EFFICIENT Modbus · The Efficient Solution

Are you cost-conscious but still demanding when it comes to your wind measurement data?

Then the EFFICIENT Modbus sensors are your ideal solution.

With this sensor concept, high-quality materials meet functional design. EFFICIENT sensors also impress with their high accuracy, effortlessly simple mounting principles and corrosion-resistant materials. EFFICIENT sensors save time and money, but not the quality of your measurement data.

- Proven sensor technology
- Very good starting values
- Simple mast mounting

POSSIBLE APPLICATIONS

- Professional meteorological applications
- Building automation
- Photovoltaic systems
- Industrial meteorology

Content

Disposal

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

WEEE-Reg.-No. 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.

1 Initial operation

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 put up. We therefore recommend to select the place of installation very carefully.

Selecting the place of installation

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, install the sensors at the same measuring point, if possible, and make sure to avoid any mutual influence of the sensors. A wind sensor pair easily meets this requirement since the sensors are set up side by side. Their horizontal distance should be approximately 1.5 m. The two sensors must be staggered vertically so that the lower edge of the upper wind speed sensor is 0.1 to 0.5 m above the upper edge of the lower wind direction sensor.

2 Principles of installation

Because the installation takes place in a dangerous height, the assembly personal must follow the rules for prevention of accidents.

I. Traverse with bore (e.g. Id-No. 32.14627.010000)

Material thickness for installation of the sensor between the nuts may be max. 10 mm.

2. The sensor is led without cable into the bore and fastened by the opposite side with the loose nut.
3. Attach the sensor with the flat side of detached nut from the lower side. Tighten with a suitable tool (wrench size 36), until a twisting safety of the sensor aligned to the north is given.

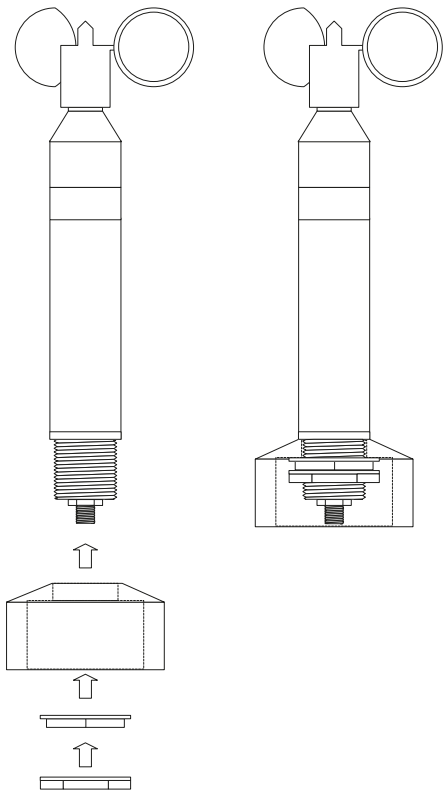
II. Mast or pipe mounting

Make sure the device is easily accessible so that you can set up the north direction for the wind direction sensor and perform any maintenance work. To reach the sensors use a ladder of the appropriate length or a telescoping working platform of the appropriate height.

Ladders or other lifting helps must be absolutely in order and must be guarantee a secure support! Follow the rules for prevention of accidents.

Mount the sensors at the top of grounded tube with an outer diameter Ø 48-50 mm. The mast adapter (see accessories) is obligatory.

1. Remove both thread nut from the sensor.
2. The sensor is inserted without cable into the bore (Ø 30 mm) of the adapter and locked from the opposite side with a loose nut in the direction of the adapter.
3. And finally we recommend to lock the second nut with its plane side ahead against the first nut (see drawing).



If wind speed and wind direction are measured at the same time, the measurement generally takes place not only at the top of a mast but also at the ends of a cross arm. The arms must stay torsion-free and vibration-proof even at high wind speeds and they must be accessible for you to perform mounting and maintenance work.

When you install the connecting cables make sure not to excessively shorten the cable leading to the connector in the lower part of the sensor casing so that you can later maintain or dismounting the sensor. Put further a cable loop as sensor protection against water under the sensor.

Tip: Install the sensors on ground to the traverse and align you the wind vane parallel to the traverse. You go only then upward, in order to accordingly align the sensors with traverse under assistance of a partner on ground.

3 Setting up the North direction of the wind direction sensor

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

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. When you have fixed the wind vane this way 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.

Please make sure there is no magnetic deviation of the compass.

When the North direction is set up for the wind direction sensor, you can mounting it like under point "Principle of installation". Remove any adhesive tape.

If you cannot select a northern reference point owing to local conditions, you can proceed analogously using a reference point in the south. In this case, however, you have to make sure the north mark on the sensor does not point to the reference point but in the opposite direction.

4 Electrical connection

Wind sensors EFFICIENT Modbus are connected to a data measuring system via the open cable end. The sensors have a cable-plug connection to the cable.

The connecting cable is suitably led along the mast between the data evaluation device (indicating instrument or data acquisition system) and the sensor. The cable must be fastened using appropriate cable ties (their length depends on the mast diameter).

Lead the cable in a wide curve from the mast to the bottom of the casing so that you can later easily dismount the cable.

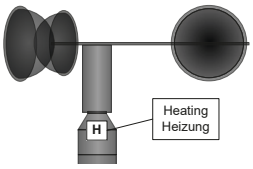
Please note that the cable on the data processing side is protected against moisture, e.g. by using suitable cable glands.

If the mast is prepared accordingly, the connection cable can also be laid completely in the pipe sections of a mast.

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

5 Heating

The sensor has an electronically controlled 18 watt heating in the sensor head. The heating is powered along with the electronics of the sensor.

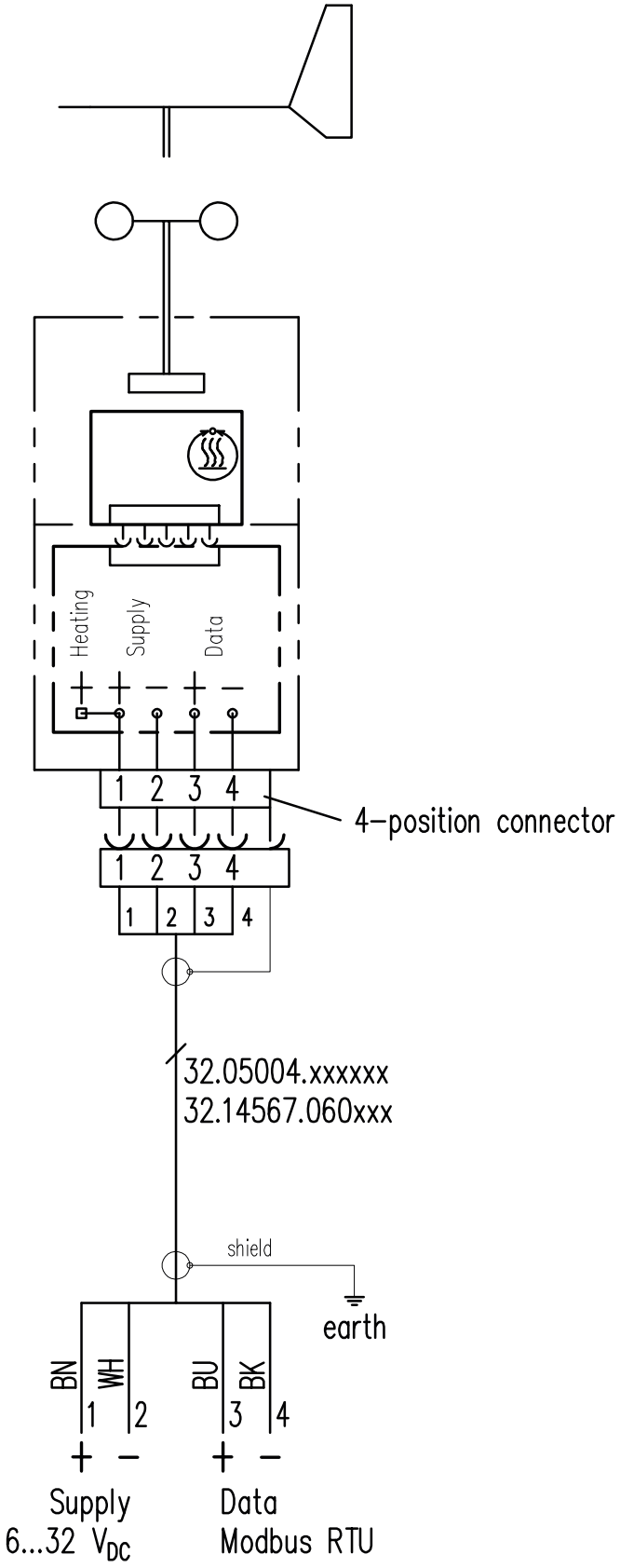


Under most climatological conditions the heating prevents blocking of the moving sensor parts (see illustration). The cup rotor or the wind vane are not heated. In case of icing or formation of ice at the moving sensor element the function is restricted for the period of icing.

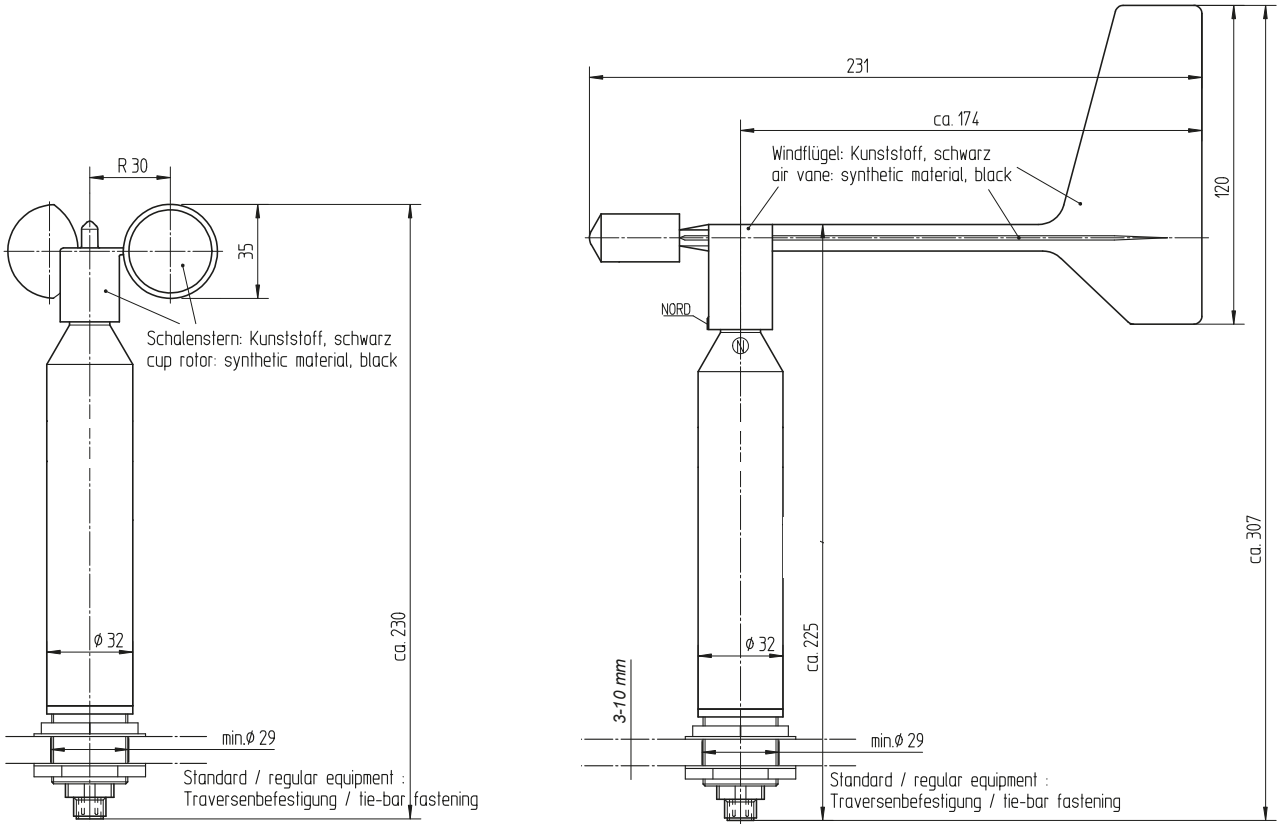
6 Maintenance

The sensor design permits long periods of maintenance-free operation. We therefore recommend a regular visual verification of the north setup of the wind direction sensor as well as a sensor calibration of both sensor types in the distance of 2 years.

7 Wiring diagram



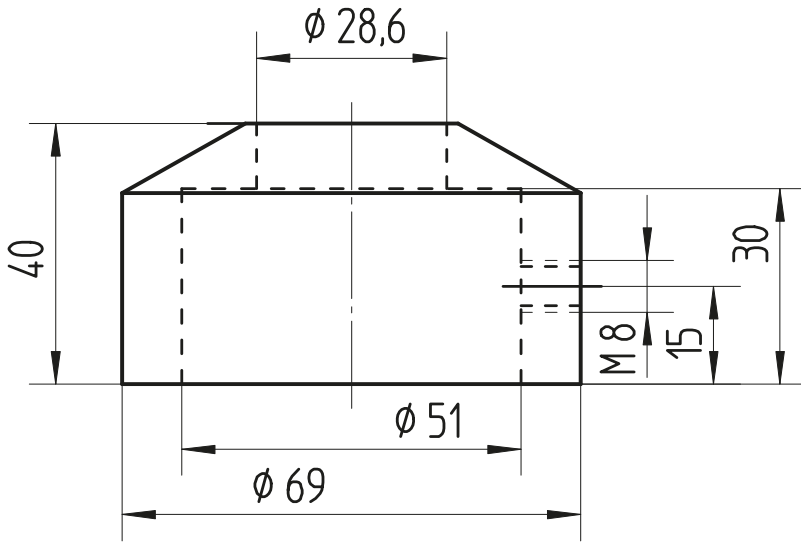
8 Dimensional drawings



Accessories (optional):

(14567 U6) Mast adapter

Id-No. 32.14567.006 000



9 Modbus data protocols EFFICIENT Modbus

9.1 General

The Lambrecht meteo Modbus sensors follow the specification of the Modbus organization: “MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3”.

(See www.modbus.org).

9.2 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.

9.3 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:	(1) Wind speed sensor
	(2) Wind direction sensor

Default addresses of the LAMBRECHT sensors:

Address	Sensor
1	Wind speed
2	Wind direction
3	Precipitation rain[e]
4	THP
5	EOLOS IND · u[sonic]WS6
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

9.4 Available Modbus commands

The LAMBRECHT 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)

9.5 Instantaneous values / realtime values (Input Register)

The following measured values are provided:

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

Example: Retrieve 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

9.6 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

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

9.7 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: Retrieve 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

9.8 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: Change 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

9.9 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 “Lambrecht_Modbus_Autoconfiguration”.

10 Technical data

Measuring principle:	Hall Sensor Array, non-contact
Range of application:	Temperatures -30...+70 °C heated * • wind speed 0...60 m/s
Heating:	18 W heating • electronically controlled • The heating within the sensor head prevents blocking of the moving parts under most climatological conditions.
Supply voltage:	24 VDC (6...32 VDC)
Current consumption:	max. 800 mA at 24 VDC and max. heating • 13 mA at 24 VDC and inactive heating (Note: The heating can be deactivated via software tool. This allows the current consumption to be reduced to 8.5 mA at 24 VDC.)
Housing:	Seawater-resistant Aluminium · IP 65 · shaft-Ø 32 mm · for mounting-bore Ø 30 mm at max. 10 mm material thickness
Dimensions:	See dimensioned drawings
Included in delivery:	1 sensor (without cable)
For connection to:	Data processing system, e. g. met[LOG], Ser[LOG]Plus · power supplies · user specific evaluation systems (not included in delivery)
Accessory:	Id-No. 32.14567.060000 · sensor cable with M12, 4 pin female connector, length: 12 m (please order separately)

Parameters	**Wind direction** **Id-No. 00.14579.101 030**	**Wind speed** **Id-No. 00.14579.201 030**
Measuring elements:	wind vane • stably fibre-reinforced plastics	3-armed cup anemometer • fail-safe plastics
Measuring ranges:	0...360°	0.7...50 m/s
Accuracy:	± 2°	0.5 m/s at 0.7...5 m/s and 2 % FS at 5.02...50 m/s
Resolution:	1°	< 0.02 m/s
Starting value:	< 0.7 m/s	< 0.7 m/s
Interface:	RS485	RS485
Protocol:	Modbus RTU	Modbus RTU
Weight:	0.35 kg	0.25 kg
Measured values:	instantaneous value · average value · max. value of the average value · min. value of the average value	

*) [Note: In the event of possible icing and ice formation on the moving sensor element, the function is limited for the duration of the icing. We offer specially heated sensors for use in locations with acute icing hazards.]

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.

Quality System certified by DQS according to DIN EN ISO 9001:2015 Reg. No. 003748 QM15

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