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User Manual EE211

Humidity and Temperature Sensor for Continuous High Humidity

Modbus

www.epluse.com

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1 General Information

This user manual is intended to ensure 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. accepts no liability for any warranty or liability claims arising from this publication or improper handling of the product(s) described.

All information, technical data and diagrams included in this document are based on the information available at the time of writing. The document may contain technical inaccuracies and typographical errors. The contents will be revised on a regular basis and changes will be implemented in subsequent versions. The product(s) described and the contents of this document may be changed or improved at any time without prior notice.

PLEASE NOTE

Find this document and further product information on our website at www.epluse.com/ee211.

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.

Informative notes

Informative notes provide important information that is characterised by its relevance.

INFO

The information symbol indicates tips on handling the device or provides additional information on it. This information is useful to achieve optimum performance of the device.

The title field may 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 EE211 enclosure, the sensing probe and the sensing module shall not be exposed to unnecessary mechanical stress.
- Do not apply the supply voltage to the RS485 data lines.
- The EE211 electronics are sensitive to electrostatic discharge (ESD). Take appropriate protective measures when touching it.
- Use the EE211 only as intended and observe all technical specifications.

1.2.2 Intended Use

The EE211 is intended for the measurement of relative humidity (RH) and temperature (T) in environment with continuous high humidity.

⚠ WARNING

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

The manufacturer is not liable for any damage caused by improper handling, installation and maintenance of the device.

- Do not use EE211 in explosive atmosphere or for measurement in 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

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

- The EE211 may only be operated under the conditions described in this user manual and within the specification included in chapter 9 Technical Data.
- Any unauthorised product modifications will invalidate all warranty claims. Modifications may only be carried out with express authorisation of E+E Elektronik Ges.m.b.H.!
- The sensor must be operated with the filter cap on at all times. Do not touch the sensing element inside the sensing head.
- While replacing the filter cap, take very good care not to touch or rub the sensing elements.

1.2.3 Mounting, Start-up and Operation

The EE211 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 device shall be set up and installed in a way that does not impair its safe use. All applicable local and international safety guidelines for safe installation and operation of the device have to be observed. This user manual contains information and warnings that must be observed in order to ensure safe operation.

PLEASE NOTE

The manufacturer or his authorised 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 damage caused by non-compliance with the applicable regulations, operating instructions or the specified operating conditions. Any consequential damage is excluded from liability.

⚠ WARNING

Non-compliance with the product documentation may result in accidents, personal injury or property damage.

- Mounting, installation, commissioning, start-up, operation and maintenance of the device may only be carried out by qualified staff. Such staff must be authorised 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. The manufacturer accepts no responsibility for non-compliance with instructions, recommendations and warnings.
- All process and electrical connections must be thoroughly checked by authorised staff before commissioning the device.
- Do not install or start-up a device suspected to be faulty. Mark it clearly as faulty and remove it from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer. A faulty device may only be investigated and possibly repaired by qualified, trained and authorised staff. If the fault cannot be fixed, the device shall be removed from the process.

1.3 Environmental Aspects

PLEASE NOTE

Products from E+E Elektronik Ges.m.b.H. are developed and manufactured in compliance with 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. Failure to do so may damage the device by electrostatic discharge when touching exposed sensitive components.

2 Scope of Supply

- EE211 Humidity and Temperature Sensor
- Cable gland M20x1.5
- Mounting material
- Inspection certificate according to DIN EN 10204-3.1
- Quick Guide

3 Product Description

3.1 General

The EE211 is dedicated for accurate and long-term stable measurement under continuous high humidity (>85 %RH) and condensing conditions in demanding climate control.

It features a heated relative humidity (RH), and an interchangeable temperature (T) probe.

Excellent performance of the EE211 even in condensing polluted, aggressive environment is ensured by the combination of IP65 / NEMA 4X enclosure, encapsulated electronics inside the RH probe and a long-term stable E+E sensing element with proprietary coating.

All measured and calculated data is available on the RS485 interface via Modbus RTU whereas two of the values are available on the analogue voltage or current (3-wire) output. Up to three values can be shown simultaneously on the illuminated display.

An optional USB configuration stick and the free PCS10 Product Configuration Software facilitate the configuration of the EE211 as well as the RH and T adjustment. The T probe can also be adjusted separately and the reference can be a high accuracy dry block calibrator.

3.2 Operation Principle

The RH probe is continuously heated to avoid the effects of condensation and high humidity onto the sensing elements, such as corrosion, high humidity drift or stray impedances.

Based on the measured values for RH and T, the EE211 base unit calculates the dew point temperature Td whereas the separate, interchangeable T probe measures the ambient temperature. Ultimately, out of Td and T, the device calculates RH as well as several other parameters like absolute humidity, mixing ratio, wet bulb temperature or enthalpy.

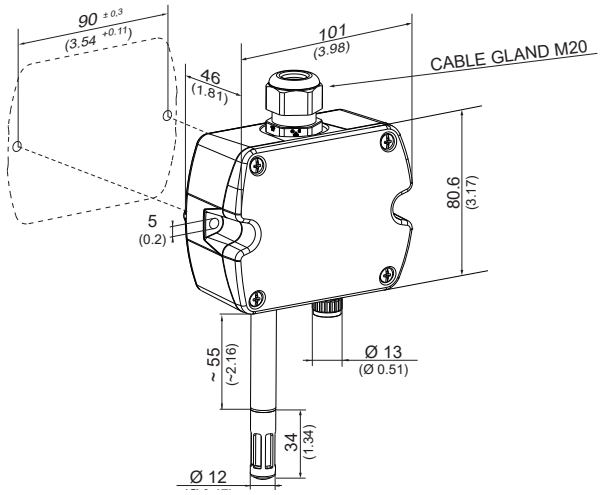
The operation principle of the EE211 copes with the causes of poor long-term stability of non-heated sensors at continuously high humidity. The constant over-temperature of the EE211 sensing head (approx. +5 °C (+9 °F)) means max. 76 % RH at the sensors and enables following benefits:

- The sensing head of EE211 stays dry even under condensing conditions, which prevents dust and dirt from sticking to the sensor. Thus, the probe heating leads to outstanding long-term stability.
- The combination of dry sensing head, E+E proprietary coating of the sensing element and sealed solder pads minimize the impact of corrosive agents.
- Maximum humidity of 76 %RH at the sensor eliminates the drift caused by exposure to continuous high humidity.

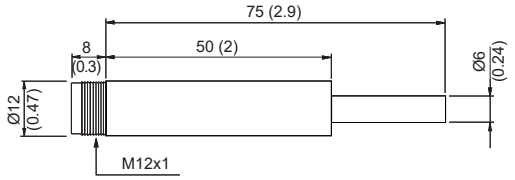
3.3 Dimensions

Values in mm (inch)

Base Unit



Temperature Probe



3.4 Electrical Connection

⚠ WARNING

Incorrect installation, wiring or power supply may cause overheating and result in personal injury or property damage.

Cables must not be under voltage during electrical installation and connection or disconnection, especially at terminal connections on circuit boards. For correct cabling, always observe the presented wiring diagram for the product version used.

The manufacturer cannot be held responsible for personal injury or damage to property caused by incorrect handling, installation, wiring, power supply or maintenance of the device.

The EE211 features screw terminals for connecting the power supply and the outputs. The cables are fed into the enclosure through the M20 cable gland.

NOTICE

It is important to ensure that the cable glands are closed tightly for the power supply and outputs cable. This is necessary to assure the IP rating of the enclosure according to EE211 specification, as well as for stress relief at the screw terminals on the EE211 board.

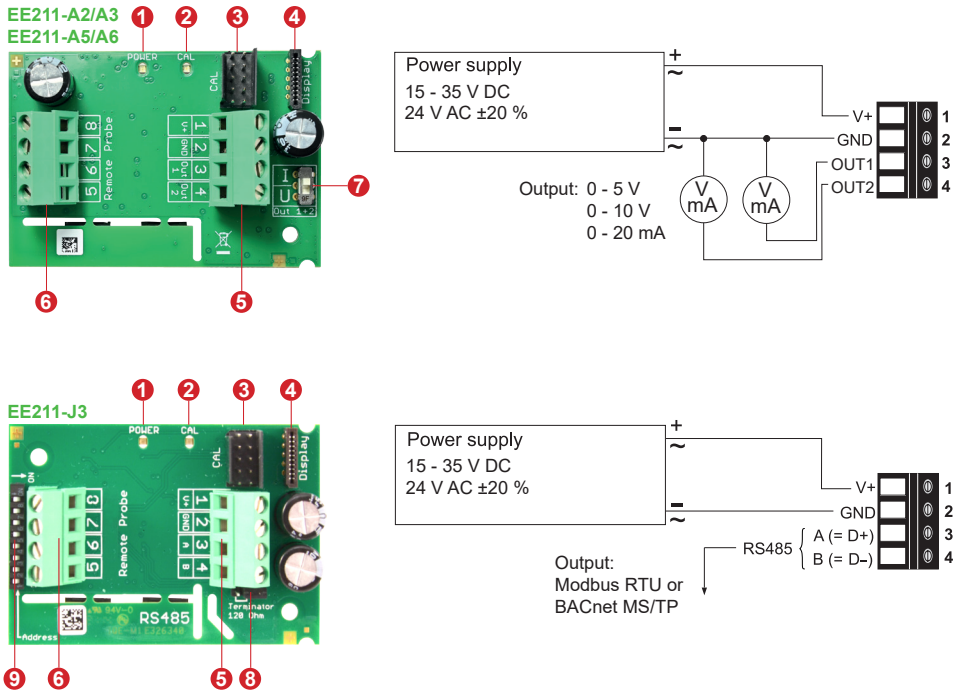


Fig. 1 EE211 connection options

No.	Function
1	Green LED Information during operation On — normal operation Flashing — the main board does not recognize the probe's measurement electronics Off — no power supply or main board failure
2	Blue LED Information during setup with the optional USB-C configuration stick HA011070 and the PCS10 Product Configuration Software On — USB connection to PC, no communication with PCS10 Flashing — communication with PCS10 in progress Off — no USB connection to PC
3	Configuration connector (USB configuration adapter)
4	FFC cable socket for the display
5	Screw terminals for power supply and outputs
6	Screw terminals, do not connect
7	Output signal (I / U) selection
8	Bus termination resistor 120 Ω (jumper)
9	Address DIP switch for RS485 interface

Tab. 1 Parts of the EE211 electronics board types

3.5 Analogue Outputs and Selection of Output Signal (Voltage or Current)

The factory setup of the output signal and scaling corresponds to the specified order code.

The analogue models provide measured data on two freely scalable analogue outputs. These are both are either current (0 - 20 / 4 - 20 mA) or voltage (0 - 5 / 0 - 10 V). Configuration can be selected at the time of order and can be changed in the field via PCS10 Product Configuration Software.

The output signal (voltage - U or 3-wire-current - I) can be selected with the DIP switch on the main electronics board (see 3.4 Electrical Connection). This has not impact on the scaling of the outputs, which can be changed using the PCS10 Product Configuration Software and the optional USB-C configuration stick HA011070.

Examples

Factory setup: voltage output 0 - 5 V or 0 - 10 V corresponds to 0…100 %RH.

After switching from U to I: current output 4 - 20 mA (3-wire) corresponds to 0…100 %RH.
A change of the current output range for instance to 0 - 20 mA can be made subsequently with the PCS10 Product Configuration Software and the optional USB-C configuration stick HA011070.

Factory setup: current output 0 - 20 mA or 4 - 20 mA (3-wire) corresponds to -10…+50 °C.

After switching from I to U: voltage output 0 - 10 V corresponds to -10…50 °C.
A change of the voltage output range for instance to 0 - 5 V can be made subsequently with the PCS10 Product Configuration Software and the optional USB-C configuration stick HA011070.

3.6 Configuration Interface

The EE211 is ready to use and does not require any further configuration. The factory setup corresponds to the type number ordered. Please refer to the datasheet at www.epluse.com/ee211. If needed, the factory setup can be changed with the free PCS10 Product Configuration Software and the optional USB-C configuration stick HA011070 (not included in the scope of supply). A USB cable is needed for connection (USB-A to USB-C, accessory HA010327).

3.7 Display

Factory setup

The display shows the two parameters selected for output 1 and output 2 (according to the ordering code). With the Modbus version, the display shows RH and T.

User setup

The user can change the display layout to 1, 2 or 3 lines and select the parameters to be displayed by using PCS10 Product Configuration Software (free download from www.epluse.com/pcs10) and the optional USB-C configuration stick HA011070 (not included in the scope of supply).

PLEASE NOTE

The display is available as spare part, intended for replacement only, not for retrofitting an EE211 originally ordered without display.

4 Mounting and Installation

Preparing the EE211 base unit insert the M20 cable gland included in the scope of supply into the corresponding opening on the top of the EE211 enclosure and fix it tight with the nut.

Alternatively, it is possible to install a 1/2" conduit fitting (not included in the scope of supply).

Install the EE07-M3 temperature probe either directly on the M12 connector of the EE211 base unit or use an optional probe cable.

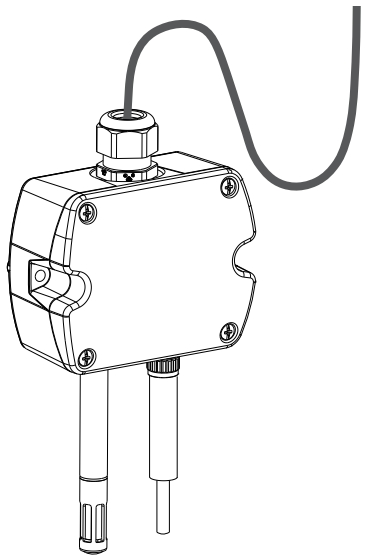
PLEASE NOTE

To achieve optimum measurement results and to ensure a professional installation, the EE211

- in total (base unit and probes) must be installed within the room to be monitored.
- measured RH corresponds to the location of the T-probe. Consequently, the T-probe must be positioned at the location that is most important for measuring the RH. In a climate chamber, for example, the EE211 base unit can be conveniently attached to the inside wall, while the T-probe can be placed in the center of the chamber using an optional cable.
- must be installed so that the RH sensor is pointing downwards
- must be installed in an environment in which the medium to be measured flows sufficiently around both the RH and T probes.
- must not be installed in the vicinity of influencing objects such as radiators or fan heaters.
- must be installed in a way that temperature gradients due to thermal coupling, which lead to incorrect measurements, are avoided.

PLEASE NOTE

If the connection cable is fed into the EE211 from above, a bow must be created to drain off condensation water so that it does not penetrate the enclosure.



5 Setup and Configuration

The EE211 is ready to use and does not require any further configuration by the user. The factory setup of EE211 corresponds to the specified order code. Please refer to the datasheet at www.epluse.com/ee211. If needed, the factory setup can be changed with the help of the free PCS10 Product Configuration Software and the USB-C configuration stick (HA011070).

The user can change the scaling and the analogue output signal, the digital settings and perform RH and T adjustment.

5.1 Product Configuration

5.1.1 EE211 Configuration Using HA011070

PLEASE NOTE

The USB-C configuration stick (HA011070) is applicable for all EE211 types, analogue and digital.

NOTICE

The USB-C configuration stick HA011070 galvanically isolates the USB interface of the PC from the supply voltage of the EE211. When using the USB-C configuration stick, the EE211 needs external supply.

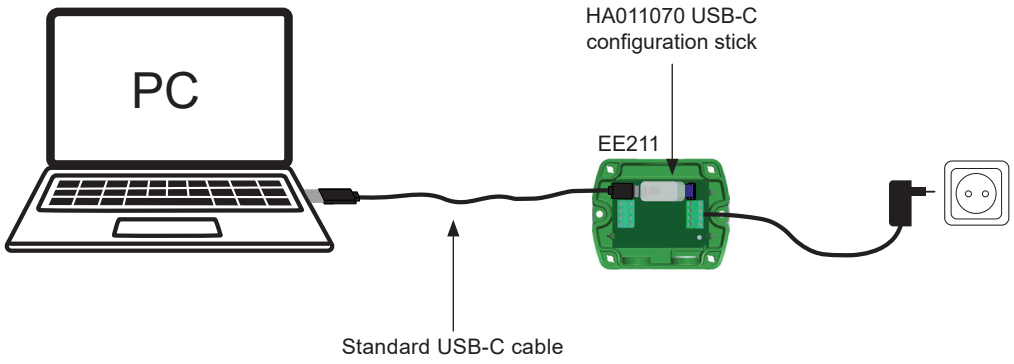


Fig. 2 EE211 configuration using the HA011070 USB-C configuration stick

5.1.2 EE211 Configuration Using Legacy USB Configuration Adapter HA011066

PLEASE NOTE

The USB configuration adapter (HA011066) is not applicable for new designs.

NOTICE

The EE211 must not be connected to any additional power supply when using the USB configuration adapter HA011066.

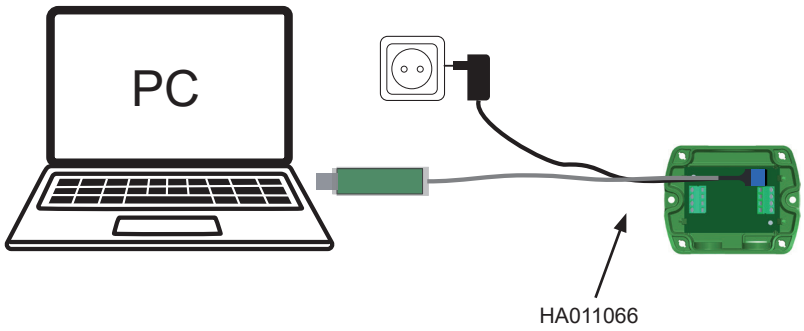


Fig. 3 EE211 connected to a PC running PCS10

5.2 PCS10 Product Configuration Software

The PCS10 provides a convenient graphical user interface to the EE211 for changing the factory setup via PCS10 and USB-C configuration stick / USB configuration adapter.

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 EE211 to the PC using the USB-C configuration stick / USB configuration adapter.
3. Start the PCS10 software.
4. Follow the instructions on the PCS10 opening page to scan the ports and identifying the connected device
5. Click on the desired setup 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 sensor by pressing the “Sync” button.

Analogue output configuration options:

- Measurand assignment
- Current and/or voltage scaling
- Unit selection
- Output value fixing (measured value or current/voltage value)

Digital output configuration options:

- Address
- Baud rate
- Parity
- Stop bits

Display configuration options:

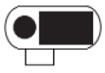
- Display layout
- Measurand selection
- Display appearance (backlight, brightness, contrast)

5.3 RS485 Digital Interface with Modbus RTU Protocol

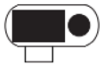
5.3.1 Hardware Bus Termination

For bus termination, the EE211 features an internal 120 Ω resistor which can be activated using the jumper on the electronics board (refer to chapter 3.4 Electrical Connection for details).

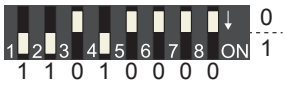
- Jumper not mounted (right position = factory setup): bus is not terminated



- Jumper mounted (left position): bus is terminated



5.3.2 Device Address

Address Switch	Option
	**Address setting via PCS10 Product Configuration Software (= factory setting)** All DIP switches at position 0 → factory-set default address (239_{DEC}, 0xEF) applicable, can be changed via software (PCS10 or Modbus protocol, permitted values: 1…247). Example: Address is set via configuration software.
	**Address setting via DIP switches** DIP switches in any other position than 0 indicate the effective Modbus address which overrules the factory setting and any Modbus address set via PCS10 or Modbus command (permitted values: 1…247). Example: Address set to 11_{DEC} ($0000\ 1011_{BIN}$).

5.3.3 Modbus RTU Protocol Settings

	Factory settings	Selectable values (via PCS10)
Baud rate	9 600	9 600, 19 200, 38 400, 57 600
Data bits	8	8
Parity	Even	None, odd, even
Stop bits	1	1, 2
Modbus address	239	1...247

Tab. 2 Modbus RTU protocol settings

PLEASE NOTE

- The recommended settings for multiple devices in a Modbus RTU network are 9600, 8, even, 1.
- The EE211 represents 1 unit load on an RS485 network.

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

- The PCS10, Product Configuration Software and the USB-C configuration stick HA011070.
  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/ee211).

The serial number as ASCII-code is located in read-only registers 1 - 8 (0x00 - 0x07).
The firmware version is located in read-only register 9 (0x08) (bit 15...8 = major release; bit 7...0 = minor release).
The sensor name as ASCII-code is located in read-only registers 10 - 17 (0x09 - 0x10).

NOTICE

When reading information that spans multiple registers, it is always necessary to read all registers, even if the desired information requires less.

NOTICE

To obtain the correct floating point values, both registers have to be read within the same read cycle. The measured value may change between two Modbus requests. This can cause inconsistencies in the exponent and mantissa.

INFO

The Modbus function codes mentioned throughout this document shall be used as described in the MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3, chapter 6:
www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf

Communication settings (INT16)

Parameter	Register number[1)] [Dec]	Register address[2)] [Hex]	Size[3)]
Write register: function code 0x06			
Modbus address[4)5)]	1	00	1
Modbus protocol settings[4)]	2	01	1

Device information (INT16)

Parameter	Register number[1)] [Dec]	Register address[2)] [Hex]	Size[3)]
Read register: function code 0x03 / 0x04			
Serial number (as ASCII)	1	00	8
Firmware version	9	08	1
Sensor name (as ASCII)	10	09	8

1) Register number (decimal) starts from 1.
2) Register address (hexadecimal) starts from 0.
3) Number of registers.
4) For Modbus address and protocol settings see Application Note Modbus AN0103 (available at www.epluse.com/ee211).
5) If the address is set via DIP-switch the response will be NAK.

Tab. 3 EE211 registers for device setup

5.4 Modbus Register Map

The measurement data is saved as 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	°C, °F	26	19
Relative humidity	%	28	1B
Water vapour partial pressure	mbar, psi	30	1D
Dew point temperature	°C, °F	32	1F
Wet bulb temperature	°C, °F	34	21
Absolute humidity	g/m^3, gr/ft^3	36	23
Mixing ratio	g/kg, gr/lb	38	25
Specific enthalpy	kJ/kg,BTU/lb	40	27
Frost point temperature	°C, °F	42	29

INT16

Parameter	Unit[1)]	Scale[4)]	Register number[2)] [DEC]	Register address[3)] [HEX]
Read register: function code 0x03 / 0x04				
Temperature	°C, °F	100	301	12C
Relative humidity	%	100	302	12D
Water vapour partial pressure	mbar, psi	100	303	12E
Dew point temperature	°C, °F	100	304	12F
Wet bulb temperature	°C, °F	100	305	130
Absolute humidity	g/m^3, gr/ft^3	100	306	131
Mixing ratio	g/kg, gr/lb	100	307	132
Specific enthalpy	kJ/kg,BTU/lb	100	308	133
Frost point temperature	°C, °F	100	309	134

1) The choice of measurement units (metric or non-metric) must be done according to the ordering guide, see EE211 datasheet. It is not possible to switch from metric to non-metric or vice versa with the PCS10.
2) Register number (decimal) starts from 1
3) Register address (hexadecimal) 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. 4 EE211 FLOAT32 and INT16 measured data registers

5.5 Modbus RTU Example

The EE211's Modbus address is 239 [0xEF].

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/ee211)

Read the temperature (FLOAT32) T = 26.652524 °C from register address 0x19:

Master (e.g. PLC) **EE211**

Request [Hex]:

Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC	
EF	03	00	19	00	02	EB	7B

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	
EF	03	04	38	5F	41	D5	0A	E3

Tab. 5 Example temperature query

NOTICE

To obtain the correct floating point values, both registers have to be read within the same read cycle. The measured value may change between two Modbus requests. This can cause inconsistencies in the exponent and mantissa.

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 the T reading Modbus request/response example above):

Modbus response [Hex]			
Byte 3	Byte 4	Byte 1	Byte 2
38	5F	41	D5
MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

Tab. 6 Modbus response

IEEE754			
Byte 1	Byte 2	Byte 3	Byte 4
41	D5	38	5F
0100 0001	1100 1000	1011 0011	0111 1110
SEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM
Decimal value: 26.652524			

Tab. 7 Data representation according to IEEE754

6 Maintenance and Service

6.1 Calibration and Adjustment

The EE211 can be calibrated / adjusted with the help of the PCS10. For this purpose, the sensor needs to be connected to a PC via USB-C configuration stick and a standard USB-C cable.

Depending on the application and the requirements of certain industries, there might arise the need for periodical humidity calibration (comparison with a reference) or adjustment (bringing the device in line with a reference).

Definitions

- **Calibration** documents the accuracy of a measurement device. The device under test (specimen) is compared with the reference and the deviations are documented in a calibration certificate. During the calibration, the specimen is not changed or improved in any way.
- **Adjustment** improves the measurement accuracy of a device. The specimen is compared with the reference and brought in line with it. An adjustment can be followed by a calibration which documents the accuracy of the adjusted specimen.

6.2 Overall RH / T Calibration and Adjustment

6.2.1 1-Point (Offset) Calibration / Adjustment

1-point (offset) calibration / adjustment at ambient T can be easily performed by comparison with an adequate RH and a T reference. The E+E Omniport 40 hand-held meter can serve as such reference. Omniport 40 can be optionally supplied with an accredited calibration certificate. See E+E calibration brochure at www.eplusecal.com.

PLEASE NOTE

As the RH value of the EE211 is determined at the measurement point of the T probe, the RH reference used must be placed close to it.

6.2.2 Multi-Point Calibration / 2-Point Adjustment

For multi-point calibration or 2-point adjustment for RH and T, the EE211 as a complete device (main unit and T probe) shall be placed in a climate chamber with an appropriate RH and T reference.

6.2.3 Adjustment Procedure

1. Connect the EE211 to the a Windows PC using the PCS10 Product Configuration Software and the optional USB-C configuration stick HA011070.
2. PCS10 (free download from www.epluse.com/pcs10) shall be installed on the PC.
3. Start the PCS10 and proceed with the 1 or 2-point adjustment of the RH and of the T reading.

PLEASE NOTE

The adjustment data is stored in the main electronics board of the EE211. The factory adjustment of the heated humidity probe and of the T probe is not altered. In case of replacing of theT probe, it is necessary to return to the factory setup of EE211.

6.3 Individual Calibration / Adjustment of the T Probe

The T probe can also be adjusted separately, which may be desirable in highly demanding applications. For best accuracy, it is advisable to use a dry block calibrator.

Adjustment Procedure:

1. Connect the T probe to the a Windows PC using the EE-PCA product configuration adapter and the cable HA011057 (see data sheet EE-PCA).
2. PCS10 (free download from www.epluse.com/pcs10) shall be installed on the PC.
3. Start PCS10 and proceed with the calibration or adjustment of the T reading.

PLEASE NOTE

In case of individual adjustment, the adjustment data is stored in the T probe; the factory setup of the EE211 base unit is not altered. This means that the T-sensor can be recalibrated or replaced at any time without having to recalibrate the EE211 base unit.

6.4 Individual Calibration / Adjustment of the RH Measurement

The EE211 is not designed for individual RH calibration or adjustment by the user due to its heated sensor concept. Please contact your E+E representative for details on individual TH calibration / adjustment of your EE211 units.

6.5 Filter Cap Exchange

In a dusty, polluted environment it might be necessary to replace the filter cap once in a while. In most cases, a clogged filter shows visible contamination or dirt. Longer response time of the measurement also indicates a clogged filter cap. In such cases, replace the filter by a new, original one, see datasheet “Accessories”.

Procedure:

1. Turn the filter cap counter-clockwise to remove it.
2. Install the new filter cap finger-tight by turning it clockwise.

NOTICE

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

- While replacing the filter cap, take very good care not to touch or rub the sensing elements.

6.6 Cleaning

If needed, the sensing head of the humidity probe can be cleaned by the user (see cleaning instruction - www.epluse.com/cleaning-instructions). The EE07-MT probe does not require any special cleaning because the temperature sensor is encapsulated in the stainless steel body of the probe.

6.7 Display Exchange

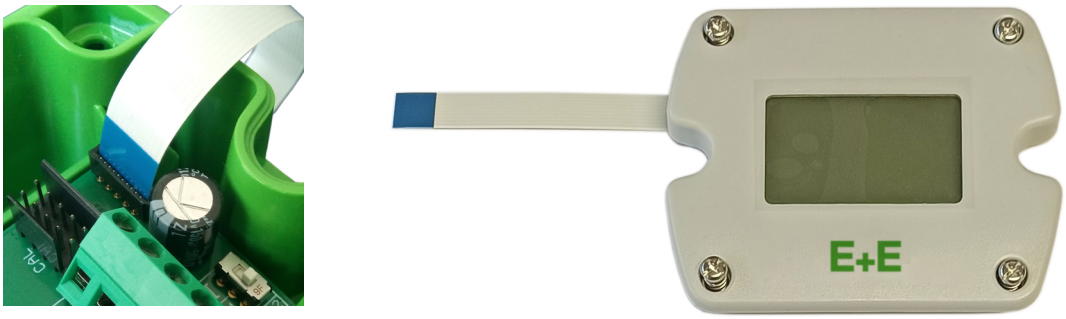


Fig. 4 Display and FFC cable connection on the EE211 electronics board

When connecting the display's FFC cable to the EE211 electronics board, please observe the correct orientation. The blue cable stiffener needs to be on the left side as shown in Fig. 4.

NOTICE

Disconnecting or connecting the display while the EE211 is powered may cause damages to the EE211 and to the display.

Always switch off the EE211 before exchanging the display.

6.8 Repairs

PLEASE NOTE

Repairs may only be carried out by the manufacturer. The attempt of unauthorised repair excludes any warranty claims.

7 Spare Parts

Description	Code
Filter cap	**refer to the Accessories datasheet**
Temperature probe	**EE07-MT**
Display for EE211	**D09P**

8 Accessories

For further information please refer to the Accessories datasheet.

Description		Code
PCS10 Product Configuration Software (Free download: www.epluse.com/pcs10)		**PCS10**
Power supply adapter		**V03**
Protection cap for 12 mm (0.47") probe		**HA010783**
USB-C configuration stick		**HA011070**
Cable for T probe (M12x1 socket, M12x1 plug)	**2 m (6.6 ft)** **5 m (16.4 ft)** **10 m (32.8 ft)**	**HA010801** **HA010802** **HA010803**

9 Technical Data

Measurands

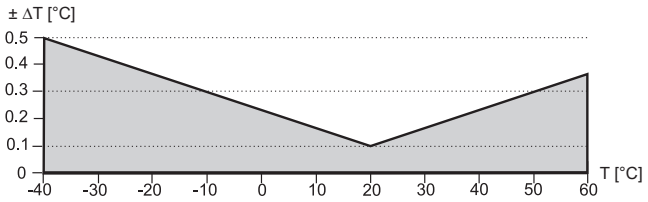
Relative humidity (RH)

Measuring range	0...100 %RH		
Accuracy[1)] incl. hysteresis, non-linearity and repeatability **-5...+30 °C (23...86 °F)**	±(1,3 + 0,007 *mv) %RH		mv = measured value

1) Traceable to international standards, administrated by NIST, PTB, BEV,...
The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

Temperature (T)

Accuracy



Outputs

Analogue

RH + T (RH: 0...100 %; T: see ordering guide)	0 - 5 V / 0 - 10 V 0 - 20 mA / 4 - 20 mA (3-wire)	-1 < I_L < 1 mA R_L ≤ 500 Ω	I_L = load current R_L = load resistance

Digital

Digital interface	RS485 (EE211 = 1 unit load)
Protocol **Factory settings** **Supported Baud rates** **Measured data types**	Modbus RTU 9 600 Baud, parity even, 1 stop bit, Modbus address 239 9 600, 19 200, und 38 400 FLOAT32 und INT16

General

Power supply class III USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	15 - 35 V DC or 24 V AC ±20 %				
Current consumption, at 24 V		**DC**		**AC**	
		Without display	With display	Without display	With display
	Voltage output	max. 13 mA	max. 19 mA	max. 38 mA_{rms}	max. 49 mA_{rms}
	Current output	max. 34 mA	max. 40 mA	typ. 75 mA_{rms}	typ. 85 mA_{rms}
	Digital interface	typ. 8 mA	typ. 17 mA	typ. 23 mA_{rms}	typ. 40 mA_{rms}
Electrical connection	Screw terminals max. 1.5 mm^2				
Cable gland	M20x1.5				
Display	1, 2 or 3 lines, user configurable, with backlight				
Temperature ranges		**Without display**		**With display**	
	Operation	-40...+60 °C (-40...+140 °F)		-20...+50 °C (-4...+122 °F)	
	Storage	-40...+60 °C (-40...+140 °F)		-20...+60 °C (-4...+140 °F)	
T probe **Material**	Stainless steel 1.4571				
Enclosure **Material** **Protection rating**	PC (Polycarbonate), UL94V-0 (with display UL94HB) approved IP65 / NEMA 4X				
Electromagnetic compatibility	EN 61326-1 FCC Part15 Class A	EN 61326-2-3 ICES-003 Class A	Industrial environment		
Conformity	CE UKCA				

10 Conformity

10.1 Declarations of Conformity

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

CE European directives and standards.

and

UKCA UK statutory instruments and designated standards.

Please refer to the product page at www.epluse.com/ee211 for the Declarations of Conformity.

10.2 Electromagnetic Compatibility

EMC for industrial environment.
Our sensors are group 1 devices and correspond to class A.

⚠ WARNING

This device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

10.3 FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

10.4 ICES-003 Compliance Statement

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

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

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