

# EE210

## Humidity and Temperature Sensor for Demanding Climate Control

The EE210 humidity (RH) and temperature (T) sensor is designed to meet the highest requirements in demanding climate control applications. Besides the accurate measurement of RH and T EE210 calculates various RH related parameters such as dew point temperature, absolute humidity and mixing ratio.

### Outstanding Measurement Performance

Excellent performance of EE210 in polluted or aggressive environment is ensured by the encapsulated measurement electronics inside the sensing probe and the long-term stable E+E sensing element with proprietary coating.

### Analogue, Digital Outputs and Display

All measured and calculated values are available on the BACnet MS/TP or Modbus RTU interface, two of them on the analogue voltage or current outputs, while up to three values can be shown simultaneously on the optional display.

### Versatility

EE210 is available for wall or duct mount, with remote probe, as well as an outdoor version. The IP65/NEMA 4X enclosure minimizes installation costs and provides outstanding protection against contamination and condensation.

### Easy Configuration and Adjustment

With an optional USB configuration adapter, the user can set the RS485 interface parameters, the output scaling and perform one or two point adjustment for RH and T.



## Features

### Appropriate for US mounting requirements

- » Knockout for 1/2" conduit fitting

### External mounting holes

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

### Electronics on the underside of the PCB

- » Optimum protection against mechanical damage during installation

### Bayonet Screws

- » Open/closed with a 1/4 rotation

### Cast Electronics

- » Mechanical protection
- » Condensation-resistant

### E+E RH and T Sensing Element

- » Outstanding long-term stability
- » Protected solder pads
- » Tested according to automotive standard AEC-Q200

### Display

- » Selectable display layout
- » Measurands freely selectable
- » Backlight optional

### Smooth cover surface

- » No accumulation of dust in protruding edges

### IP65 / NEMA 4X Enclosure

- » Type T13 compatible with radiation shield H010501

### Watertight cable outlet

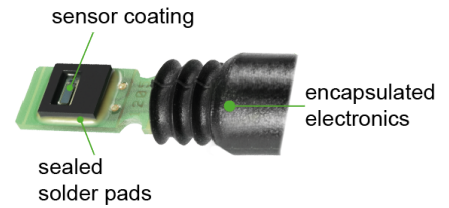
Inspection certificate according DIN EN 10204-3.1



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## 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 life-time 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.



## Technical Data

### Measured Values

#### Relative Humidity (RH)

Working range 0...100 %RH

RH accuracy<sup>1)</sup> (incl. hysteresis, non-linearity and repeatability)

Type T1 (wall), T2 (duct):

-15...40 °C (5...104 °F)	≤90 %RH	±(1.3 + 0.003*measured value) %RH
-15...40 °C (5...104 °F)	>90 %RH	±2.3 %RH
-40...60 °C (-40...140 °F)		±(1.5 + 0.015*measured value) %RH

Type T3 (remote):

at 20 °C (68 °F) ±2.5 %RH

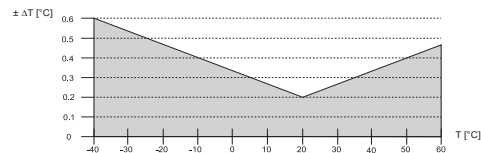
Type T13 (outdoor):

-15...40 °C (5...104 °F)	≤90 %RH	±(1.6 + 0.005*measured value) %RH
-15...40 °C (5...104 °F)	≥90 %RH	±3 %RH
-40...60 °C (0...140 °F)		±(2.3 + 0.008*measured value) %RH

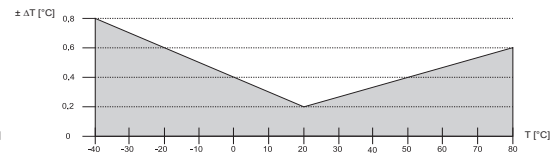
#### Temperature (T)

T accuracy

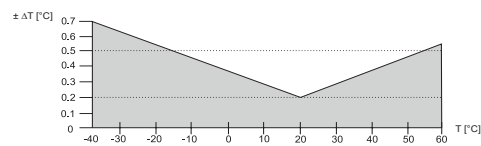
Type T1, T2



Type T3



Type T13



### Calculated parameters




		from	up to	unit
Dew point temperature	Td	-40 (-40)	60 (140)	°C (°F)
Frost point temperature	Tf	-40 (-40)	0 (32)	°C (°F)
Wet bulb temperature	Tw	0 (32)	60 (140)	°C (°F)
Water vapour partial pressure	e	0 (0)	200 (3)	mbar (psi)
Mixing ratio	r	0 (0)	160 (1200)	g/kg (gr/lb)
Absolute humidity	dv	0 (0)	150 (60)	g/m <sup>3</sup> (gr/ft <sup>3</sup> )
Specific enthalpy	h	-40 (-10)	500 (200)	kJ/kg (BTU/lb)

1) Traceable to intern. 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). For Type T13: at 24 V DC and RL=250 for A6 versions.

## Outputs

<b>Analogue output</b>	0 - 5 V / 0 - 10 V	-1 mA < I <sub>L</sub> < 1 mA
	4 - 20 mA (2-wire) for Type T13	R <sub>L</sub> ≤ 500 Ω 250 ≤ R <sub>L</sub> ≤ 500 Ω recommended
	0 - 20 mA (3-wire)	R <sub>L</sub> ≤ 500 Ω
	<b>Digital output</b>	RS485 (BACnet MS/TP or Modbus RTU), EE210 = 1 unit load
Default settings Modbus RTU	Baud rate according ordering guide, parity even, 1 stop bit, address 242	
Default settings BACnet MS/TP	Baud rate according ordering guide, parity none, 1 stop bit, address 1	

## General

Power supply (Class III)  <sup>2)</sup> for 4 - 20 mA, 2-wire	10 V + R <sub>L</sub> x 20 mA < V <sub>+</sub> < 30 V DC for Type T13: 24 V DC ±10 % recommended	
for 0 - 20 mA, 3-wire for 0 - 5 V / 0 - 10 V / RS485	15 - 35 V DC or 24V AC ±20 %	
Current consumption at 24 V		
Voltage output	DC supply max. 12 mA; AC supply max. 34 mA <sub>rms</sub> ;	with display max. 23 mA with display max. 49 mA <sub>rms</sub>
Current output		
2-wire	DC supply max. 40 mA;	with display max. 40 mA
3-wire	DC supply typ. 33 mA; AC supply typ. 65 mA <sub>rms</sub> ;	with display max. 44 mA with display max. 84 mA <sub>rms</sub>
Digital interface	DC supply typ. 5 mA; AC supply typ. 15 mA <sub>rms</sub> ;	with display max. 20 mA with display max. 35 mA <sub>rms</sub>
Display <sup>3)</sup>	Available for Type T1/T2/T3 1, 2 or 3 lines, user configurable Optional with backlight	
Electrical connection	Screw terminals, max. 1.5 mm <sup>2</sup>	
Enclosure material	Polycarbonate, UL94 V-0 (with Display UL94HB) approved	
Protection rating	IP65 / NEMA 4X	
Cable gland	M16 x 1.5	
Probe cable (for PE210)	PVC, Ø 4.3 mm, 4 x 0.25 mm <sup>2</sup> , Length: 1.5 or 3 m (4.9 or 9.8 ft)	
Electromagnetic compatibility	EN 61326-1 FCC Part15 Class A	EN 61326-2-3 ICES-003 Class A Industrial Environment
		 
Temperature ranges	Working: -40...60 °C (-40...140 °F) (-40...80 °C / -40... 176 °F for probe PE210)	
Without display	Storage: -40...60 °C (-40...140 °F)	
Temperature ranges	Working: -20...50 °C (-4...122 °F) (-40...80 °C / -40... 176 °F for probe PE210)	
With display	Storage: -20...60 °C (-4...140 °F)	

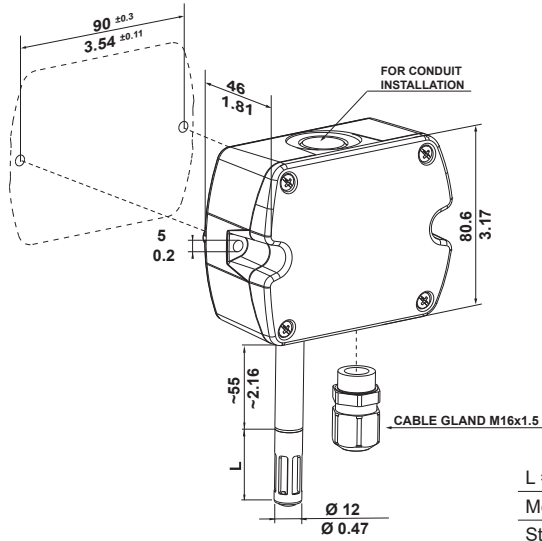
2) USA & Canada: class 2 supply required, max. supply voltage 30 V DC

3) For display operation with EE210-M1xA6 (4 - 20 mA, 2-wire) both outputs must be connected

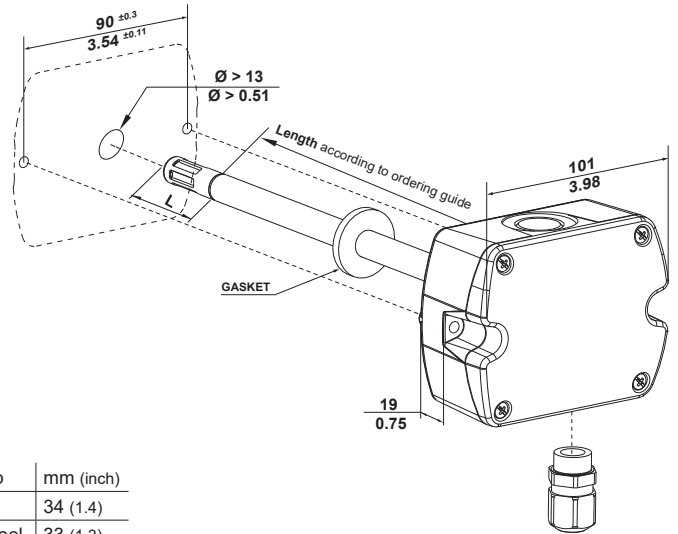
## Dimensions

Values in mm (inch)

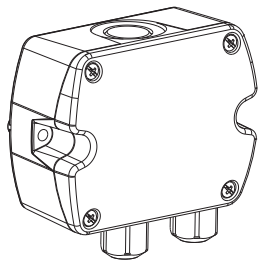
### Type T1



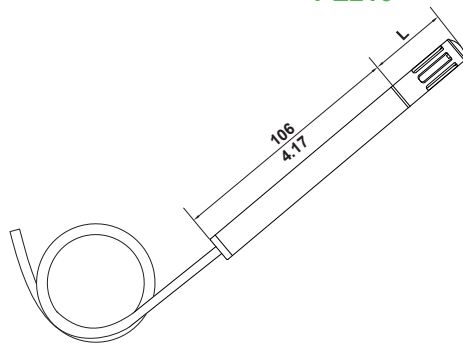
### Type T2



### Type T3

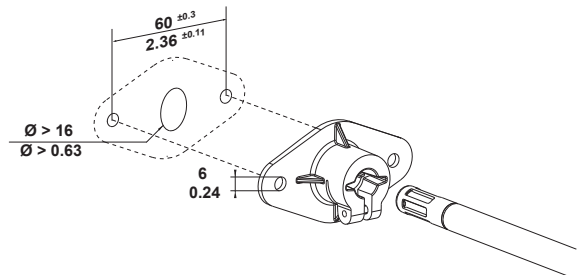


### PE210



### Mounting flange

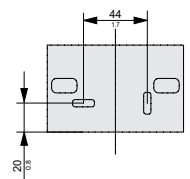
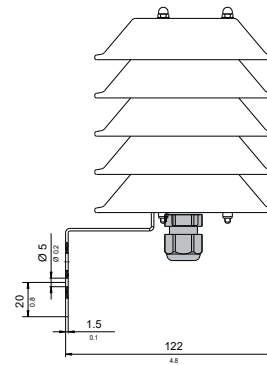
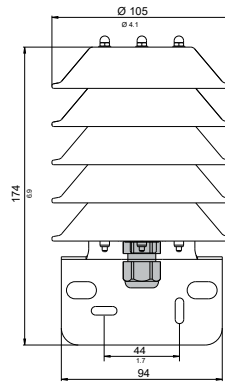
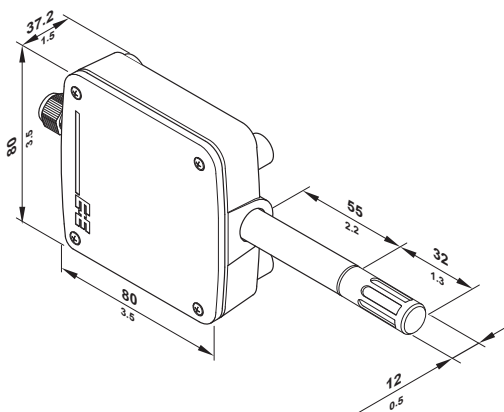
in the scope of supply for Type T2 and T3



### Type T13

### Radiation Shield HA010501 for Type T13

(needs to be ordered separately)



## Ordering Guide

		EE210-				
Hardware Configuration	<b>Model</b>	RH + T		M1		
	<b>Type</b>	Wall mount	T1	T2	T3	T13
		Duct mount				
		Remote probe <sup>1)</sup>				
		Outdoor				
	<b>Probe length</b>	50 mm (2")	L50			
		200 mm (4")	L200			
<b>Output</b>	0 - 5 V	A2				
	0 - 10 V	A3		A3		
	0 - 20 mA (3-wire)	A5				
	4 - 20 mA (2-wire)	A6		A6		
	RS485	J3				
<b>Filter</b>	Membrane	F2	F2			
	Metal grid	F3	F3	F3		
	Stainless steel sintered	F4	F4			
<b>Display<sup>2)</sup></b>	No Display	no code	no code	no code	no code	
	Without backlight <sup>3)</sup>	D1	D1	D1		
	With backlight <sup>4)</sup>	D2	D2	D2		
Setup Analogue Outputs	<b>Output 1</b>	Relative humidity RH [%] Temperature T [°C] Temperature T [°F] Other measurand ( <b>xx</b> see measurand code below)		no code MA1 MA2 MAxx		
	<b>Scaling 1 low</b>	0 Value	no code SALValue			
	<b>Scaling 1 high</b>	100 Value	no code SAHValue			
	<b>Output 2</b>	Temperature T [°C] Temperature T [°F] Other measurand ( <b>xx</b> see measurand code below)	no code MB2 MBxx			
	<b>Scaling 2 low</b>	Value	SBLValue			
	<b>Scaling 2 high</b>	Value	SBHValue			
Setup RS485	<b>Protocol</b>	Modbus RTU <sup>5)</sup> BACnet MS/TP <sup>6)</sup>	P1 P3			
	<b>Baud rate</b>	9600	BD5			
		19200	BD6			
		38400	BD7			
		57600 <sup>7)</sup>	BD8			
76800 <sup>7)</sup>		BD9				
<b>Units</b>	Metric (SI) Non metric (US/GB)	no code U2				

1) The PE210 probe has to be ordered as separate position

2) Factory setup: 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.

3) Not with output A5

4) Not with output A6

5) Modbus Map and setup instructions: See User Guide and Modbus Application Note at [www.epluse.com/ee210](http://www.epluse.com/ee210)

6) Product Implementation conformance Statement (PICS) available at [www.epluse.com/ee210](http://www.epluse.com/ee210)

7) Only for BACnet

## Measurand Code

For Output 1 and 2 in the Ordering Guide



Please note: no mix of SI/US units allowed

Measurand code		MAxx / MBxx
Relative humidity RH	[%]	10
Temperature T	[°C]	1
	[°F]	2
Dew point temperature Td	[°C]	52
	[°F]	53
Frost point temperature Tf	[°C]	65
	[°F]	66
Mixing ratio r	[g/kg]	60
	[gr/lb]	61

Measurand code		MAxx / MBxx
Absolute humidity dv	[g/m <sup>3</sup> ]	56
	[gr/ft <sup>3</sup> ]	57
Wet bulb temperature Tw	[°C]	54
	[°F]	55
Water vapor partial pressure e	[mbar]	50
	[psi]	51
Specific enthalpy h	[kJ/kg]	62
	[BTU/lb]	64

## Ordering Guide PE210

			PE210-
HW Config.	Model	RH + T	M1
	Filter	Membrane	F2
		Metal grid	F3
		Stainless steel sintered	F4
	Cable length	1.5 m	KL150
3 m		KL300	

## Order Examples

### Type T1 and T2

#### EE210-M1T1A3F2D2SBL-40SBH60

Model: RH + T  
 Type: Wall mount  
 Output: 0 - 10 V  
 Filter: Membrane  
 Display: With backlight  
 Output 1: Relative humidity  
 Scaling 1: Low: 0 %RH  
 High: 100 %RH  
 Output 2: Temperature [°C]  
 Scaling 2: Low: -40 °C  
 High: 60 °C

### Type T3

#### Position 1: Basic Device

#### EE210-M1T3A6MB52SBL-10SBH50

Model: RH + T  
 Type: Remote probe  
 Output: 4 - 20 mA  
 Filter: Without  
 Display: Without  
 Output 1: Relative humidity  
 Scaling 1: Low: 0 %RH  
 High: 100 %RH  
 Output 2: Dew Point Temperature [°C]  
 Scaling 2: Low: -10 °C  
 High: 50 °C

#### Position 2: Remote Probe

#### PE210-M1F3KL150

Model: RH + T  
 Filter: Metal grid  
 Cable length: 1.5 m

### Type T13

#### Position 1:

#### EE210-M1T13A6F3SBL-40SBH60

Model: RH + T  
 Type: Outdoor  
 Output: 4 - 20 mA  
 Filter: Metal grid  
 Display: Without  
 Output 1: Relative humidity  
 Scaling 1: Low: 0 %RH  
 High: 100 %RH  
 Output 2: Temperature [°C]  
 Scaling 2: Low: -40 °C  
 High: 60 °C

#### Position 2:

#### HA010501

Radiation shield for EE210 Outdoor

## Accessories

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USB configuration adapter	HA011066
Product configuration software	EE-PCS (free download: <a href="http://www.epluse.com/ee210">www.epluse.com/ee210</a> )
Radiation shield for EE210 Outdoor (Type T13)	HA010501
Power supply adapter	V03 (see data sheet Accessories)
Protection cap for 12 mm probe	HA010783