E+E

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in sensor
technology.

Datasheet EE210

Humidity and Temperature Sensor for Demanding Climate Control

Modbus

BACnet

www.epluse.com

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.

EE210 duct mount (type T2)

EE210 with remote probe (type T3)

EE210 outdoor with radiation shield (type T13)

EE210 wall mount (type T1)

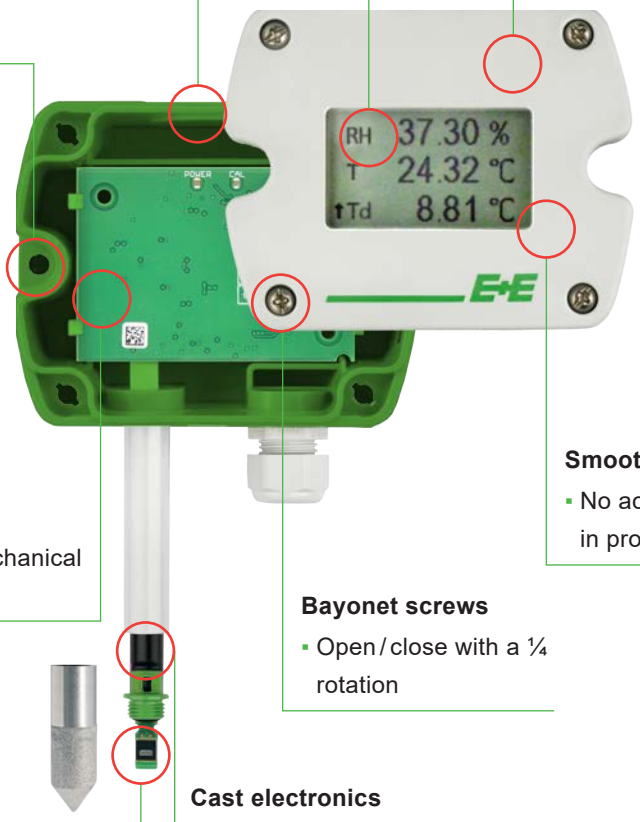
Features

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

Knockout for ½" conduit fitting (US)

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

Enclosure
- Protection rating IP65 / NEMA 4X
- Type T13 compatible with radiation shield H010501



Electronics on the underside of the PCB
- Optimum protection against mechanical damage during installation

Smooth cover surface
- No accumulation of dust in protruding edges

Bayonet screws
- Open / close with a ¼ 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

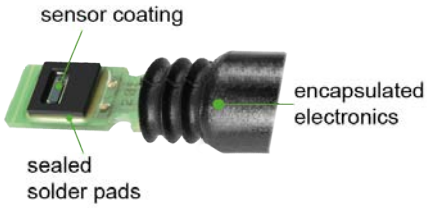
Watertight cable outlet

Inspection certificate
according DIN EN 10204-3.1

Features

Protective Sensor Coating

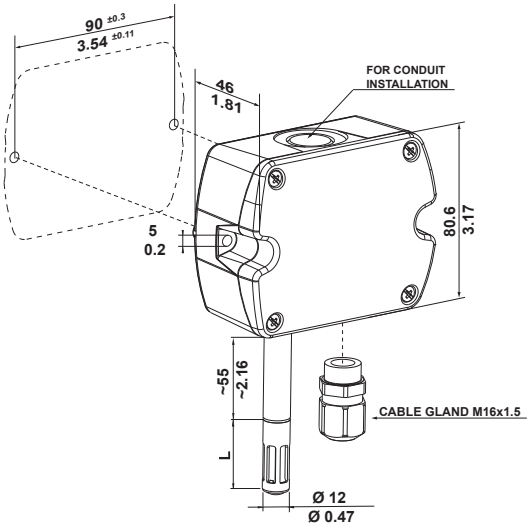
The E+E proprietary sensor coating is a protective layer applied to the active surface of the sensing element. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves the sensors'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



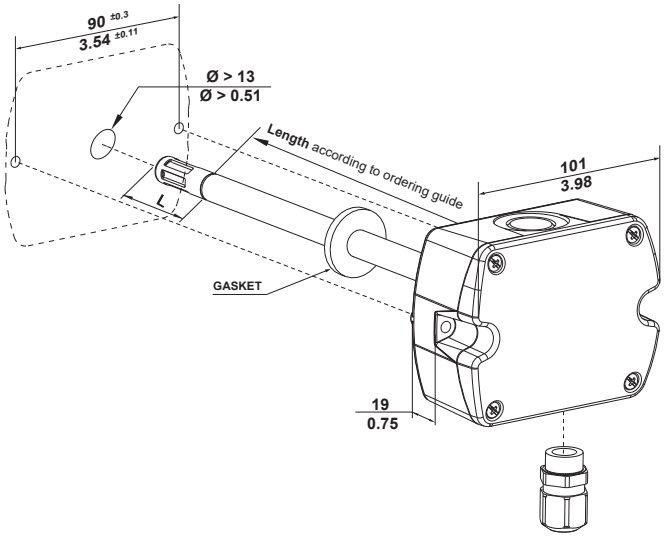
Dimensions

Values in mm (inch)

Type T1 (wall mount)



Type T2 (duct mount)

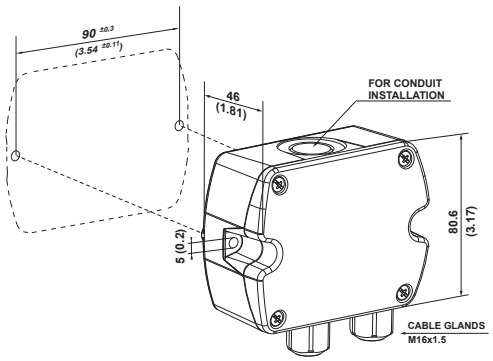


L = filter cap length	mm (inch)
Membrane	34 (1.4)
Stainless steel	33 (1.3)
Metal grid	33 (1.3)

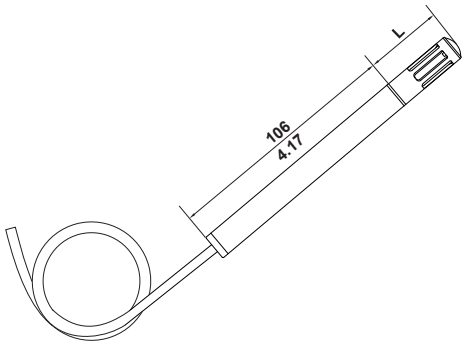
Dimensions

Values in mm / inch

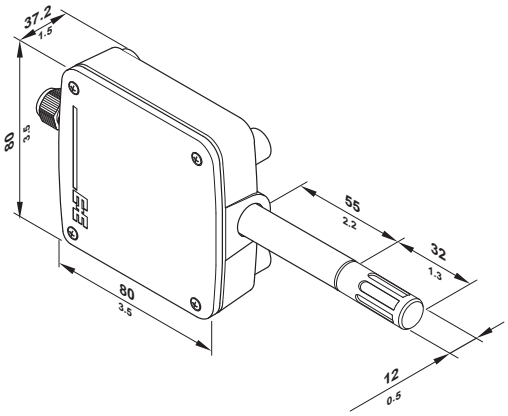
Type T3 (remote probe)



PE210

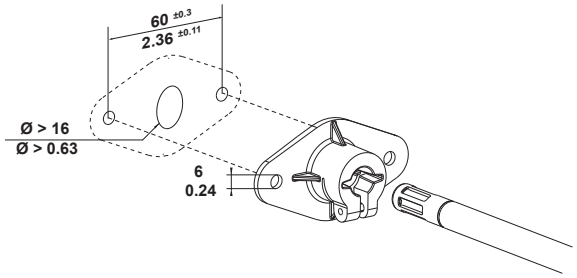


Type T13 (outdoor)



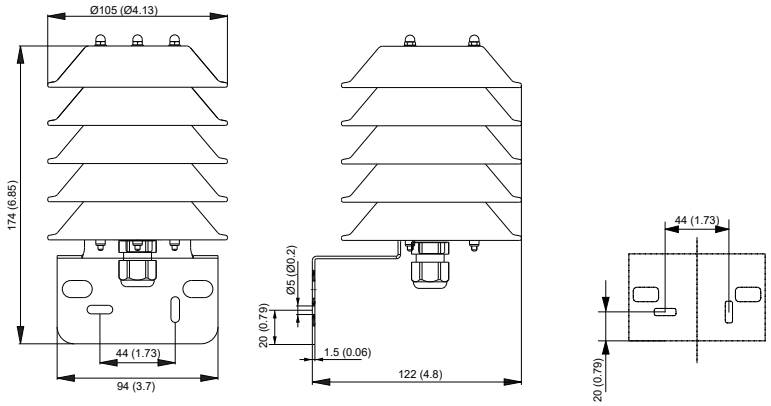
Mounting flange

in the scope of supply for type T2 and T3



Radiation shield HA010501 for type T13 (outdoor)

needs to be ordered separately



Technical Data

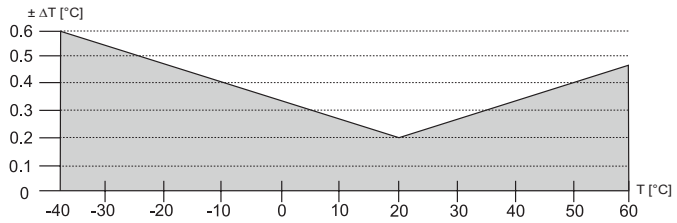
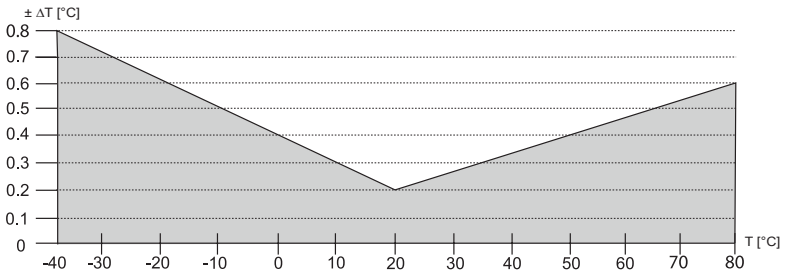
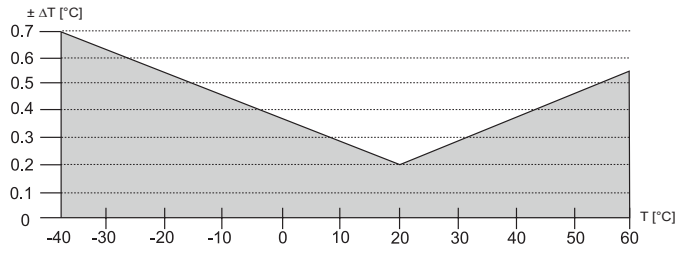
Measurands

Relative humidity (RH)

Measuring range	0...100 % RH
Accuracy[1)] incl. hysteresis, non-linearity and repeatability	
Type T1, T2	
-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	
@ 20 °C (68 °F)	±2.5 %RH
Type T13	
-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 (-40...+140 °F)	±(2.3 + 0.008*measured value) %RH

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).
For Type T13: @ 24 V DC and RL=250 Ω for A6 Versions.

Temperature (T)

Measuring range		
	Type T1, T2, T13	-40...+60 °C (-40...+140 °F)
	Type T3 (probe)	-40...+80 °C (-40...+176 °F)
	Type T3 (enclosure)	-40...+60 °C (-40...+140 °F)
Accuracy	**Type T1,T2**	
	Type T3	
	Type T13	

Technical Data

Measurands

Calculated measurands

		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^3	(gr/ft^3)
Specific enthalpy	h	-40	(-10)	500	(200)	kJ/kg	(BTU/lb)

Outputs

Analogue

Two freely selectable and scalable outputs	0 - 5 V / 0 - 10 V 4 - 20 mA (2-wire) 0 - 20 mA (3-wire)	-1 mA < I_L < 1 mA $R_L \leq 500\ \Omega$ $250 \leq R_L \leq 500\ \Omega$ recommended for type T13 $R_L \leq 500\ \Omega$	I_L = load current R_L = load resistance

Digital

Digital interface	RS485 (EE210 = 1 unit load)
Protocol **Factory settings** **Supported Baud rates** **Data types for measured values**	Modbus RTU Baud rate according to ordering guide, parity even, 1 stop bit, Modbus address 242 9600, 19200 and 38400 FLOAT32 and INT16
Protocol **Factory settings** **Supported Baud rates**	BACnet MS/TP Baud rate according to ordering guide, parity none, 1 stop bit, BACnet address 1 9600, 19200, 38400, 57600, 76800 and 115200

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Technical Data

General

Power supply class III USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	**4 - 20 mA (2-wire)**	(10 V + R_L * 20 mA) < V+ < 30 V DC for type T13: 24 V DC ±10 % recommended	
	0 - 5 V / 0 - 10 V **0 - 20 mA (3-wire)** **RS485**	15 - 35 V DC or 24 V AC ±20%	
Current consumption at 24 V	**Voltage output**	DC supply max. 12 mA AC supply max. 34 mA_{rms}	with display max. 23 mA with display max. 49 mA_{rms}
	Current output 2-wire	DC supply max. 40 mA	with display max. 40 mA
	Current output 3-wire	DC supply typ. 33 mA AC supply typ. 65 mA_{rms}	with display max. 44 mA with display max. 84 mA_{rms}
	Digital interface	DC supply typ. 5 mA AC supply typ. 15 mA_{rms}	with display max. 20 mA with display max. 35 mA_{rms}
Electrical connection	Screw terminals, max. 1,5 mm^2		
Cable gland	M16x1,5		
Display[1)]	Available for type T1 / T2 / T3 1, 2 or 3 lines, user configurable Optional with backlight		
Temperature ranges		**Without display**	**With display**
	Operation	-40...+60 °C (-40...+140 °F)	-20...+50 °C (-4...+122 °F)
		-40...+80 °C (-40...+176 °F) for probe PE210	-40...+80 °C (-40...+176 °F) for probe PE210
	Storage	-40...+60 °C (-40...+140 °F)	-20...+60 °C (-4...+140 °F)
Enclosure **Material** **Protection rating**	PC (Polycarbonate), UL94 V-0 (with display UL94 HB) 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		

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

Ordering Guide

	Feature	Description	Code			
			EE210-			
Hardware Configuration	**Model**	RH + T	M1			
	Type	Wall mount	T1			
		Duct mount		T2		
		Remote probe[1)]			T3	
		Outdoor				T13
	Probe length	50 mm (1.97")		L50		
		200 mm (7.84")		L200		
	Output	0 - 5 V	A2			
		0- 10 V	A3			A3
		0 - 20 mA (3-wire)	A5			
		4 - 20 mA (2-wire)	A6			A6
		RS485	J3			
	Filter	Membrane	F2			
		Metal grid	F3			F3
		Stainless steel sintered	F4			
	Display[2)]	Without display	No code			
		Without backlight[3)]	D1			
		With backlight[4)]	D2			
Setup Analogue Outputs	**Output 1 measurand**	Relative humidity RH [%]	No code			
		Temperature T [°C]	MA1			
		Temperature T [°F]	MA2			
		Other measurands (xx see measurand code)	MA*xx*			
	Output 1 scaling low	0	No code			
		Value	SAL*Value*			
	Output 1 scaling high	100	No code			
		Value	SAH*Value*			
	Output 2 measurand	Temperature T [°C]	No code			
		Temperature T [°F]	MB2			
		Other measurands (xx see measurand code)	MB*xx*			
	Output 2 scaling low	Value	SBL*Value*			
	Output 2 scaling high	Value	SBH*Value*			
Setup RS485	**Protocol**	Modbus RTU[5)]	P1			
		BACnet MS/TP[6)]	P3			
	Baud rate	9 600	BD5			
		19 200	BD6			
		38 400	BD7			
		57 600[7)]	BD8			
		76 800[7)]	BD9			
		115 200[7)]	BD10			
	Units	Metric (SI)	No code			
		Non metric (US/GB)	U2			

1) The PE210 probe has to be ordered as seperate 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.
6) Product Implementation Conformance Statement (PICS) available at www.epluse.com/ee210.
7) Only for BACnet MS/TP.

	Feature	Description	Code
			PE210-
HW-Configuration	**Model**	RH + T	M1
	Filter	Membrane	F2
		Metal grid	F3
		Stainless steel sintered	F4
	Connection cable length	1.5 m (4.9 ft)	KL150
		3 m (9.8 ft)	KL300

Measurand Code

For Output 1 and 2 in the Ordering Guide

Please note: no mix of SI / US units allowed.

Measurand		Unit	Code
			MA*xx* / MB*xx*
Relative humidity		%	10
Temperature		°C °F	1 2
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/m³ gr/ft³	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

Order Examples

Type T1 and T2

EE210-M1T1A3F2D2SBL-40SBH60

Feature	Code	Description
Model	M1	RH + T
Type	T1	Wall mount
Output	A3	0 - 10 V
Filter	F2	Membrane
Display	D2	With backlight
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 scaling low	No code	0 %RH
Output 1 scaling high	No code	100 %RH
Output 2 measurand	No code	Temperature T [°C]
Output 2 scaling low	SBL-40	-40 °C
Output 2 scaling high	SBH60	60 °C

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Order Examples

Type T3 Position 1: Basic Device

EE210-M1T3A6MB52SBL-10SBH50

Feature	Code	Description
Model	M1	RH + T
Type	T3	Remote probe
Output	A6	4-20 mA (2-wire)
Display	No code	Without display
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 scaling low	No code	0 %RH
Output 1 scaling high	No code	100 %RH
Output 2 measurand	MB52	Dew Point Temperature Td [°C]
Output 2 scaling low	SBL-10	-10 °C
Output 2 scaling high	SBH50	50 °C

Position 2: Remote Probe

PE210-M1F3KL150

Feature	Code	Description
Model	M1	RH + T
Filter	F3	Metal grid
Connection cable length	KL150	1,5 m (4.9 ft)

Type T13 Position 1:

EE210-M1T13A6F3SBL-40SBH60

Feature	Code	Description
Model	M1	RH + T
Type	T13	Outdoor
Output	A6	4 - 20 mA (2-wire)
Filter	F3	Metal grid
Display	No code	Without display
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 scaling low	No code	0 %RH
Output 1 scaling high	No code	100 %RH
Output 2 measurand	No code	Temperature T [°C]
Output 2 scaling low	SBL-40	-40 °C
Output 2 scaling high	SBH60	60 °C

Position 2:

HA010501

Radiation shield for EE210 Outdoor.

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Accessories

For further information see datasheet “Accessories”.

Accessories	Code
USB configuration adapter	**HA011066**
Product configuration software (Free download: www.epluse.com/configurator)	**EE-PCS**
Radiation shield for EE210 Outdoor (Type T13)	**HA010501**
Power supply adapter	**V03**
Protection cap for Ø12 mm probe	**HA010783**

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