

# + Datasheet EE211

**Humidity and Temperature Sensor  
for Continuous High Humidity**



# EE211

## Humidity and Temperature Sensor for Continuous High Humidity

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 humidity (RH), and an interchangeable temperature (T) probe.

### Reliability

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

### Versatility

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.

### Configurable and Adjustable

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



EE211 with backlit display



EE211 without display

# Features

## External mounting holes

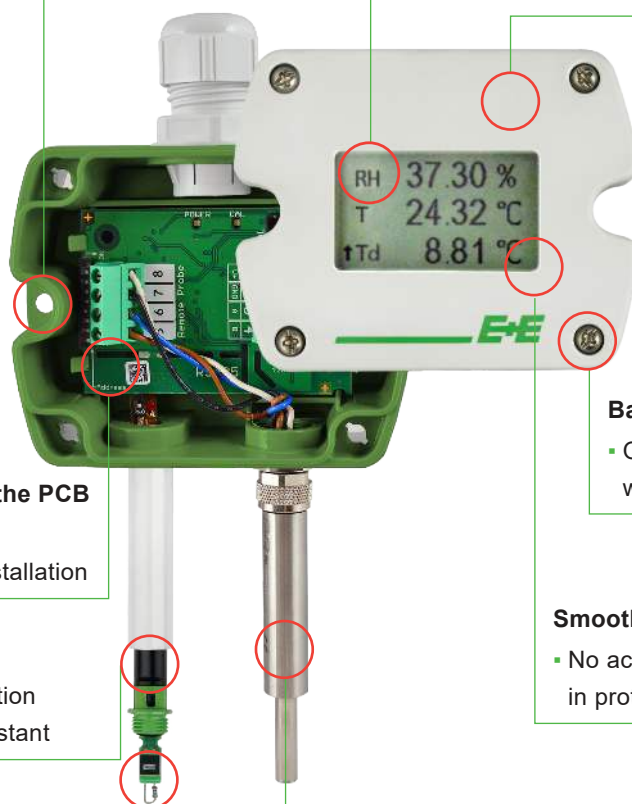
- Mounting with closed cover
- Electronics protected against construction site pollution
- Easy and fast mounting

## Display

- Shows up to 3 measurands
- Backlight

## Enclosure

- IP65/NEMA 4X



## Electronics on the bottom of the PCB

- Optimum protection against mechanical damage during installation

## Cast electronics

- Mechanical protection
- Condensation-resistant

## E+E humidity sensing element

- Protected by E+E proprietary coating
- Sealed solder pads
- Tested according to automotive standard AEC-Q200

## Bayonet screws

- Open/close with a ¼ rotation

## Smooth cover surface

- No accumulation of dust in protruding edges

## Separate T probe EE07-M3HS2

- Intelligent, interchangeable T probe
- Remote connection possible
- Suitable for dry block calibrator

## Heated sensing head

- Best performance and long term stability under continuous high RH and condensing conditions

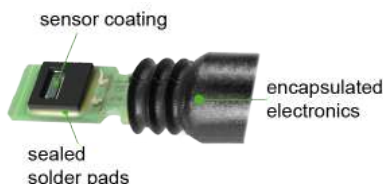
## Test Report

According to DIN EN 10204-3.1

# Features

## Protective Sensor Coating

The E+E proprietary sensor coating is a protective layer applied to the active surface of the sensing element. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves the sensors' long term stability in dusty, dirty or oily applications by preventing stray impedance caused by deposits on the active sensor surface.



## Operation Principle

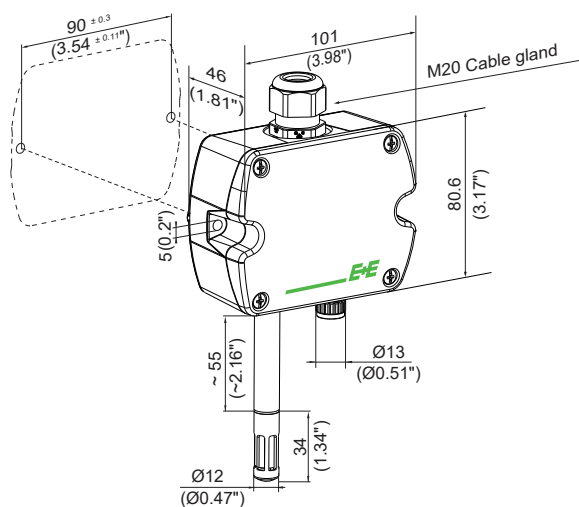
The humidity probe is continuously heated for avoiding the effects of condensation and high humidity on the sensing elements, such as corrosion, high humidity drift or stray impedances. Thus, the probe heating leads to outstanding long term stability. Based on the measured RH and T values, the EE211 calculates the dew point temperature  $T_d$  whereas the separate, interchangeable T probe measures the ambient temperature. Ultimately, out of  $T_d$  and T, the device calculates the relative humidity RH as well as several other parameters like absolute humidity, mixing ratio, wet bulb temperature or enthalpy.

For details on the operation principle please refer to the EE211 user guide at [www.epluse.com/ee211](http://www.epluse.com/ee211).

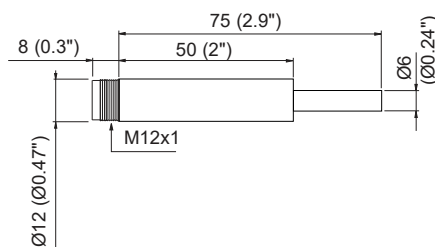
# Dimensions

Values in mm (inch)

### Basic device



### Temperature probe



# Technical Data

## Measurands

### Relative humidity (RH)

<b>Measuring range</b>	0...100 %RH	
<b>Accuracy<sup>1)</sup></b> incl. hysteresis, non-linearity and repeatability <b>-5...+30 °C (23...86 °F)</b>	$\pm(1,3 + 0,007 \cdot mv) \%RH$	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)

<b>Accuracy</b>	<p>The graph plots the temperature accuracy <math>\pm \Delta T</math> in degrees Celsius against the temperature <math>T</math> in degrees Celsius. The x-axis ranges from -40 to 60 with major ticks every 10 units. The y-axis ranges from 0 to 0.5 with major ticks every 0.1 units. The accuracy curve is a V-shape, starting at approximately 0.45 at -40°C, reaching a minimum of 0.1 at 20°C, and rising back to approximately 0.45 at 60°C.</p>	
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## Outputs

### Analogue




<b>RH + T</b> (RH: 0...100 %; T: see ordering guide)	0 - 5 V / 0 - 10 V 0 - 20 mA / 4 - 20 mA (3-wire)	$-1 < I_L < 1 \text{ mA}$ $R_L \leq 500 \Omega$	$I_L$ = load current $R_L$ = load resistance
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### Digital

<b>Digital interface</b>	RS485 (EE211 = 1 unit load)
<b>Protocol</b>	Modbus RTU
<b>Factory settings</b>	9600 Baud, parity even, 1 stop bit, Modbus address 239
<b>Supported Baud rates</b>	9600, 19200, und 38400
<b>Measured data types</b>	FLOAT32 und INT16

# Technical Data

## General

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

# Ordering Guide

Feature	Description	Code		
Hardware Configuration		EE211-		
	Model	M1		
	Analogue output	0 - 5 V	A2	
		0 - 10 V	A3	
		0 - 20 mA (3-wire)	A5	
		4 - 20 mA (3-wire)	A6	
	Digital interface <sup>1)</sup>	RS485		J3
Display <sup>2)</sup>	Without display	No code		
	Display with backlight	D2		
T probe	Metal EE07-M3HS2	AM7		
Software Setup Outputs	Output 1 measurand	Relative humidity RH [%]	No code	
		Other measurands (xx see measurand code below)	MAxx	
	Output 1 scaling low	0	No code	
		Value	SALValue	
	Output 1 scaling high	100	No code	
		Value	SAHValue	
	Output 2 measurand	Temperature T [°C]	No code	
		Temperature T [°F]	MB2	
		Other measurands (xx see measurand code below)	MBxx	
	Output 2 scaling low	-40	No code	
		Value	SBLValue	
	Output 2 scaling high	60	No code	
		Value	SBHValue	
	Units	Metric (SI)		No code
Non-metric (US/GB)			U2	

1) Factory setting: Baud rate 9600, parity even, 1 stop bit. Other factory settings available upon request. Baud rate choice: 9600 / 19200 / 38400. Modbus Map and communication setting: See User Guide and Modbus Application Note at [www.epluse.com/ee211](http://www.epluse.com/ee211).

2) Factory setting: For analogue output versions the display shows the measurands selected for output 1 and output 2. For digital output versions the display shows RH and T.

## Measurand Code

For Output 1 and 2 in the Ordering Guide

Measurand	Unit	Code
		MAxx / MBxx
Dew point	Td °C °F	52
		53
Frost point	Tf °C °F	65
		66
Mixing ratio	r g/kg gr/lb	60
		61
Absolute humidity	dv g/m <sup>3</sup> gr/ft <sup>3</sup>	56
		57
Wet bulb temperature	Tw °C °F	54
		55
Water vapour partial pressure	e mbar psi	50
		51
Specific enthalpy	h kJ/kg BTU/lb	62
		64

# Ordering Example

## EE211-M1A6AM7MB60SBL100SBH300

Feature	Code	Description
Model	M1	RH + T
Analogue output	A6	4 - 20 mA
Display	No code	Without display
T probe	AM7	Metal EE07-M3HS2
Output 1 measurand	No code	Relative humidity RH (%)
Output 1 scaling low	No code	0
Output 1 scaling high	No code	100
Output 2 measurand	MB60	Mixing ratio r (g/kg)
Output 2 scaling low	SBL100	100
Output 2 scaling high	SBH300	300

## EE211-M1J3D2AM7U2

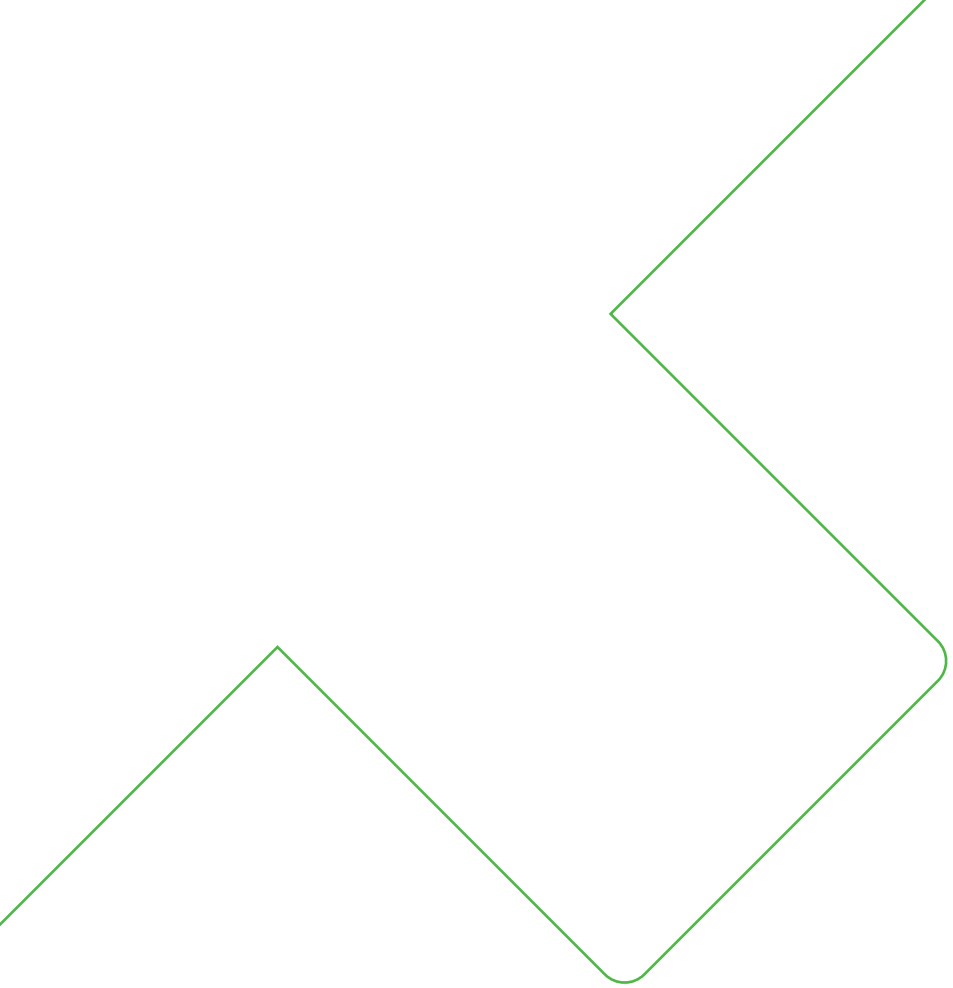
Feature	Code	Description
Model	M1	RH + T
Digital interface	J3	RS485
Display	D2	Display with backlight
T probe	AM7	Metal EE07-M3HS2
Unit	U2	Non-metric (US/GB)

# Accessories

For further information see datasheet [Accessories](#).

Accessories	Code
E+E Product Configuration Software (Free download: <a href="http://www.epluse.com/configurator">www.epluse.com/configurator</a> )	EE-PCS
Power supply adapter	V03
Protection cap for 12 mm (0.47") probe	HA010783
USB configuration adapter	HA011066
Cable for T probe (M12x1 socket, M12x1 plug)	2 m (6.6 ft) HA010801 5 m (16.4 ft) HA010802 10 m (32.8 ft) HA010803





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