User Manual
HTS201

Humidity and Temperature
Room Sensor

Modbus

ASHRAE BACnet®

Content

1 General Information

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. E+E Elektronik Ges.m.b.H. does not accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

This document may contain technical inaccuracies and typographical errors. The content will be revised on a regular basis. These changes will be implemented in later versions. The described product(s) can be improved and changed at any time without prior notice.

The user manual may not be used for the purposes of competition without the written consent of E+E Elektronik Ges.m.b.H. and may not be forwarded to third parties. Copies may be made for internal purposes. All information, technical data and diagrams included in these instructions are based on the information available at the time of writing.

> ℹ️ **PLEASE NOTE**
>
> Find this document and further product information on our website at www.epluse.com/hts201.

1.1 Explanation of Warning Notices and Symbols

Safety precautions

Precautionary statements warn of hazards in handling the device and provide information on their prevention. The safety instruction labeling is classified by hazard severity and is divided into the following groups:

> ⚠️ **DANGER**
>
> **Danger** indicates hazards for persons. If the safety instruction marked in this way is not followed, the hazard will verly likely result in severe injury or death.

> ⚠️ **WARNING**
>
> **Warning** indicates hazards for persons. If the safety instruction marked in this way is not followed, there is a risk of injury or death.

> ⚠️ **CAUTION**
>
> **Caution** indicates hazards for persons. If the safety instruction marked in this way is not followed, minor or moderate injuries may occur.

> **NOTICE**
>
> **Notice** signals danger to objects or data. If the notice is not observed, damage to property or data may occur.

Informational notes

Informational notes provide important information which stands out due to its relevance.

> ℹ️ **INFO**
>
> The information symbol indicates tips on handling the device or provides additional information on it. The information is useful for reaching optimal performance of the device.
>
> The title field can deviate from "INFO" depending on the context. For instance, it may also read "PLEASE NOTE".

1.2 Safety Instructions

1.2.1. General Safety Instructions

NOTICE

Improper handling of the device may result in its damage.

- The HTS201 enclosure and the electronics board inside shall not be exposed to unnecessary mechanical stress.
- Do not apply the supply voltage to the RS485 data lines.
- The HTS201 electronics is sensitive to electrostatic discharge (ESD), appropriate protective measures shall be taken when touching it.
- Use the HTS201 only as intended and observe all technical specifications.

1.2.2. Intended Use

⚠ WARNING

Non-compliance with the product documentation may cause safety risk for people and the entire measurement installation.

The manufacturer cannot be held responsible for damages as a result of incorrect handling, installation, and maintenance of the device.

- Do not use HTS201 in explosive atmosphere or for measurement of aggressive gases.
- This device is not appropriate for safety, emergency stop or other critical applications where device malfunction or failure could cause injury to human beings.
- The device may not be manipulated with tools other than specifically described in this manual.

NOTICE

Failing to follow the instructions in this user manual may lead to measurement inaccuracy and device failures.

- The HTS201 may only be operated under the conditions described in this user manual and within the specification included in chapter 8 Technical Data.
- Unauthorized product modification leads to loss of all warranty claims. Modification may be accomplished only with an explicit permission of E+E Elektronik Ges.m.b.H.!

1.2.3. Mounting, Start-up and Operation

The HTS201 has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a way that does not impair its safe use. The user is responsible for observing all applicable local and international safety guidelines for safe installation and operation of the device. This user manual contains information and warnings that must be observed by the user in order to ensure safe operation.

ⓘ PLEASE NOTE

The manufacturer or his authorized agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the specified operating conditions. Consequential damages are excluded from the liability.

> ⚠️ **WARNING**
>
> Non-compliance with the product documentation may cause accidents, personal injury or property damage.
>
> - Mounting, installation, commissioning, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorized by the operator of the facility to carry out the mentioned activities.
> - The qualified staff must have read and understood this user manual and must follow the instructions contained within.
> - All process and electrical connections shall be thoroughly checked by authorized staff before putting the device into operation.
> - Do not install or start-up a device supposed to be faulty. Make sure that such devices are not accidentally used by marking them clearly as faulty.
> - A faulty device shall be removed from the process.
> - Service operations other than described in this user manual may only be performed by the manufacturer.

1.3 Environmental Aspects

> ℹ️ **PLEASE NOTE**
>
> Products from E+E Elektronik Ges.m.b.H. are developed and manufactured in compliance with all relevant environmental protection requirements. Please observe local regulations for the disposal of the device.

For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

1.4 ESD Protection

The sensing elements and the electronics board are ESD (electrostatic discharge) sensitive components of the device and must be handled as such. The failure to do so may damage the device by electrostatic discharges when touching exposed sensitive components.

2 Scope of Supply

- HTS201 Room Sensor for Humidity and Temperature according to ordering guide
- Mounting set
- Quick Guide for digital version

3   Product Description

3.1   General

The HTS201 is a RH and T room sensor for demand controlled ventilation and building automation. It is designed for indoor wall mounting in residential and commercial applications.

Depending on the target market, the sensor is available with an EU or US enclosure. For dimensions, please refer to chapter 3.2 Dimensions.

The electronics of HTS201 is located in the front cover, which can be easily snapped on/off once the back cover is fixed onto the wall and wired. The back cover contains just the push-in terminals. No tools are needed for mounting or changing the active part.

Front cover

Back cover
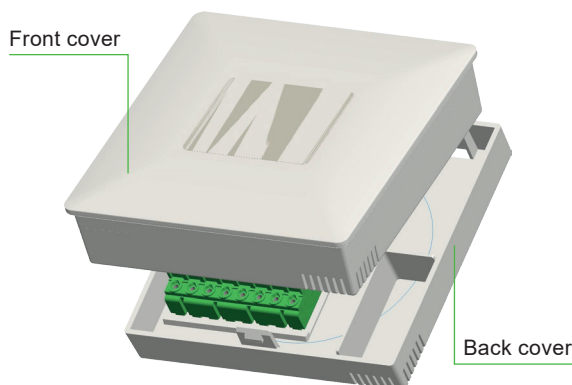
RH and T can also be read on the optional display. Please refer to chapter 3.4 Display.

The measured data is available on two types of output:

The **analogue versions** deliver the measurands according to the ordering code. Model, measurement units (metric or non-metric) and output scaling can not be changed by the customer.

The versions with **digital interface** supply all available quantities. For further information, please refer to chapter 5.2.5. Modbus Register Map and chapter 8 Technical Data. By means of a jumper, the RS485 termination resistor can be set on or off. For BACnet, please see the PICS (Product Implementation Conformance Statement), which is available at www.epluse.com/hts201.

For a setup deviating from default, the digital HTS201 can be configured manually with the free PCS10 Product Configuration Software and an optional configuration adapter. Refer to chapter 5 Setup and Configuration for details.

3.2   Dimensions

Values in mm (inch)

Enclosure
EU format

Enclosure
US format

85 (3.35)
40 (1.57)
23 (0.91)

85 (3.35)
30 (1.18)

Optional display

85 (3.35)
40 (1.57)
23 (0.91)

115 (4.53)
30 (1.18)

Optional display
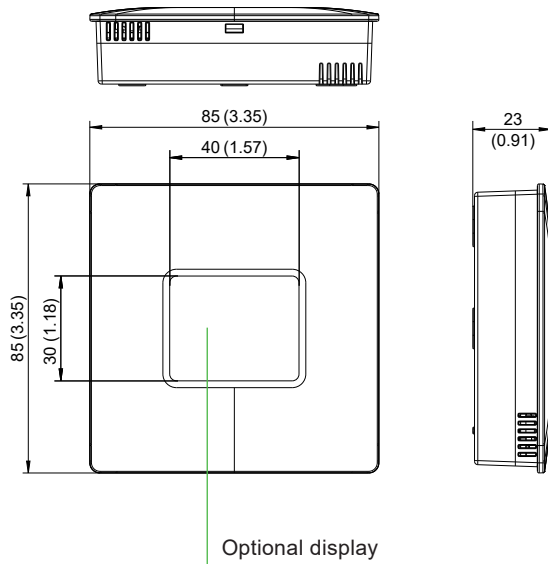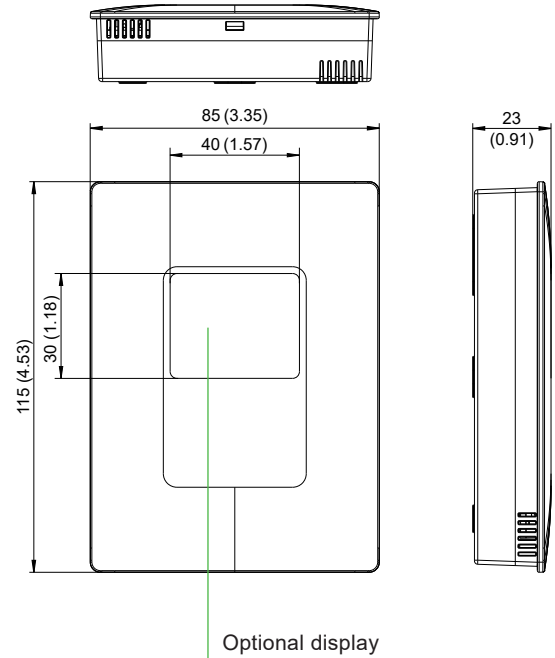
3.3   Electrical Connection

For connecting the power supply and the outputs, the HTS201 features push-in spring terminals for max. 1.5 mm^2 (AWG 16). The cables are fed into the enclosure via the rear side.

⚠ **WARNING**

Incorrect installation, wiring or power supply may cause overheating and therefore personal injuries or damage to property.

For correct cabling of the device, always observe the presented wiring diagram for the product version used.

The manufacturer cannot be held responsible for personal injuries or damage to property as a result of incorrect handling, installation, wiring, power supply and maintenance of the device.

HTS201 voltage output

Connection scheme

4 3 2 1

T RH   V+
               GND

15 - 35 V DC
24 V AC ±20 %

V   V
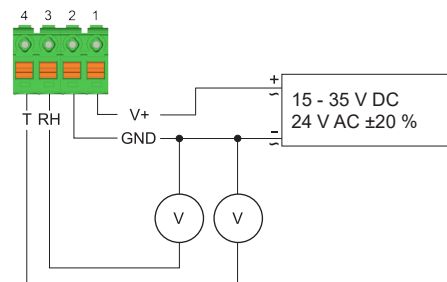
HTS201 current output

Connection scheme
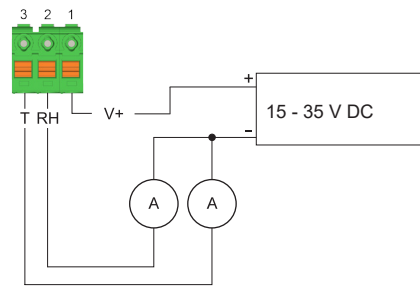
HTS201 digital interface

Connection scheme

Connection on the electronics board

Connection assignment appropriate for daisy-chain wiring
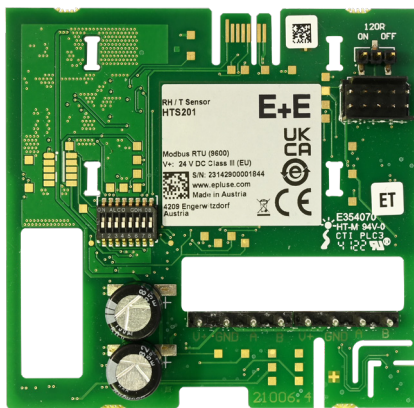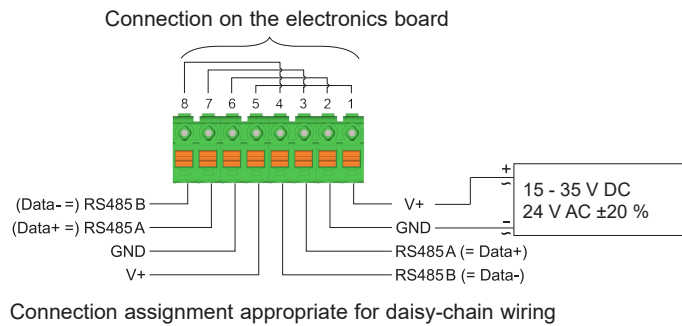
3.4   Display

The optional display shows the measured values (according to ordering code) and the measurement unit. The temperature unit is selected via order code. Tab. 1 shows the way measurands are displayed.

Line	Measurand
1	Humidity
2	Temperature

Tab. 1   Order of displayed measurands

4 Mounting and Installation

As the room sensor is generally mounted onto a conduit box, for accurate measurement results it is important to tighten the conduit box for avoiding false air ingress (along the electrical tubes inside the wall) into the room sensor enclosure.

> **ⓘ PLEASE NOTE**
>
> In order to protect the front cover and the electronics from typical construction site pollution (such as painting of the walls) the front cover should be snapped on only after the construction works are completed.

Please mind the following rules of thumb for sensor positioning:

- Mount the Sensor 2 m (6.6 ft) away from outlets and intakes
- Mount the Sensor at a height of 1.5 m (5 ft) (half of room height)
- Avoid direct sunlight from window
- Avoid restricted airflow
- Avoid close proximity to heat sources
- Avoid heat accumulation
- Avoid draught
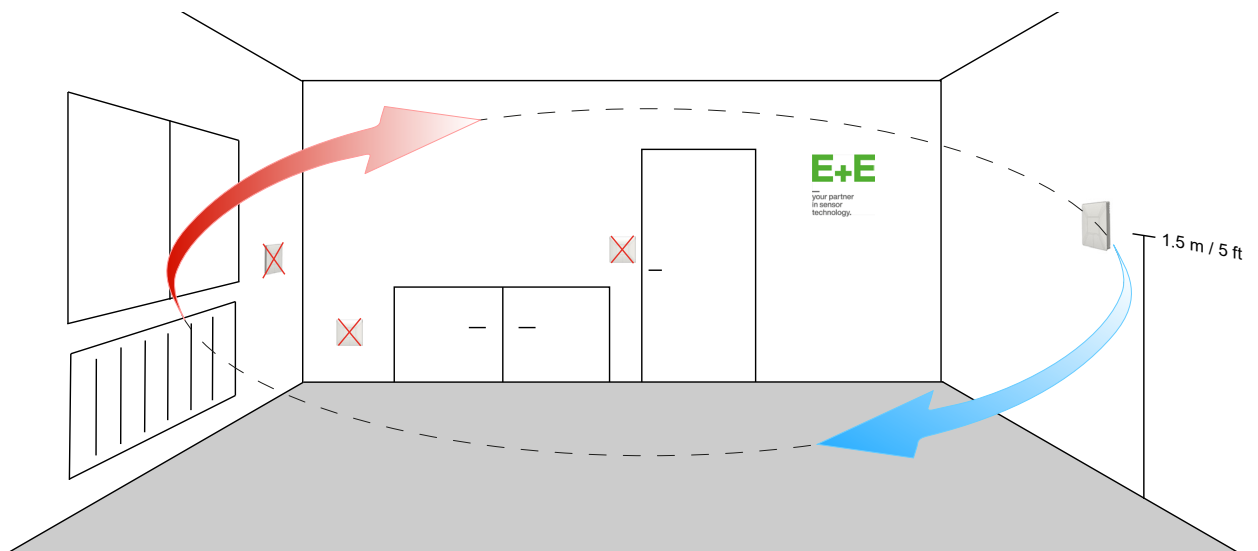
The electronics is located in the front cover, which can be easily snapped on/off once the back cover is fixed onto the wall and wired.
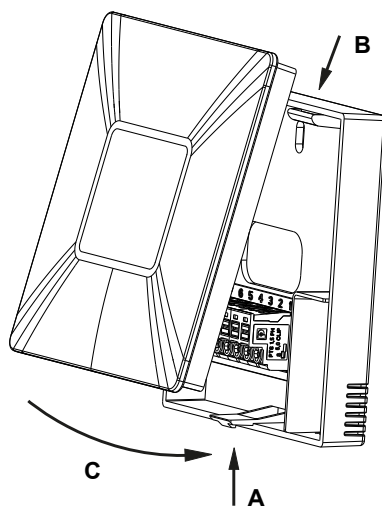
Opening the enclosure
Press to release the latch **A** till the enclosure can be opened.

Closing the enclosure
Set the front cover into flutes **B**, rotate it like C and press it onto the back cover till the latch A snaps in.

Mounting Dimensions, values in mm (inch)

EU format
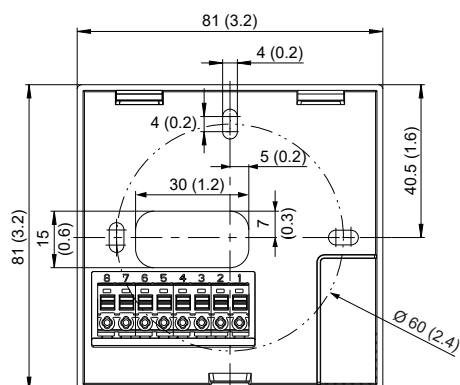
US format
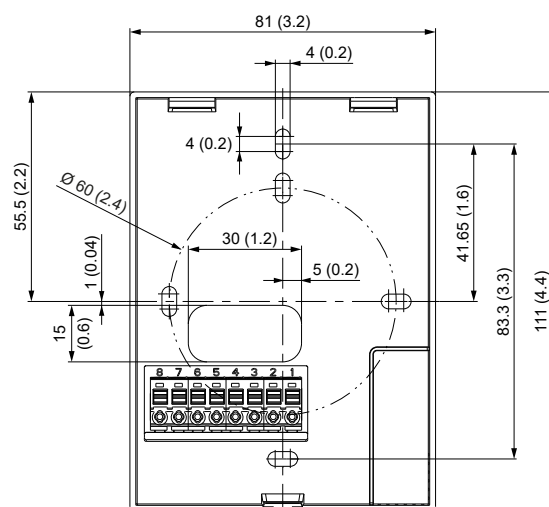
5 Setup and Configuration

The HTS201 is ready to use and does not require any configuration by the user. The factory setup of HTS201 corresponds to the type number ordered. Please refer to the datasheet at www.epluse.com/hts201. While the room sensors with analogue output do not provide a configuration interface, the digital versions offer some options for customization. If needed, the user can change the factory setup with the help of the free PCS10 Product Configuration Software and the optional USB configuration adapter (HA011066).

The following settings can be made with the help of the PCS10:

- Change interface communication parameters
- Setup and edit the custom Modbus map
- Set individual device name

The PCS10 makes visible the

- Basic device data, e.g. serial number, firmware version
- Device status register in the form of a device error list
- Measurand(s) as a live graph

Furthermore, the device configuration can be exported and imported. It is possible to reset the device to factory settings and to update the firmware.

5.1 PCS10 Product Configuration Software

To use the software for changes in settings, please proceed as follows:

1. Download the PCS10 Product Configuration Software from www.epluse.com/pcs10 and install it on the PC.
2. Connect the HTS201 to the PC using the USB configuration adapter.
3. Start the PCS10 software.
4. Follow the instructions on the PCS10 opening page for scanning the ports and identifying the connected device
5. Click on the desired setup or adjustment mode from the main PCS10 menu on the left. Follow the online instructions of the PCS10 which are displayed when clicking the "Tutorial" button.
6. Changes are uploaded to the probe by pressing the "Sync" button.

NOTICE

The HTS201 may not be connected to any additional power supply when using the USB configuration adapter HA011066.
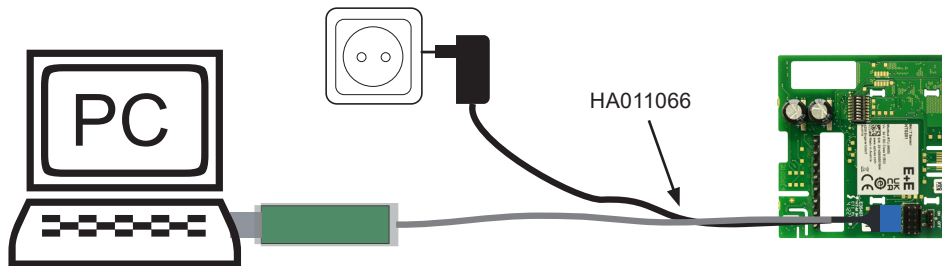
Fig. 1   HTS201 connected to a PC running PCS10

5.2   RS485 Digital Interface

5.2.1.   Hardware Bus Termination

E+E room sensors with digital interface feature an internal 120 Ω resistor for bus termination HTS201 which can be activated using the jumper on the electronics board (see also chapter 3.3 Electrical Connection for details).

Jumper not mounted,
(right position = factory setup)
Bus is not terminated

Jumper mounted,
(left position)
Bus is terminated

Fig. 2   Jumper position for RS485 bus termination resistor

5.2.2.   Device Address

Address setting via PCS10 Product Configuration Software
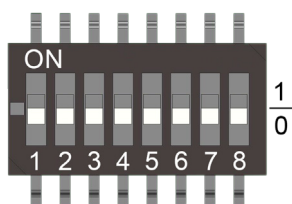
All DIP switches at position 0 → address has to be set via PCS10

Modbus (slave device): factory setting 45 (permitted values: 1…247).

BACnet (master device): factory setting 45 (permitted values: 0…127).

Example: Address is set via configuration software = factory setting.

Address setting via DIP switch
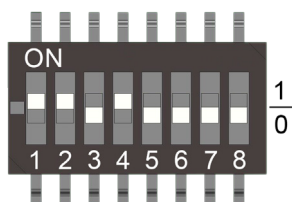
Modbus (slave device): Setting the DIP switches to any other address than 0, overrules the Modbus address set via PCS10
(permitted values: 1…247).

BACnet (master device): Setting the DIP switches to any other address than 0, overrules the BACnet address set via configuration software. BACnet note: permitted values are 0…127. The 8th bit of the DIP switches is ignored (ID 127 = 0111 111). To set address 0 via DIP switches, the 8th bit shall be set to 1 (ID 0 = 1000 0000).

Example: Address set to 11 (= 0000 1011 binary).

5.2.3. BACnet Protocol Settings

	Factory settings	User selectable values (via EE-PCS)
Baud rate	As ordered via order code	9 600, 19 200, 38 400, 57 600, 76 800, 115 200
Data bits	8	8
Parity	None	None
Stop bits	1	1
BACnet address	45	0…127

Tab. 2   BACnet protocol settings

> **ℹ PLEASE NOTE**
>
> The recommended settings for multiple devices in a BACnet MS/TP network are 38 400, 8, none, 1.

The HTS201 PICS (Product Implementation Conformance Statement) is available on the E+E website at www.epluse.com/hts201.

BACnet address and baud rate can be set via:
- PCS10 Product Configuration Software and the USB configuration adapter HA011066.
  The PCS10 can be downloaded free of charge from www.epluse.com/pcs10.
- BACnet protocol, see the PICS.

5.2.4. Modbus RTU Protocol Settings

	Factory settings	User selectable values (PCS10)
Baud rate	As ordered via order code[1]	9 600, 19 200, 38 400, 57 600, 76 800, 115 200
Data bits	8	8
Parity	Even	None, odd, even
Stop bits	1	1, 2
Modbus address	45	1...247

1) Please refer to datasheet; not all user selectable values are available ex works.

Tab. 3   Modbus RTU protocol settings

> **ℹ PLEASE NOTE**
>
> The recommended settings for multiple devices in a Modbus RTU network are 9600, 8, even, 1.

Device address, baud rate, parity and stop bits can be set via:

- EE-PCS Product Configuration Software and the USB configuration adapter HA011066.
  The PCS10 can be downloaded free of charge from www.epluse.com/pcs10.
- Modbus protocol in the register 1 (0x00) and 2 (0x01).
  See Application Note Modbus AN0103 (available at www.epluse.com/hts201).

The serial number as ASCII-code is located in read-only registers 1 - 8 (0x00 - 0x07, 16 bits per register).

The firmware version is located in register 9 (0x08) (bit 15...8 = major release; bit 7...0 = minor release). The sensor name is located in registers 10 - 17 (16 bits per register).

> **NOTICE**
>
> When reading the serial number or the sensor name, it is always necessary to read all 8 registers, even if the desired information requires less.

> **NOTICE**
>
> For obtaining the correct floating point values, both registers have to be read within the same reading cycle. The measured value can change between two Modbus requests, exponent and mantissa may get inconsistent then.

Communication settings (INT16)

Parameter	Register number[1] [Dec]	Register address[2] [Hex]
Write register: function code 0x06		
Modbus address	1	0x00
Modbus protocol settings[3]	2	0x01

Device information (INT16)

Parameter	Register number[1] [Dec]	Register address[2] [Hex]
Read register: function code 0x03 / 0x04		
Serial number (as ASCII)	1	0x00
Firmware version	9	0x08
Sensor name (as ASCII)	10	0x09
Device status (bit decoded)[4]	602	0x259

1) Register number starts from 1.
2) Protocol address starts from 0.
3) For Modbus protocol settings see Application Note Modbus AN0103 (available at www.epluse.com/hts201).
4) See chapter 5.5 Device Status Indication.

Tab. 4   HTS201 registers for device setup

5.2.5. Modbus Register Map

The measured data is saved as a 32 bit floating point values (data type FLOAT32) and as 16 bit signed integer values (data type INT16).

FLOAT32

Parameter	Unit[1]	Register number[2] [DEC]	Register address[3] [HEX]
Read register: function code 0x03 / 0x04			
Temperature T	°C	1003	0x3EA
	°F	1005	0x3EC
	K	1009	0x3F0
Relative humidity RH, Uw	%	1021	0x3FC
Dew point temperature Td	°C	1105	0x450
	°F	1107	0x452
	°K	1147	0x47A

INT16

Parameter	Unit[1]	Scale[4]	Register number[2] [DEC]	Register address[3] [HEX]
Read register: function code 0x03 / 0x04				
Temperature T	°C	100	4002	0xFA1
	°F	50	4003	0xFA2
	°K	50	4005	0xFA4
Relative humidity RH, Uw	%RH	100	4011	0xFAA
Dew point temperature Td	°C	100	4053	0xFD4
	°F	100	4054	0xFD5
	°K	100	4074	0xFE9

1) The choice of measurement units (metric or non-metric) must be done according to the ordering guide, see HTS201 datasheet. Switching from metric to non-metric or vice versa by using the PCS10 is not possible.
2) Register number starts from 1
3) Register address starts from 0
4) Examples: For scale 100, the reading of 2550 means a value of 25.5. For scale 50, the reading of 2550 means a value of 51.

Tab. 5   HTS201 FLOAT32 and INT16 measured data registers

5.2.6. Freely Configurable Custom Modbus Map

It is possible to map measured value/status registers arbitrarily in a block with up to 20 registers provided for this purpose. This means that registers of interest may be mapped in an area with consecutive registers, so that important values can be queried with a single command in one block.

The custom map can be configured via:

- PCS10 Product Configuration Software and the Modbus configuration adapter HA011018.
  The PCS10 can be downloaded free of charge from www.ecpluse.com/pcs10.
- Modbus protocol commands, refer to the example in chapter 5.2.8. ModBus RTU Examples.

The register block for the configuration of the customisable Modbus map consists of the registers 6001 (0x1770) to 6010 (0x1779). For the blockwise query of the measured values behind Modbus registers 3001 (0xBB8) to 3020 (0xBCB), the firmware accesses this configuration area and thus gets the information which measured value/status registers are to be output. A maximum of 10 user-defined registers can be mapped. The table below shows an example:

Registers ...		... with these assigned measurands ...			... map to registers ...		... mirrored from source registers	
Dec	Hex	Meas.	Unit	Type	Dec	Hex	Dec	Hex
Function code 0x10					*Function code 0x03 / 0x04*			
6001	0x1770	T	°C	FLOAT32	3001	0xBB8	1003	0x3EA
			°C	FLOAT32	3002	0xBB9		
6002	0x1771	T	°F	FLOAT32	3003	0xBBA	1005	0x3EC
			°F	FLOAT32	3004	0xBBB		
6003	0x1772	T	K	FLOAT32	3005	0xBBC	1009	0x3F0
			K	FLOAT32	3006	0xBBD		
6004	0x1773	RH	%	FLOAT32	3007	0xBBE	1021	0x3FC
			%	FLOAT32	3008	0xBBF		
6005	0x1774	T	°C	INT16	3009	0xBC0	4002	0xFA1
6006	0x1775	RH	%	INT16	3010	0xBC1	4011	0xFAA
					3011	0xBC2		
					3012	0xBC3		
					3013	0xBC4		
					3014	0xBC5		
					3015	0xBC6		
					3016	0xBC7		
					3017	0xBC8		
					3018	0xBC9		
					3019	0xBCA		
					3020	0xBCB		

Tab. 6   Custom Modbus map example

5.2.7. Device Status Indication and Error Monitoring

ModBus

The HTS201 features a status register which contains all status and error information. It is possible to read it from Modbus register 602 (0x259).

If a critical error occurs, all Modbus values are set to NaN (according to IEEE754 for data type FLOAT32) or to 0x8000 (INT16). Errors are displayed in bit-coded form. If an event is present, the corresponding bit is set to 1.

Measured values outside the measuring range are limited with the corresponding limit value.

Error bits	Description	Recommended action
Bit 0	Temperature below lower limit	1. Check the actual temperature with the temperature output scaling of the ordered sensor 2. Service recommended, check the repair possibilities with the E+E service
Bit 1	Temperature above upper limit	1. Check the actual temperature with the temperature output scaling of the ordered sensor 2. Service recommended, check the repair possibilities with the E+E service
Bit 2	Temperature value = infinite	1. Check the wiring 2. Service recommended, check the repair possibilities with the E+E service
Bit 3	Humidity below lower limit	1. Check the actual relative humidity with the humidity output scaling of the ordered sensor 2. Service recommended, check the repair possibilities with the E+E service
Bit 4	Humidity above upper limit	1. Check the actual relative humidity with the humidity output scaling of the ordered sensor 2. Service recommended, check the repair possibilities with the E+E service
Bit 5	Humidity value = infinite	1. Check the wiring 2. Service recommended, check the repair possibilities with the E+E service
Bit 6		
Bit 7		
Bit 8		
Bit 9	RH / T element not accessible	Service recommended, check the repair possibilities with the E+E service
Bit10		
Bit 11	Display communication broken	Service recommended, check the repair possibilities with the E+E service

Tab. 7   Device status indication register

PCS10

In the Information section, the PCS10 Product Configuration Software displays possible errors and states. Please refer to chapter 6.2.2. Error Messages in PCS10.

BACnet

In the event of a serious error, the "Present Value" of each Analogue Input Object is set to NaN and "Reliability" is set to NO_SENSOR. The „Event State" Property is set to FAULT.
Please refer to the HTS201 PICS (Product Implementation Conformance Statement) at www.epluse.com/hts201.

5.2.8. ModBus RTU Examples

The HTS201 Modbus address is 46 [0x2E].

Please refer to

- MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3, chapter 6:
  www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf
- E+E Application Note Modbus AN0103 (available at www.epluse.com/hts201)

Read the temperature (FLOAT32) T = 23.4400005340576171875 °C from register address 0x3EA:

Master (e.g. PLC)   **HTS201**

Request [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
2D	03	03	EA	00	02	12	53

Response [Hex]:

Modbus address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
2D	03	04	85	1F	41	BB	7F	18
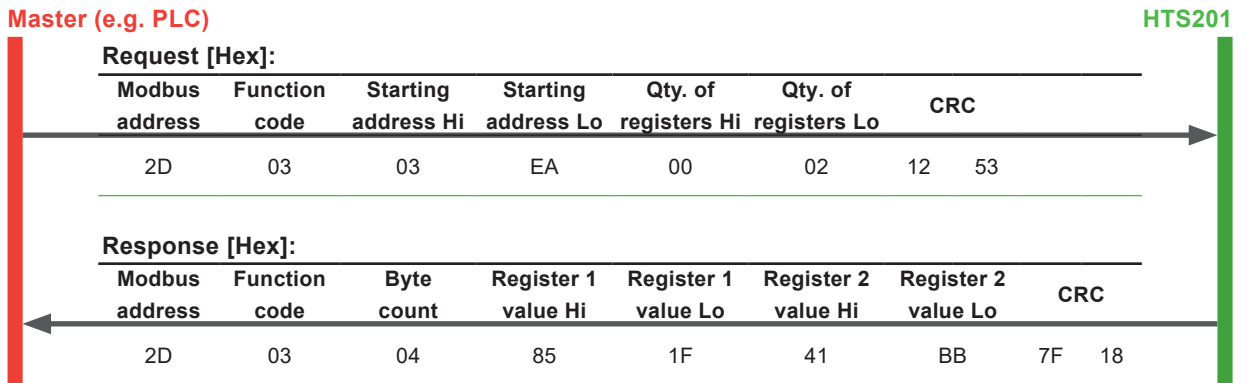
Fig. 3   Example temperature query

Decoding of floating point values:

Floating point values are stored according to IEEE754. The byte pairs 1, 2 and 3, 4 are transformed as follows (numbers taken from T reading Modbus request/response example above):

Modbus response [Hex]

Byte 3	Byte 4	Byte 1	Byte 2
85	1F	41	BB
MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

Tab. 8   Modbus response

IEEE754

Byte 1	Byte 2	Byte 3	Byte 4
41	BB	85	1F
0100 0001	1011 1011	1000 0101	0001 1111
SEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM
Decimal value: 23.4400005340576171875			

Tab. 9   Data representation according to IEEE754

Read register from unconfigured custom modbus map address 0xBB8-0xBB9:

Master (e.g. PLC)   **HTS201**

Request [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
2D	03	0B	BB	00	02	41	A6

Response [Hex]:

Modbus address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
2D	03	04	FF	FF	FF	FF	16	65

Fig. 4   Query of an unconfigured custom Modbus map

Mapping a simple custom Modbus map

assign RH [%] (address 0x3FC) and T [°C] (address 0x3EA) to the map, starting address 0xBB8:

Master (e.g. PLC)   **HTS201**

Request [Hex]:

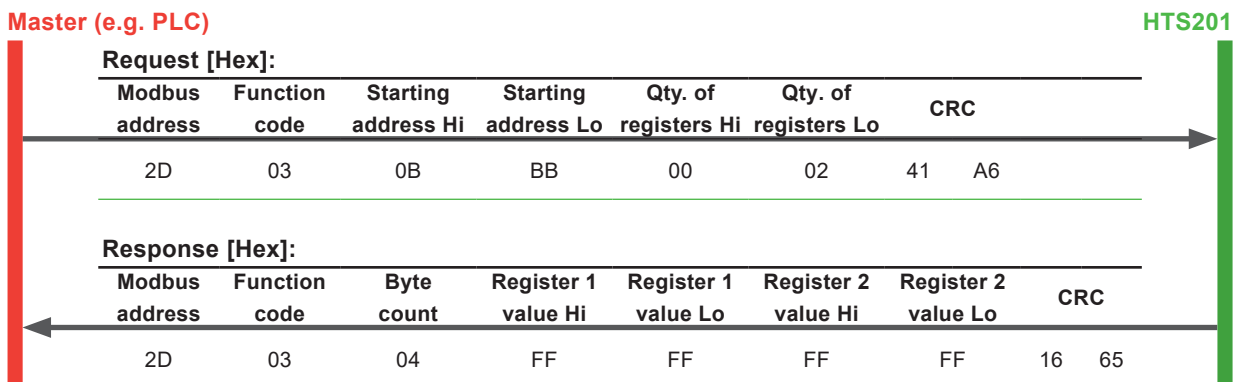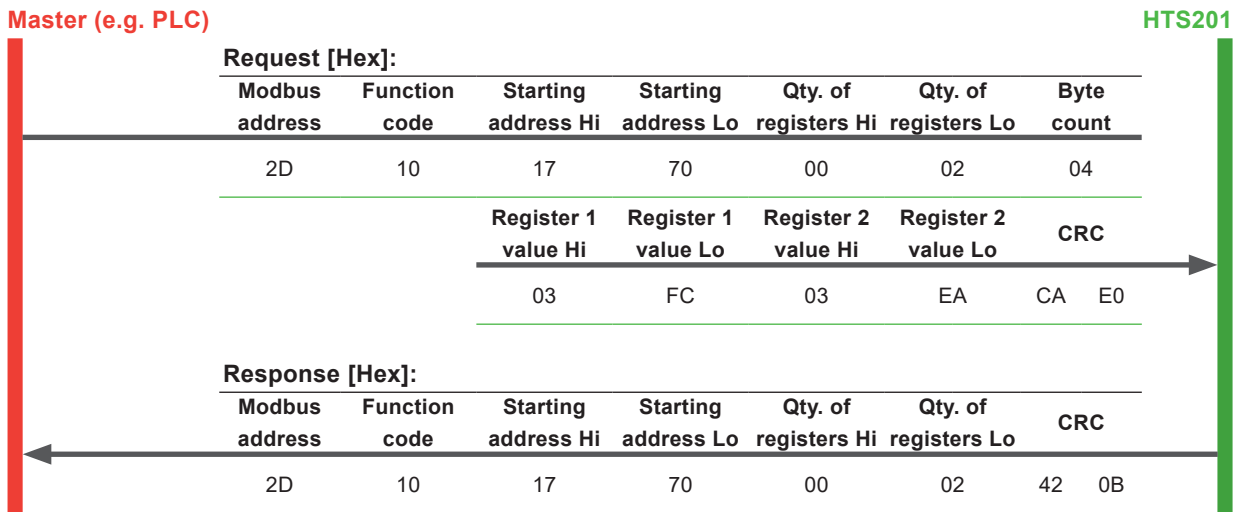| Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	Byte count
2D	10	17	70	00	02	04

		Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
		03	FC	03	EA	CA	E0

Response [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
2D	10	17	70	00	02	42	0B

Fig. 5   Mapping a simple custom Modbus map

Query register address 0xBB8 (RH [%] mapped)

Master (e.g. PLC)   **HTS201**

Request [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
2D	03	0B	B8	00	02	41	A6

Response [Hex]:

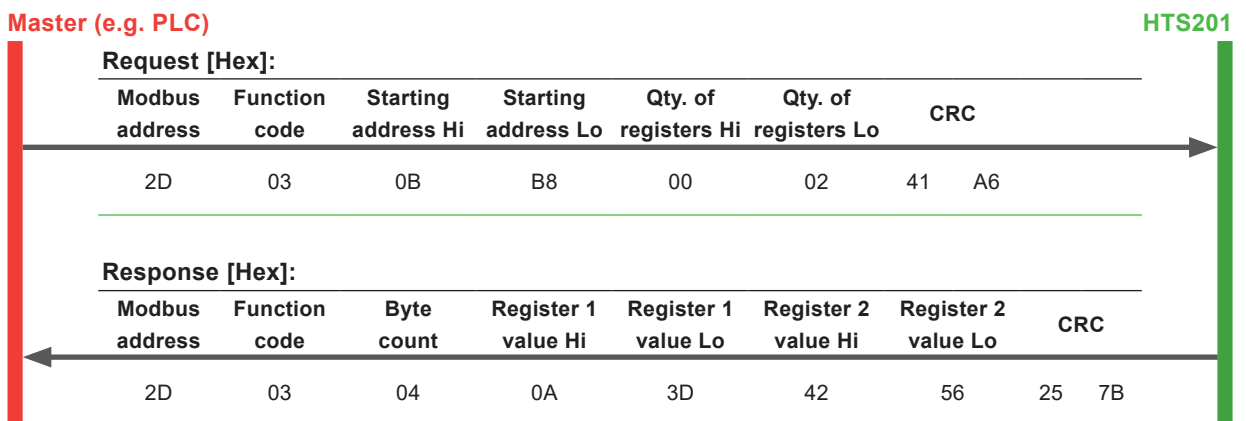| Modbus address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
2D	03	04	0A	3D	42	56	25	7B

Fig. 6   Read RH value

Query consecutive registers, addresses 0xBB8-0xBBD (RH [%] and T [°C] mapped, one register empty)

Master (e.g. PLC)   **HTS201**

Request [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
2D	03	0B	B8	00	06	40	65

Response [Hex]:

Modbus address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	Register 3 value Hi
2D	03	0C	14	7B	42	5D	33

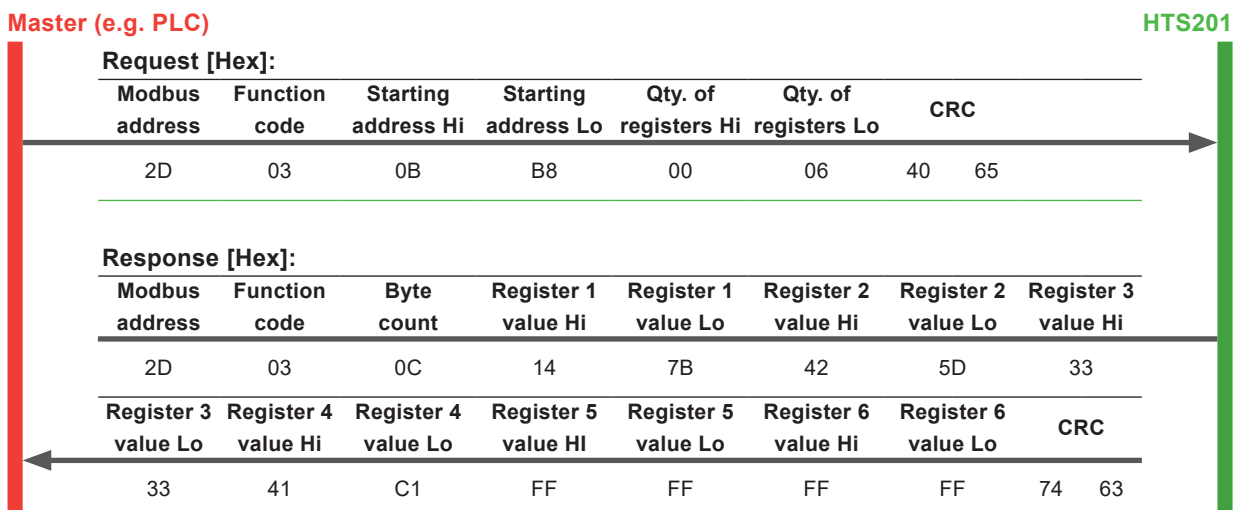| Register 3 value Lo	Register 4 value Hi	Register 4 value Lo	Register 5 value HI	Register 5 value Lo	Register 6 value Hi	Register 6 value Lo	CRC	
33	41	C1	FF	FF	FF	FF	74	63

Fig. 7   Read several values with a single query

6 Maintenance and Service

6.2.1. Basic Cleaning

If the response times are longer than specified, this may be due to contamination. In this case clean the ventilation slots by blowing from inside out.

6.2.2. Error Messages in PCS10

The PCS10 information section includes error messages from HTS201, if there are any errors present. The following table shows the error codes and their meaning. Please note that this table directly corresponds to Tab. 7 Device status indication register in chapter 5.2.7.

Error code	Description	Recommended action
7.x	Temperature measurement incorrect	1. Check the actual temperature with the temperature output scaling of the ordered sensor, check the wiring 2. Service recommended, check the repair possibilities with the E+E service
9.x	Humidity measurement incorrect	1. Check the actual temperature with the temperature output scaling of the ordered sensor, check the wiring 2. Service recommended, check the repair possibilities with the E+E service
19.x	Sensing element not accessible	Service recommended, check the repair possibilities with the E+E service
21.x	Display communication faulty	Service recommended, check the repair possibilities with the E+E service

Tab. 10   Possible error messages for HTS201

6.2.3. Repairs

> **ℹ PLEASE NOTE**
>
> Repairs may be carried out by the manufacturer only. The attempt of unauthorized repair excludes any warranty claims.

7 Accessories

Description	Code
E+E Product Configuration Software (Free download from www.epluse.com/pcs10)	**PCS10**
USB Configuration Adapter for HTS201 digital	**HA011066**

8   Technical Data

Measurands

Relative Humidity (RH)

Measuring range	0...100 %RH, non-condensing
Accuracy[1] incl. hysteresis, non-linearity and repeatability **0...100 %RH**	$\pm(2 + 0.003 * mv)$ %RH mv = measured value
Temperature dependency of electronics, typ.	0.008 % RH / °C (0.004 %RH / °F)
Factory calibration uncertainty[2] @ 23 °C (73 °F) **0...90 %RH** **>90...100 %RH**	$\pm(0.7 + 0.003 * mv)$ %RH mv = measured value ±1 %RH

1) Defined against E+E calibration reference at 23 °C (73 °F). With supply voltage 24 V DC, 0.2 m/s (39. 4 ft/min) medium flow and load resistor 250 Ω for version with current output.
2) Defined at with an enhancement factor k=2, corresponding to a confidence level of 95 %.

Temperature (T)

Measuring range	-30...+60 °C (-22...+140 °F)

Accuracy[1]
      0- 10 V, RS485
    4 - 20 mA (2-wire)
	±0,25 °C (±0.14 °F)
	±0,38 °C (±0.21 °F)

Temperature dependency of electronics, typ.	0.006 K/K
Factory calibration uncertainty[2] @ 23 °C (73 °F)	±0.1 °C

1) Defined @ 23 °C (73 °F) against E+E calibration reference. With supply voltage 24 V DC, 0.2 m/s (39. 4 ft/min) medium flow and load resistor 250 Ω for version with current output.
2) Defined with an enhancement factor k=2, corresponding to a confidence level of 95 %.

Calculated Physical Quantity

		from	up to	unit
Dew point temperature	Td	-30　(-22)	60　(140)	°C　(°F)

Outputs

Analogue

T: acc. to ordering guide **RH: 0...100 %**	0 - 10 V 4 - 20 mA (2-wire)	$-1\,mA < I_L < 1\,mA$ $R_L < (V+ - 10) / 0.02 < 500\,\Omega$	I_L = load current R_L = load resistance

Digital

Digital interface	RS485 (HTS201 = 1 unit load)
Protocol **Factory settings** **Supported Baud rates**[1] **Measured data type**	Modbus RTU Baud rate according to ordering guide, 8 data bits, parity even, 1 stop bit, Modbus address 45 9 600, 19 200 and 38 400 FLOAT32 and INT16
Protocol **Factory settings** **Supported Baud rates**[1]	BACnet MS/TP BACnet address 45 9 600, 19 200, 38 400, 57 600, 76 800 and 115 200

1) Ex works: see ordering guide.

General

Power supply class III ◁▥▷ USA & Canada: Class 2 supply necessary, max. voltage 30 V DC		
0 - 10 V, RS485	15 - 35 V DC or 24 V AC ±20 %	
4 - 20 mA (2-wire)	$10 + 0.02 \times R_L < V+ < 35$ V DC ($R_L < 500\ \Omega$)	R_L = load resistance

Current consumption, typ.		**@ 24 V DC**	**@ 24 V AC**
	0 - 10 V	6 mA	14 mA$_{rms}$
	4 - 20 mA	Acc. to output current	
	RS485	5 mA	12 mA$_{rms}$

Electrical connection	Push-in spring terminals max. 1.5 mm^2 (AWG 16)
Display	1.8" LCD, dot-matrix, 2 lines, visible area 38 x 31 mm (1.5" x 1.2")
Humidity range Operation Storage	0…100 %RH non-condensing 0…95 %RH non-condensing
Temperature range, operation and storage without display with display	-30...+60 °C (-22...+140 °F) -20...+60 °C (-4...+140 °F)
Enclosure Material Protection rating	PC (Polycarbonate), RAL 9003 (signal white), UL94 HB approved IP30
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial environment FCC Part15 Class B ICES-003 Class B
Shock and vibration	Tested according to EN 60068-2-64 and EN 60068-2-27
Conformity	CE UKCA
Configuration[1]	PCS10 Product Configuration Software (free download) and optional configuration adapter

1) With digital versions only.

Accuracy of E+E Humidity and Temperature Sensors

The measurement accuracy depends both on the performance of the measuring instrument and on the correct installation in the application.

For best accuracy, every E+E RH and T sensing element is factory adjusted and calibrated in a highly stable RH / T reactor. Using a high-precision reference, the overall uncertainty of the factory calibration U_{cal} is minimal.

The total measurement uncertainty U_{total} for E+E sensors is calculated in accordance with EA-4/02 (European Accreditation, Evaluation of the Measurement Uncertainty in Calibration) and with GUM (Guide to the Expression of Uncertainty in Measurement) as follows:

$$U_{total} = k \cdot \sqrt{\left(\frac{U_{cal}}{2}\right)^2 + \left(\frac{u_{accuracy}}{\sqrt{3}}\right)^2}$$

U_{total} ....total accuracy incl. factory calibration
U_{cal} ....the uncertainty of the factory calibration
$u_{accuracy}$.................the accuracy of the measurement device
k...........................enhancement factor k=2, corresponding to a confidence level of 95 %.

For external calibrations, U_{total} is to be used as the evaluation criterion. The calculation does not include effects due to long-term drift or chemical exposure.

As designated laboratory (NMI) responsible for maintaining the National Standard for humidity and temperature in Austria, E+E Elektronik represents the highest instance in humidity and temperature calibration.

9 Conformity

9.1 Declarations of Conformity

E+E Elektronik Ges.m.b.H. hereby declares that the product complies with the respective regulations listed below:

European directives and standards.

and

UK statutory instruments and designated standards.

Please refer to the product page at www.epluse.com/hts201 for the Declarations of Conformity.
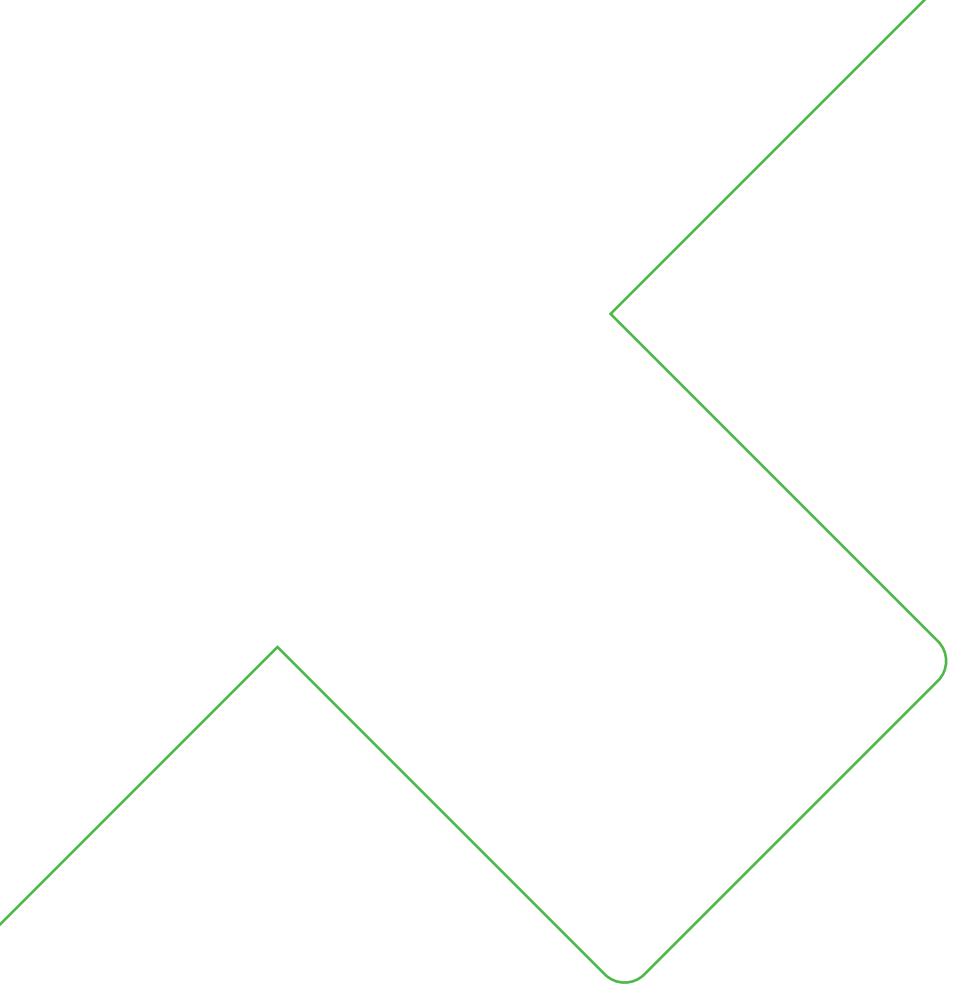
9.2 FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

9.3 ICES-003 Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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