



USER MANUAL

THP[pro] Modbus

Temperature-Humidity-Pressure Sensor



Content

1	Features	3
2	Function	3
3	Warranty	3
4	Start-up	3
5	Mounting	4
6	Electrical connection	4
7	Wiring diagram	4
8	Dimensioned drawing	5
9	Mounting of the sensor into the sensor shelter	5
10	Modbus protocol	6
10.1	General	6
10.2	Data encoding	6
10.3	Standard configuration – Default	6
10.4	Available Modbus commands	7
10.5	Instantaneous values/realtime values (Input Register)	7
10.6	Period data - average, maximum and minimum (Input Register)	7
10.7	Descriptive sensor parameter registers (Holding Register)	8
10.8	Sensor parameters / Configurations parameters	9
10.9	Autoconfiguration	9
10.10	Modbus tool	9
11	Perform measurements	10
12	General sources of error	10
13	Maintenance and service	11
14	Maintenance and care	12
15	Safety instructions	13
16	Disposal	13
17	Technical data	14

1 Features

- Combined measuring device for demanding applications
- Capacitive humidity measuring element
- Low maintenance
- Humidity signal output: RS 485; Modbus
- For use in all climatic zones
- Appropriate sensor shelter type 8141.6 optionally available

2 Function

PROVEN ENVIRONMENTAL MEASUREMENT TECHNOLOGY

The sensor THP[pro] Modbus is a combined measuring instrument for measuring relative humidity, air temperature, and air pressure. The sensor is characterized by high reliability and energy-saving electronics. If the device is handled properly the perfect function and long-term stability as well as high accuracy are ensured.

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 (false polarity) etc.
4. Damages which are caused by using the device beyond the specified operation conditions.

4 Start-up

For climatic measurements the sensor should be mounted at a representative place. The sensor can be installed in any position. The sensor must be protected against water splashes and rain. As a suitable weather and protection screen we recommend the sensor shelter 8141.6.

Dew formation and splashes do not damage the sensor, although corrupted measurement readings are recorded until all the moisture on the filter has dried up. Inside a room you should avoid a place near heatings, windows, and cold outer walls.

The protective filters should only be screwed off carefully to check functioning with the humidity standard. It is important not to touch the highly sensitive sensor element in the process.

When you screw them back on, bear in mind that sensors will not measure accurately again until they are completely dry.

5 Mounting

First of all the protective screen has to be mounted without the incorporated sensor at a selected installation place as mentioned before. When having inserted the sensor THP[pro] bottom-up into the big support of sensor shelter 8141.6, the plastic nut must be fastened carefully with a wrench.

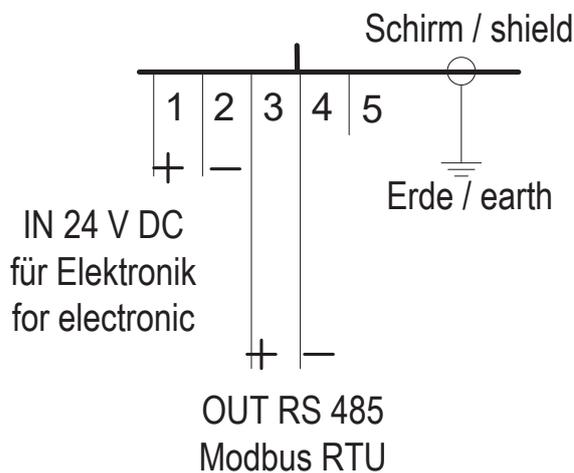
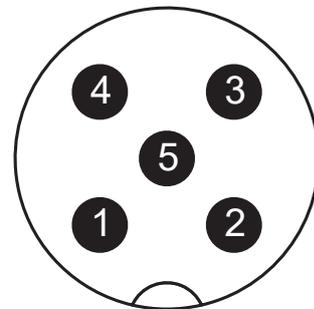
6 Electrical connection



Incorrect voltage supplies and overloading of the outputs can destroy the sensor!

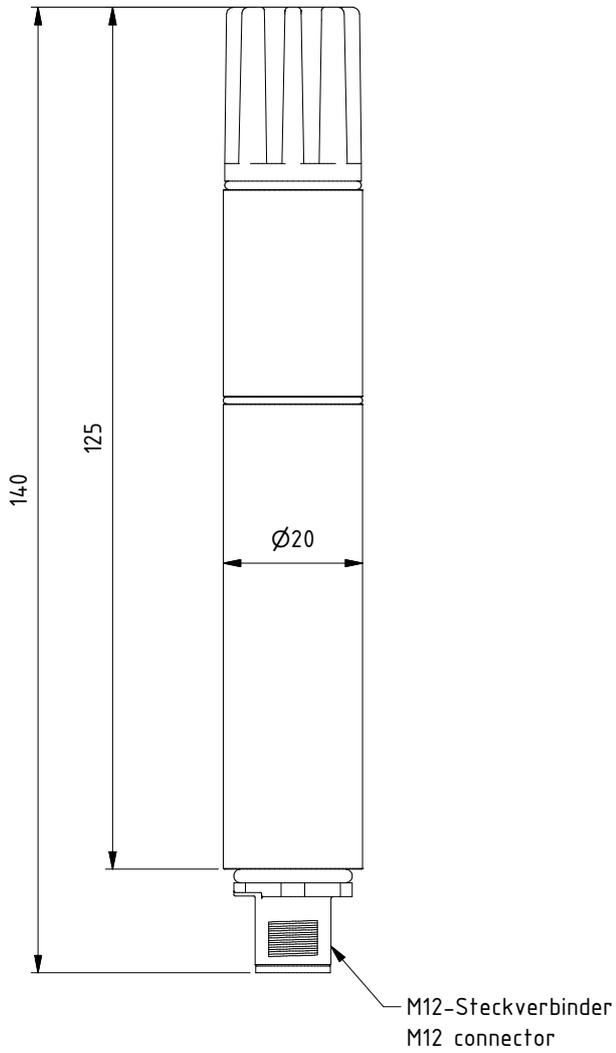
The sensor THP[pro] Modbus has to be connected with the end of the cable to an external power supply and signal evaluation (see figure).

7 Wiring diagram

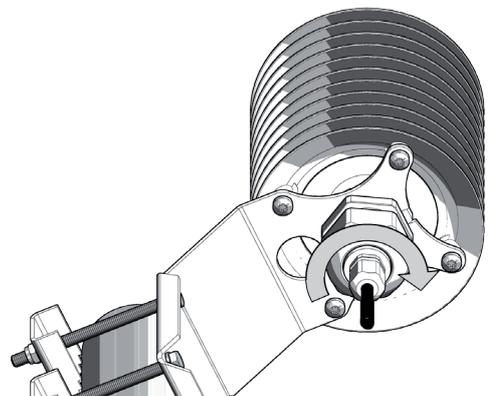
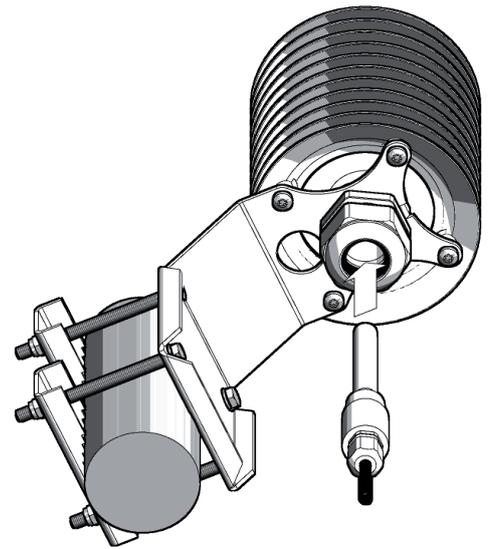
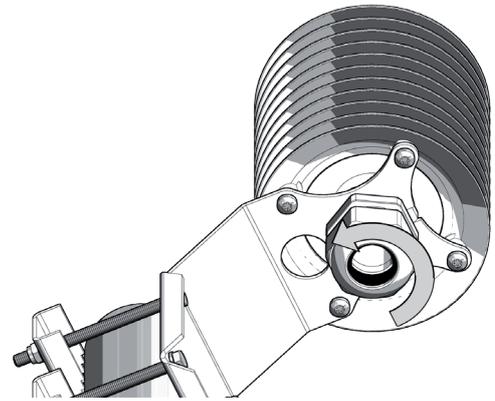


PIN	color	Farbe
1	br	br
2	wt	ws
3	bl	bl
4	bk	sw
5	N/A	N/A

8 Dimensioned drawing



9 Mounting of the sensor into the sensor shelter



10 Modbus protocol

10.1 General

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

10.2 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 (provided in 6.5, 6.6).

Values of -9999 indicate an internal sensor error.

10.3 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: 4

DEFAULT ADDRESSES OF THE LAMBRECHT SENSORS

Address	Sensor
1	Wind speed
2	Wind direction
3	Precipitation rain[e]
4	THP
5	EOLOSIND; 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



10.4 Available Modbus commands

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

10.5 Instantaneous values/realtime values (Input Register)

Register	Parameter name	Unit	Divisor	Quantity of registers	Access type
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	1	Read only
33560	Absolute humidity	g/m ³	10	1	Read only
33541	Wet-bulb temperature	°C	10	1	Read only

Example: Retrieve air temperature

04	04	76	C1	00	01	7A	2B	04	04	02	00	E1	B5	7B
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

LEN	Transmission	Source	Dest	Function	Func Desk	Checksum	
6	Query =>	Master	Slave 4	Read Input Register (4)	Address=30401, Quantity of Register=1	OK:2B7A	
LEN	Transmission	Source	Dest	Function	Func Desk	Data	Checksum
5	Response <=	Slave 4	Master	Read Input Register (4)	Byte count=2	00 E1	OK:7BB5

10.6 Period data - average, maximum and minimum (Input Register)

Register	Parameter name	Unit	Divisor	Quantity of registers	Access type
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
33561	Absolute humidity average	W/m ²	10	1	Read only
33562	Absolute humidity maximum	W/m ²	10	1	Read only
33563	Absolute humidity minimum	W/m ²	10	1	Read only
33542	Wet-bulb temperature average	°C	10	1	Read only
33543	Wet-bulb temperature maximum	°C	10	1	Read only
33544	Wet-bulb temperature minimum	°C	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 air temperature (min. max. avr.) and erase the register content

04	04	76	C4	00	01	6A	2A	04	04	02	00	D8	75	6A	04
04	76	C3	00	01	DB	EB	04	04	02	00	E2	F5	79	04	04
76	C2	00	01	8A	2B	04	04	02	00	E2	F5	79			

LEN 6	Transmission Query =>	Source Master	Dest Slave 4	Function Read Input Register (4)	Func Desk Address=30404, Quantity of Register=1	Checksum OK:2A6A
LEN 5	Transmission Response <=	Source Slave 4	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 D8 Checksum OK:6A75
LEN 6	Transmission Query =>	Source Master	Dest Slave 4	Function Read Input Register (4)	Func Desk Address=30403, Quantity of Register=1	Checksum OK:EBDB
LEN 5	Transmission Response <=	Source Slave 4	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 E2 Checksum OK:79F5
LEN 6	Transmission Query =>	Source Master	Dest Slave 4	Function Read Input Register (4)	Func Desk Address=30402, Quantity of Register=1	Checksum OK:2B8A
LEN 5	Transmission Response <=	Source Slave 4	Dest Master	Function Read Input Register (4)	Func Desk Byte count=2	Data 00 E2 Checksum OK:79F5

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

05	03	9C	72	00	08	CB	C3	05	03	10	30	30	2E	31	36	0000000000000000
34	38	30	2E	30	30	30	31	33	30	00	37	CA				00.16480.000130000
LEN 6	Transmission Query =>	Source Master	Dest Slave 5	Function Read Holding Register (3)	Func Desk Address=40050, Quantity of Register=8	Checksum OK:C3CB										

LEN 19	Transmission Response <=	Source Slave 5	Dest Master	Function Read Holding Register (3)	Func Desk Byte count=16	Data 30 30 2E 31 36 34 38 30 2E 30 30 30 31 33 30 00	Checksum OK:CA37
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10.8 Sensor parameters / Configurations parameters

Register	Parameter name	Allowed values	Quantity of registers	Access type
40001	Modbus address device		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 13 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
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LEN 6	Transmission Response <=	Source Slave 5	Dest Master	Function Write Multiple Register (16)	Func Desk Address=40001, Quantity=1	Checksum OK:097E
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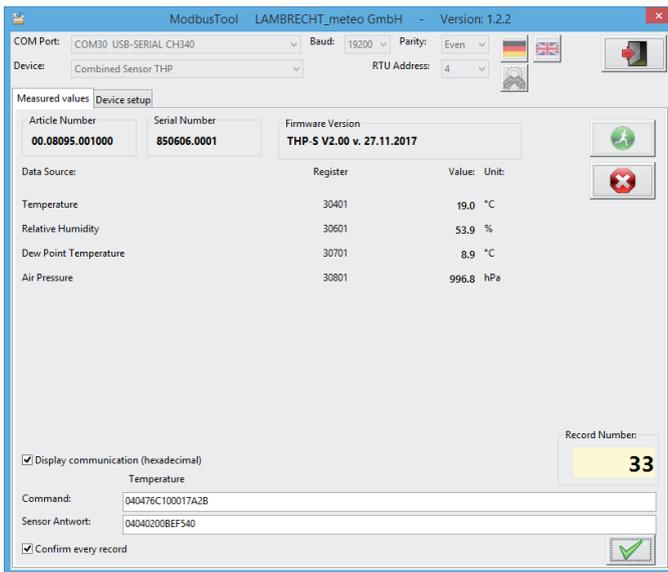
10.9 Autoconfiguration

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 "General Manual for LAMBRECHT meteo Modbus Sensors".

10.10 Modbus tool

On our homepage (<https://www.lambrecht.net>) you will find free firmware and the configuration software "Commander" for your product under "Service" in the "Download Portal" in the section "Free Software Tools & Firmware". Select the appropriate software for your product and benefit after the download from new functions and product enhancements by LAMBRECHT meteo development.

The application "Modbus_Tool" is used for checking, verifying the function and configuration of LAMBRECHT meteo Modbus sensors.



In the "Measured values" section, property data (article number, serial number and firmware version) and measured values are retrieved and displayed. In addition, the communication history can be displayed in hexadecimal format.

In the "Settings" area, the baud rate, parity, and RTU address can be adapted to the user's requirements.

11 Perform measurements

The measuring probe is adjusted by delivery. For putting into operating another readjustment is not required. The probe is ready for use five seconds after being switched on and sends its first data protocol.



Before a reliable measurement can be made, the measuring probe and medium to be measured must be in temperature and humidity equilibrium.

The necessary adjustment time, which can last up to 30 minutes, depends upon several factors:

- Size of the humidity and temperature deviation of probe and medium before start of measurement
- Change of the measured values during the adjustment time

The humidity measurement provides a better picture of the progress of acclimatization since it reacts much more quickly and more sensitively than the temperature measurement. The 1/10 percent display is therefore very suitable as a trend display. If the display oscillates about mean value, then adjustment is completed.

12 General sources of error

Humidity measurements are very sensitive to various influences:

TEMPERATURE ERROR

Due to too short adjustment time, sunshine during the measurement, heating, cold outer wall, air draft (e.g. fans), radiating hand, and/or body heat etc..



HUMIDITY ERROR

Due to steam, water splashes dripping water or condensation on the sensor etc.. Repeatability and long-term stability in operation are not impaired by this even if the probe has been exposed to high humidity or saturation with water vapor over a lengthy period.

STAINING

Staining of the humidity sensor can be largely avoided by using a corresponding filter. The filters must be cleaned or replaced periodically depending upon the degree of contamination of the measuring site.



The sensor is insensitive to chemicals, when they occur in normal concentrations (MAK values = maximum workplace exposure). At higher concentrations or possibilities of contact with liquid chemicals, the manufacturer must always be consulted!

13 Maintenance and service

DEFINITIONS

Calibration = Control measurement with a humidity standard.

Adjustment = Calibration and additional readjustment of the probe to the setpoint value.

TEMPERATURE

The sensor is adjusted before delivery. A temperature readjustment is usually not necessary. If there is any doubt about the correct adjustment, please contact the manufacturer.

HUMIDITY

The sensor is adjusted before delivery so that the results are in optimum accuracy over the full measuring range. We recommend testing the sensor **at least once a year** to maintain this accuracy.

CLEANING

Dirty filters can cause measurement errors and extend the adjustment time. Depending on the degree of contamination of the filters, they must be cleaned periodically or replaced if necessary.



To avoid damaging the measuring elements, unscrew the filter element for cleaning.

Clean the filter with soapy water, alcohol or a cleaning agent suitable for removing contamination and rinse thoroughly with water.

Do not screw the filter back onto the probe until it is completely dry.



Troubleshooting or maintenance and repair work may only be carried out by trained maintenance personnel who have completed appropriate training by the manufacturer.

14 Maintenance and care

REGULAR VISUAL INSPECTIONS

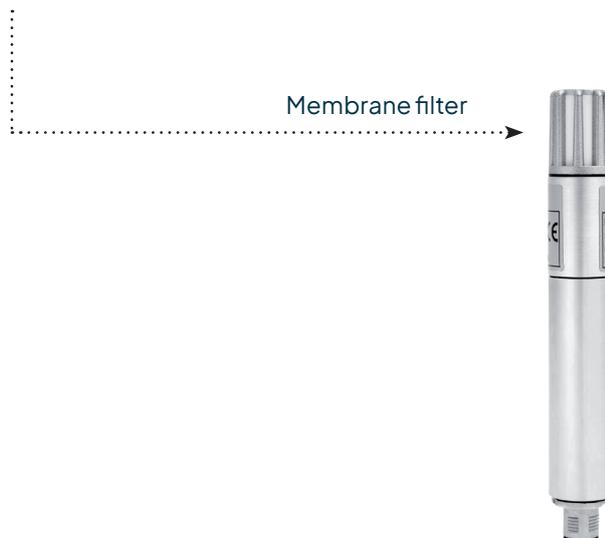
The producer recommends periodical visual checks of the sensor and shelter housing regarding outer damages, watertightness, and the fixing of the mounting screws, at intervals of **four weeks**.

REPLACEMENT OF SPARE PARTS

All spare parts or alternate devices can be replaced with regular tools such as wrenches, screw drivers etc.

ACCESSORIES AND SPARE PARTS LIST

ID	Description
00.08141.600000	Sensor shelter To avoid the effects of radiation and to protect the sensor from dirt, wind, and precipitation, and for mounting on the mast
32.14567.060010	Cable 15 m
37.08093.100001	Membrane filter as sensor protection



ORDER SPARE PARTS

For a quick and correct replacement or exchange delivery, please provide the following data to the manufacturer:

- Name and type number of the device
- Ident no., serial or article number
- Quantity needed

OPTIONAL (IF AVAILABLE)

- Respective description of the connected system components (e.g. data logger variant)
- Type of vessel and country of origin, if applicable
- Reference number of LAMBRECHT wiring diagram designated with the bold letters SKF.... or SWF.... and a 3- or 4-digits running number.

The above mentioned data can be found on the nameplates of the devices, in the order-related circuit diagrams or in the documentation of the complete system.

STORAGE AND DISPATCH

The sensor should be stored in a clean and dust-free area between $-40...+70$ °C (not condensing) in a cardboard box or similar container. Alternative packing material should be adequate to the standard of the original packing of LAMBRECHT meteo. It must ensure an optimal protection against mechanical or electrical influences as well as against other transport damages caused by liquids or by the weather.

15 Safety instructions

This system is designed according to the state-of-the-art accepted safety regulations. However, please note the following rules:

1. Before set into operation, please read all appropriate manuals!
2. Please take notice of internal and state-specific guidelines and/or rules for the prevention of accidents (e.g. the professional association). If necessary ask your responsible safety representative.
3. Use the system according to the manual's regulations only.
4. Always leave the manual at hand at the place of work of the system.
5. Use the system in technically correct conditions only! You have to eliminate influences immediately, which impair the security.
6. Prevent the ingress of liquids into the devices.
7. Make sure that the system is free of power before cleaning of the devices. Do not use noxious or flammable detergents.

16 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.

17 Technical data

THP[pro] Modbus	
ID	00.08095.100030
Temperature	
Measuring range	-40...+70 °C
Resolution	0.1 °C
Accuracy	± 0.1K (0...60 °C); ± 0.2K (-40...0 °C); ± 0.2K (60...70 °C) ¹⁾
Relative humidity	
Measuring range	0...100 % r. h.
Resolution	0.1% r. h.
Accuracy	typically at 25 °C: ± 1% (20...70 %) r. F.; ± 1.5% (0...20 %) r. F.; ± 1.5% (70...90 %) r. F.; ± 3% (90...100 %) r. F. ¹⁾ Response time rel. humidity (at v = 1.5 m/s): 30 s ²⁾
Barometric pressure	
Measuring range	500...1100 hPa
Resolution	0.1 hPa
Accuracy	typisch 0.38 hPa (700... 1100 hPa) (15...55 °C)
Further specifications	
Supply voltage	4.8...33 VDC
Power consumption ³⁾	4 mA at 24 VDC; 6 mA at 12 VDC; 11 mA at 4,8 VDC
Housing	Aluminum specially coated; IP 65 (housing); M12 plug connector (4-pole)
Weight	approx. 80 g
Dimensions	H 140 mm x Ø 20 mm
Interface	serial RS 485
Protocol	Modbus RTU
Accessories (please order separately)	
ID 00.08141.600000	Sensor shelter with natural ventilation
ID 00.08141.600004	Sensor shelter with artificial ventilation

¹⁾ ventilated sensor shelter recommended ²⁾ with filter membrane ³⁾ without terminating resistor