65 m/s
Accuracy	0.2 m/s RMSE (v < 10 m/s); 2 % RMSE (10 m/s < v < 65 m/s)
Resolution	0.1 m/s
Air temperature	
Measuring principle	Digital temperature sensor
Measuring range	-40...+70 °C
Accuracy	0.1 K (0...60 °C) [1]; 0.2 K (-40...0 °C) [1]
Resolution	0.1 °C
Relative humidity	
Measuring principle	Capacitive, digital
Measuring range	0...100 % r. h.
Accuracy	1.5 % (0...80 %) r. h. [2][3]; 2 % (> 80 %) r. h.
Resolution	0.1 % r. h.
Barometric pressure	
Measuring principle	Piezoresistive
Measuring range	300...1100 mbar
Accuracy	0.5 mbar
Resolution	0.1 mbar
Dew point temperature	
Measuring principle	Passive, calculated from air temperature and humidity
Measuring range	-40...+70 °C
Resolution	0.1 °C
Further specifications	
Response threshold	0.1 m/s
Interface	RS-485
Protocol	Modbus RTU

Further specifications	
Measuring rate	0.1...10 Hz
Supply voltage	6...60 VDC; with heating: 24 VAC/DC ± 20 %
Current consumption	Sensor: typically 50 mA at 24 VDC; heating: max. 10 A at 24 VAC/DC
Heating data	60 W
Dimensions	H 238 mm; Ø 199 mm; mast adapter Ø 50 mm for mounting on standpipe
Housing	Seawater resistant aluminum
Protection class	IP 66; IP 67
Weight	Approx. 3.1 kg
Standards	
General	• Modbus RTU • 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
Accessories (please order separately)	
ID 32.14567.060010	Sensor cable, 15 m, 4 pole M12 plug

[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

15 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.

Copyright © 2026 LAMBRECHT meteo GmbH. All rights reserved.
Information in this document subject to change without notice.

u[sonic]WS6-Modbus_b-de.indd 09.26
Photo copyright: © Udo Kroener - Adobe stock

LAMBRECHT meteo GmbH
Friedländer Weg 65
37085 Göttingen
Germany

Tel +49-(0)551-4958-0
E-Mail info-lambrecht@aem.eco
Internet www.lambrecht.net