



GENERAL MANUAL

Modbus Sensors

from LAMBRECHT meteo



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1. 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:

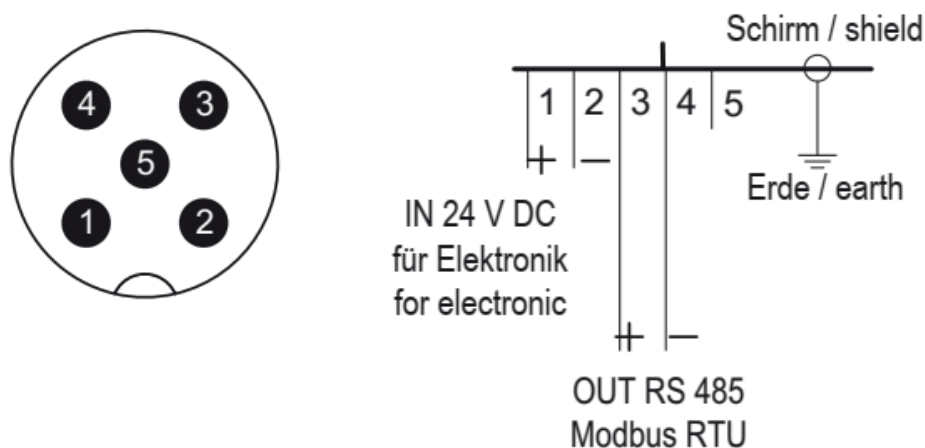
1. Mechanical damages caused by external impacts (e.g. icefall, rockfall, vandalism).
2. Impacts or damages caused by over-voltages or electromagnetic fields which are beyond the standards and specifications in the technical data.
3. Damages caused by improper handling, e.g. by wrong tools, incorrect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

2. Introduction

This manual covers the general Modbus specification common to all Modbus sensors from Lambrecht meteo. The manual allows easy operation of all Lambrecht meteo Modbus sensors. Some sensors of the Modbus family offer additional registers and functions, which are described in separate documents via the registers and functions described here. The registers and functions described in this manual are sufficient for general operation of Modbus sensors in a weather station or PLC.

3. Lambrecht Modbus standard connection

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



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

4. Modbus protocol

The Lambrecht meteo Modbus sensors and the met[LOG] follow the specification of the Modbus organization: "MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3". (See www.modbus.org)

4.1. Data encoding

MODBUS uses the "big-endian" format for addresses and data. This means that if a value is transmitted with a number format that is larger than a single byte, the "most significant byte" is sent first. For values that go beyond one register (e.g. 32 bit) this is not clearly specified for the Modbus. In these cases (32 bit or 64 bit) the Lambrecht Modbus sensors follow the big-endian number format.

Example big-endian:

Register size value

16 - bits 0x1234 is transmitted in the order: 0x12 0x34

Example big-endian (32 bit or 64 bit):

Register size value

32 - bits 0x12345678 is transmitted in the order: 0x12 0x34 0x56 0x78

5. Device address

The addresses 1...247 are permitted for Modbus.

6. Standard configuration - Default

Baud rate: 19200 Baud

Address: Each sensor type (or family) has its own default address.

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
14	IceLoad Sensor



Byte frame according to MODBUS standard for RTU mode:

8E1 (1 start bit, 8 data bits, 1 parity bit (even parity), 1 stop bit)

7. Modbus command set

The Lambrecht Modbus sensors support the following commands:

- “Read Holding Register” command: 0x03 (descriptive sensor data registers)
- “Read Input Register” command: 0x04 (measured value Registers)
- (each measured value must be requested individually)
- “Write Multiple Register” command: 0x10 (writing to configuration register)

8. Measured value and parameter register LAMBRECHT sensors

The register ranges 30001 to 35000 are intended for measured values.

The following measured values are provided by Lambrecht meteo sensors.

Register address	Parameter name	Unit	Factor	Description	
30001	Wind speed instantaneous value	m/s	10	1 decimal place	INT
30201	Wind direction instantaneous value	°	10	1 decimal place	INT
30401	Air temperature instantaneous value	°C	10	1 decimal place	INT
30601	Humidity instantaneous value	% r. h.	10	1 decimal place	INT
30701	Dew point instantaneous value	°C	10	1 decimal place	INT
30801	Air pressure instantaneous value	hPa	10	1 decimal place	INT
31001	Precipitation amount total	mm	10	1 decimal place	INT
31101	Precipitation amount total (High-WORD)	mm	1000	3 decimal places	uLONG
31102	Precipitation amount total (Low-WORD)			Registers 31101 and 31102 can only be read out together. (Function code 0x04)	
31201	Precipitation intensity of the last minute (sliding)	mm/min	1000	= average (1-min.) 3 decimal places Time base = 1 min. Measuring rate = 6x per min.	INT
31401	Global radiation instantaneous value	W/m ²	10	1 decimal place	INT

31501	Global radiation instantaneous values (High-WORD) (temperature compensated)	W/m ²	100	2 decimal places	LONG
31502	Global radiation instantaneous values (Low-WORD) (temperature compensated)			Registers 31501 and 31502 can only be read out together. (Function code 0x04)	
31591	Global radiation instantaneous values (High-WORD) (uncompensated)	W/m ²	100	2 decimal places	LONG
31592	Global radiation instantaneous values (Low-WORD) (uncompensated)			Registers 31591 and 31592 can only be read out together. (Function code 0x04)	

The registers addresses 30001 to 35000 apply to all Lambrecht meteo Modbus sensors, but are only available or valid if the respective sensor supports the corresponding values (e.g. a pure wind sensor does not provide any air humidity).

The LAMBRECHT sensors give 0xD8F1 (0xFF676981) as error code or invalid value.



Individual readout of related registers (e.g. 31101 and 31102) is not permitted.

8.1. Special case precipitation amount

Except for the amount of precipitation, all measured values are to be read in as instantaneous values. The amount of precipitation must be read in as a total amount. And the difference to the previous call must be formed for the displayed and the precipitation quantity to be stored.



The value overflow of the precipitation total must be observed and taken into account when calculating the difference.

9. Holding register

Register addresses 40001 to 49000:

Register addresses 40001 to 46000 contain the configuration parameters of the sensor.

Register addresses 46001 to 49000 contain for each sensor the available registers with measured values and sensor data from the range 30001 to 35000.



9.1. Sensor parameters / configuration parameters

Register address	Parameter name	Unit	Divisor	Description	
40001	Modbus device address		1	The addresses 1 to 247 are allowed	
40200	Baud rate		0,01	96=9600 192=19200 384=38400	
46000	Number of mapping registers		1	Contains the number of occupied mapping registers for the autoconfiguration	INT

9.2. Mapping register for autoconfiguration

Registers addresses 46001 to 49000 contain for each sensor the available registers with measured values and sensor data from the range 30001 to 35000.



The registers can only be read out as a block! The length of the block or the number of available mapping registers is in holding register 46000.

For example, in the Modbus Pro WS, registers 46001 to 46004 contain valid addresses. The holding register 46000 contains the number of registers 4, all 4 registers must be read out in the block with the instruction 0x04. Too many registers or too few lead to an error message.

10. Autokonfiguration

For the autoconfiguration, the register addresses of the measured values and sensor data available in the register range 30001 to 35000 are listed as successive values in the Lambrecht sensors in register range 46001 to 49000. Registers 46001 to 49000 can only be read out as a block! The length of the block or the number of available mapping registers is in holding register 46000.

Since the addresses from the range 30001 to 35000 apply to all Lambrecht sensors, an address from this range is also representative of a measured value type.

For example, register 30401 always contains the current value of the air temperature. If this register address is not included in the list in register range 46001 to 49000, the connected Modbus sensor does not supply an air temperature. The autoconfiguration of the met[LOG] is performed for each COM interface via the addresses from 1 to 25 by reading out the number of mapping registers (holding register 46000) and the register range from 46001 for all addresses.

The following table contains the assignment of the configuration to the individual (possible) instantaneous value registers of the sensors. Some sensors deliver registers with mean, minimum and maximum values or additional values beyond this specification. Unknown register addresses (or registers that are not required) must therefore be ignored.

Register address	Parameter name	Unit	Factor	Description	Data type	Function code	Storage type > 16 bit
30001	Wind speed instantaneous value	m/s	10	1 decimal place	INT	0x04	Big-Endian WORD
30201	Wind direction instantaneous value	°	10	1 decimal place	INT	0x04	Big-Endian WORD
30401	Air temperature instantaneous value	°C	10	1 decimal place	INT	0x04	Big-Endian WORD
30601	Humidity instantaneous value	% r. h.	10	1 decimal place	INT	0x04	Big-Endian WORD
30701	Dew point instantaneous value	°C	10	1 decimal place	INT	0x04	Big-Endian WORD
30801	Air pressure instantaneous value	hPa	10	1 decimal place	INT	0x04	Big-Endian WORD
31001	Precipitation amount total	mm	10	1 decimal place	INT	0x04	Big-Endian WORD
31101	Precipitation amount total (High-WORD)	mm	1000	3 decimal places Registers 31101 and 31102 can only be read out together. (Function code 0x04)	uLONG	0x04	Big-Endian WORD
31102	Precipitation amount total (Low-WORD)						
31201	Precipitation intensity of the last minute (sliding)	mm/min	1000	= average (1-min.) 3 decimal places Time base = 1 min. Measuring rate = 6x per min.	INT	0x04	Big-Endian WORD
31401	Global radiation instantaneous value	W/m ²	10	1 decimal place	INT	0x04	Big-Endian WORD



31501	Global radiation instantaneous value (High-WORD) (temperature compensated)	W/m ²	100	2 decimal places Registers 31501 and 31502 can only be read out together. (Function code 0x04)	LONG	0x04	Big-Endian WORD
31502	Global radiation instantaneous value (Low-WORD) (temperature compensated)						
31591	Global radiation instantaneous value (High-WORD) (uncompensated)	W/m ²	100	2 decimal places Registers 31591 and 31592 can only be read out together. (Function code 0x04)		0x04	Big-Endian WORD
31592	Global radiation instantaneous value (Low-WORD) (uncompensated)						

11. Modbus-Registers per sensor - Examples

11.1. Registers Modbus-PRO-WD

Register address	Parameter name	Unit	Factor	Description	
	Wind direction				
30201	Wind direction instantaneous value	°	10	1 decimal place	INT
46000	Number of mapping registers		1	For wind sensor PRO-Modbus = 4	INT

Register address	Register value	Unit	Factor	Description	
46001	30201	Register address	1	Wind direction instantaneous value	INT
46002	30202	Register address	1	Wind direction average since last retrieval	INT
46003	30203	Register address	1	Wind direction maximum value	INT
46004	30204	Register address	1	Wind direction minimum value	INT



The values from the registers with the maximum values and minimum values are automatically reset as soon as the register with the mean values has been read out.

11.2. Registers Modbus-PRO-WS

Register addresses 30001 to 35000 for measured values

Register address	Parameter name	Unit	Factor	Description	
	Wind speed				
30001	Wind speed instantaneous value	m/s	10	1 decimal place	INT
46000	Number of mapping-registers		1	For wind sensor PRO-Modbus = 4	INT

Register address	Register value	Unit	Factor	Description	
46001	30001	Register address	1	Wind speed instantaneous value	INT
46002	30002	Register address	1	Wind speed average value since last retrieval	INT
46003	30003	Register address	1	Wind speed maximum value	INT
46004	30004	Register address	1	Wind speed minimum value	INT



The values from the registers with the maximum values and minimum values are automatically reset as soon as the register with the mean values has been read out.

11.3. Registers Modbus-THP

Register addresses 30001 to 34000 for measured values

Register address	Parameter name	Unit	Factor	Description	
30401	Temperature instantaneous value	°C	10	1 decimal place	INT
30601	Humidity instantaneous value	% r. h.	10	1 decimal place	INT
30701	Dew point instantaneous value	°C	10	1 decimal place	INT
30801	Air pressure instantaneous value	hPa	10	1 decimal place	INT
46000	Number of mapping registers		1	For THP = 32	INT



Register address	Register value	Unit	Factor	Description	
46001	30401	Register address	1	Air temperature instantaneous value	INT
46002	30402	Register address	1	Air temperature average value since last retrieval	INT
46003	30403	Register address	1	Air temperature maximum value	INT
46004	30404	Register address	1	Air temperature minimum value	INT
46005	30601	Register address	1	Humidity instantaneous value	INT
46006	30602	Register address	1	Humidity average value since last retrieval	INT
46007	30603	Register address	1	Humidity maximum value	INT
46008	30604	Register address	1	Humidity minimum value	INT
46009	30701	Register address	1	Dew point instantaneous value	INT
46010	30702	Register address	1	Dew point average value since last retrieval	INT
46011	30703	Register address	1	Dew point maximum value	INT
46012	30703	Register address	1	Dew point minimum value	INT
46013	30801	Register address	1	Air pressure instantaneous value	INT
46014	30802	Register address	1	Air pressure average value since last retrieval	INT
46015	30803	Register address	1	Air pressure maximum value	INT
46016	30804	Register address	1	Air pressure minimum value	INT
46017	33560	Register address	1	Abs. humidity instantaneous value	INT
46018	33561	Register address	1	Abs. humidity average value since last retrieval	INT
46019	33562	Register address	1	Abs. humidity maximum value	INT
46020	33563	Register address	1	Abs. humidity minimum value	INT
46021	33580	Register address	1	QFE instantaneous value	INT
46022	33581	Register address	1	QFE average value since last retrieval	INT
46023	33582	Register address	1	QFE maximum value	INT
46024	33583	Register address	1	QFE minimum value	INT
46025	33584	Register address	1	QNH instantaneous value	INT
46026	33585	Register address	1	QNH average value since last retrieval	INT
46027	33586	Register address	1	QNH maximum value	INT
46028	33587	Register address	1	QNH minimum value	INT
46029	33588	Register address	1	QFF instantaneous value	INT
46030	33589	Register address	1	QFF average value since last retrieval	INT
46031	33590	Register address	1	QFF maximum value	INT
46032	33591	Register address	1	QFF minimum value	INT



For each type of measured value, the values from the registers with the maximum values (3XXX3) and minimum values (3XXX4) are automatically reset as soon as the register with the mean values (3XXX2) has been read out. For example, reading out 30402 resets registers 30403 and 30404.

11.4. Registers rain[e] Modbus

Register address	Parameter name	Unit	Factor	Description	
31001	Precipitation amount total	mm	10	1 decimal place	INT
31101	Precipitation amount total (High-WORD)	mm	1000	3 decimal places Registers 31101 and 31102 can only be read out together. (Function code 0x04)	uLONG
31102	Precipitation amount total (Low-WORD)	mm	1000	3 decimal places Registers 31101 and 31102 can only be read out together. (Function code 0x04)	uLONG
31103	Precipitation amount since last retrieval (High-WORD)	mm	1000	3 decimal places Registers 31103 and 31104 can only be read out together. (Function code 0x04)	uLONG
31104	Precipitation amount since last retrieval (Low-WORD)	mm	1000	3 decimal places Registers 31103 and 31104 can only be read out together. (Function code 0x04)	uLONG
31201	Precipitation intensity of the last minute (sliding)	mm/min	1000	= average (1-min.) 3 decimal places Time base = 1 min. Measuring rate = 6x per min.	INT
34921	Heating status		1	1 = ON; 0 = OFF	INT
34922	Internal temperature	°C	10	1 decimal place	INT
34931	Total heating power in percent	%	1		INT
46000	Number of mapping registers		1	For rain[e] = 9	INT

Register address	Register value	Unit	Factor	Description	
46001	31001	Register address	1	Precipitation amount total	INT
46002	31101	Register address	1	Precipitation amount total (High-WORD)	INT
46003	31102	Register address	1	Precipitation amount total (Low-WORD)	INT
46004	31103	Register address	1	Precipitation amount since last retrieval (High-WORD)	INT



46005	31104	Register address	1	Precipitation amount since last retrieval (Low-WORD)	INT
46006	31201	Register address	1	Precipitation intensity of the last minute (sliding)	INT
46007	34921	Register address	1	Heating status	INT
46008	34922	Register address	1	Internal temperature	INT
46009	34931	Register address	1	Total heating power in percent	INT

11.5. Registers Secondary Standard Pyranometer Modbus

Register address	Parameter name	Unit	Factor	Description	
31401	Global radiation instantaneous value	W/m ²	10	1 decimal place	INT
31402	Global radiation average value since last retrieval	W/m ²	10	1 decimal place	INT
31403	Global radiation maximum value since last retrieval	W/m ²	10	1 decimal place	INT
31404	Global radiation minimum value since last retrieval	W/m ²	10	1 decimal place	INT
31501	Global radiation instantaneous value (High-WORD) (temperature compensated)	W/m ²	100	2 decimal places Registers 31501 and 31502 can only be read out together. (Function code 0x04)	LONG
31502	Global radiation instantaneous value (Low-WORD) (temperature compensated)				
31591	Global radiation instantaneous value (High-WORD) (uncompensated)	W/m ²	100	2 decimal places Registers 31591 and 31592 can only be read out together. (Function code 0x04)	LONG
31592	Global radiation instantaneous value (Low-WORD) (uncompensated)				
46000	Number of mapping registers		1	Secondary Standard Pyranometer = 8	INT

Register address	Register value	Unit	Factor	Description	
46001	31401	Register address	1	Global radiation instantaneous values	INT
46002	31402	Register address	1	Global radiation average value since last retrieval	INT
46003	31403	Register address	1	Global radiation maximum value since last retrieval	INT
46004	31404	Register address	1	Global radiation minimum value since last retrieval	INT

46005	31501	Register address	1	Global radiation instantaneous value (High-WORD) (temperature compensated)	INT
46006	31502	Register address	1	Global radiation instantaneous value (Low-WORD) (temperature compensated)	INT
46007	31591	Register address	1	Global radiation instantaneous value (High-WORD) (uncompensated)	INT
46008	31592	Register address	1	Global radiation instantaneous value (Low-WORD) (uncompensated)	INT



The values from the registers with the maximum values and minimum values are automatically reset as soon as the register (31402) with the mean values has been read out.

11.6. Registers Pt100 Modbus module

Register address	Parameter name	Unit	Factor	Description	
30401	Temperature instantaneous value	°	10	1 decimal place	INT
46000	Number of mapping registers		1	For Pt100 module = 1	INT

Register address	Register value	Unit	Factor	Description	
46001	30401	Register address	1	Temperature instantaneous value	INT



Device address for the Pt100 Modbus module: The address can be set directly on the device via register 40001 and via two rotary switches.

The address is changed immediately via the register (without restarting the device). The last address set via the switch or the register is used in each case. (The last SETTER (switch/Modbus register) wins!) The change of address is also possible without voltage at the switch and is automatically accepted when switched on! After a power failure, the last address set remains valid.



11.7. Registers IceLoad Sensor

The register range from 30001 to 35000 is designated for measurement values in the LAMBRECHT sensors.
The following measurement values are provided by the IceLoad Sensor.

Register address	Parameter name	Unit	Factor	
32001	1 g	g	1	INT
31102	10 g	g	1	INT
31103-31104	Gross value		1000	LONG
34901	Status		1	INT
34921	Heating status		1	INT
34922	Temperature	°C	10	INT
34931	Heating power [%]	%	1	INT

12. Communication examples

12.1. 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

12.2. Retrieving the wind speed (min. max. avr.) and clearing 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

12.3. Retrieving the device identification number

The identification number shown in the example is sensor-dependent. It is used here for demonstration purposes only.

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



12.4. Changing the RTU address from 13 to 1

0D	10	9C	41	00	01	02	00	01	61	88	0D	10	9C	41	00
01	7F	41													

LEN 9	Transmission Query =>	Source Master	Dest Slave 13	Function Write Multiple Register (16)	Func Desk Address=40001, Quantity=1	Byte count 2	Register values 00 01	Checksum OK:8861
LEN 6	Transmission Response <=	Source Slave 13	Dest Master	Function Write Multiple Register (16)	Func Desk Address=40001, Quantity=1	Checksum OK:417F		

13. 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.

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