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technology.

# + Datasheet EE212

## Modular Humidity and Temperature Sensor



# EE212

## Modular Humidity/Temperature Sensor

The EE212 humidity (RH) and temperature (T) sensor with interchangeable sensing module is optimized for demanding climate control applications in most various industries.

### Versatility

The EE212 is available for wall or duct mount as well as an outdoor version. It features two analogue outputs as well as RS485 interface with Modbus RTU protocol and optional graphic display. Besides the accurate RH and T measurement, the sensor calculates various humidity related parameters such as dew point temperature, absolute humidity and mixing ratio.

### Outstanding Reliability with Patented Sensor Technology

The E+E sensing element with proprietary coating, the wide choice of filter caps and the IP65/NEMA 4X enclosure ensure excellent long-term performance of EE212 even under challenging working conditions. Easy on-site replacement of the sensing module minimises the down-time for maintenance purposes in heavily polluted or aggressive environment.

### Interchangeable, Robust Sensing Module

The injection-moulded module inside the sensing head is mechanically highly stable and easy to handle. The sensing module with rapidX technology enables quick replacement without tools at any time, even during operation (hot-swap). The electronics inside the module is encapsulated and therefore best protected against condensation.

### User Configurable and Adjustable

The free PCS10 Product Configuration Software and an optional stick facilitate the configuration and adjustment of the EE212. The configuration includes the measurands assignment (two on the outputs and up to three on the display), the output scaling, RS485 interface settings and the display setup.



EE212 wall mounting (type T1)



EE212 duct mounting (type T2)



EE212 outdoor (type T13)

# Features

**Knockout for ½" conduit fitting (US)**

**External mounting holes**

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

**Enclosure**

- IP65/NEMA 4X
- Protection against contamination and condensation
- Minimal installation costs
- Type T13 compatible with radiation shield HA010501

**Display**

- Configurable display layout
- Measurands freely selectable

**Bayonet Screws**

- Open/close with a ¼ rotation

**Smooth cover surface**

- No accumulation of dust in protruding edges

**Electronics on the backside of the PCB**

- Optimum protection against mechanical damage during installation

**EE212M calibrated sensing module**

- State-of-the-art E+E RH/T sensing element with proprietary coating and sealed solder pads
- Patented sensor technology
- Quick exchange with rapidX technology
- Hot-swap capable
- High mechanical stability
- Easy handling

**Inspection certificate**  
according to DIN EN 10204-3.1

**Test report**  
according to DIN EN 10204-2.2

# Features

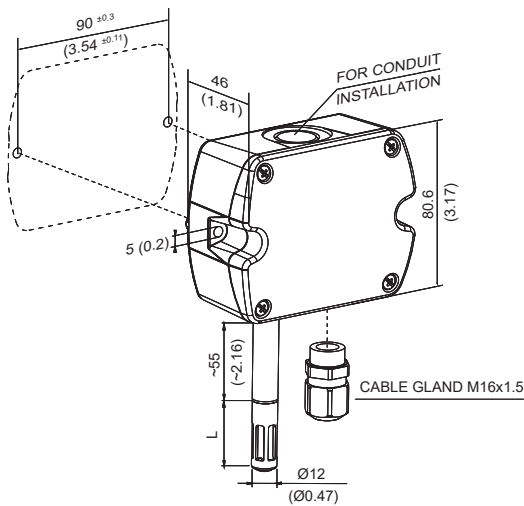
## Protective Sensor Coating

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.

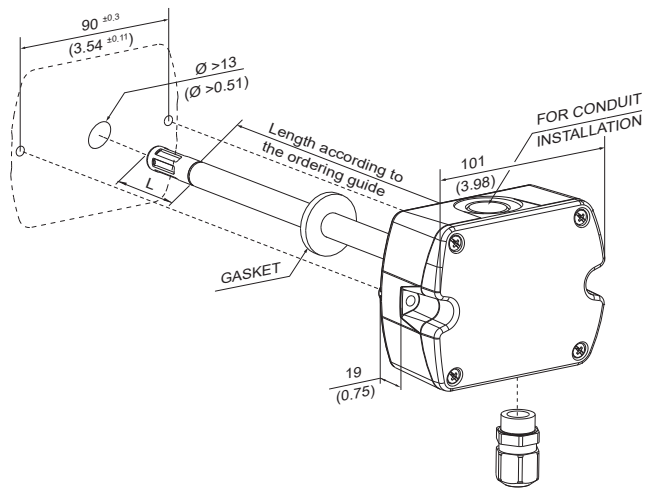
# Dimensions

Values in mm/inch

Type T1



Type T2

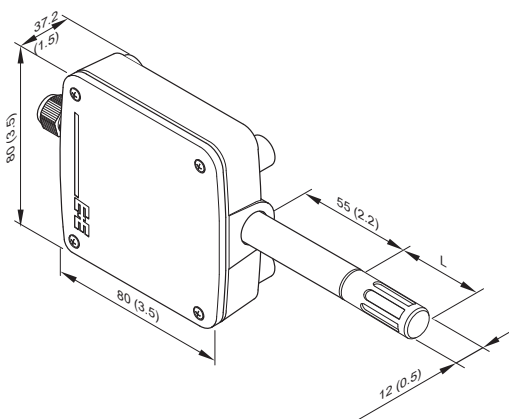


L = filter cap length	mm (inch)
Membrane	34 (1.4)
Stainless steel	33 (1.3)
Metal grid	33 (1.3)

# Dimensions

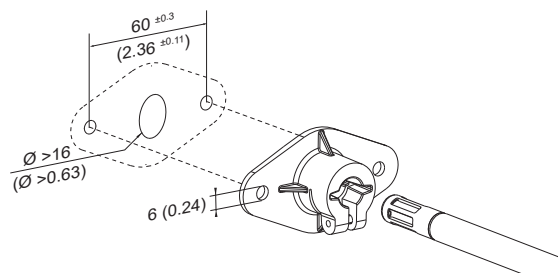
Values in mm/inch

## Type T13



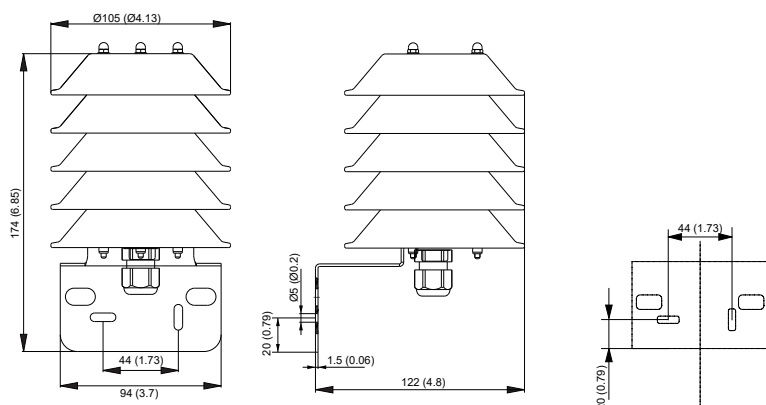
## Mounting flange

in the scope of supply for type T2



## Radiation shield HA010501 for type T13

needs to be ordered separately



# 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	$\pm(1.5 + 0.005 \cdot mv) \%RH$ $\pm(1.8 + 0.007 \cdot mv) \%RH$ Additional uncertainty $\pm 0.125 \%RH/^\circ C^2$	
	@ 23 °C (73 °F) -15...+60 °C (5...+140 °F) -40...-15 °C (-40...+5 °F)	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).  
 For Type T13: @ 24 V DC and RL=250 Ω for A6 Versions
- 2) Deviating from -15 °C (5 °F)

### Temperature (T)

<b>Measuring range</b>	-40...+60 °C (-40...+140 °F)
<b>Accuracy</b>	<p>The graph plots the 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 starts at 0.5 at -40°C, decreases to a minimum of 0.3 at 25°C, and then increases to 0.4 at 60°C. Dotted horizontal lines are drawn at each y-axis tick mark.</p>

### Calculated quantities

		from		up to		unit	
<b>Dew point temperature</b>	$T_d^{1)}$	-40	(-40)	60	(140)	°C	(°F)
<b>Frost point temperature</b>	$T_f^{2)}$	-40	(-40)	0	(32)	°C	(°F)
<b>Wet bulb temperature</b>	$T_w$	0	(32)	60	(140)	°C	(°F)
<b>Water vapour partial pressure</b>	$e$	0	(0)	200	(3)	mbar	(psi)
<b>Mixing ratio</b>	$r$	0	(0)	160	(1200)	g/kg	(gr/lb)
<b>Absolute humidity</b>	$dv$	0	(0)	150	(60)	$g/m^3$	(gr/ft <sup>3</sup> )
<b>Specific enthalpy</b>	$h$	-40	(-10)	500	(200)	kJ/kg	(BTU/lb)

- 1)  $T_d$  accuracy according to RH and T uncertainties, please use the [E+E Humidity Calculator](#) for details.  
 2) Equals  $T_d$  above 0 °C (32 °F).

# Technical Data

## Outputs




### Analogue

<b>Two freely selectable and scalable outputs</b>	0 - 5 V / 0 - 10 V 4 - 20 mA (2-wire)	-1 mA < I <sub>L</sub> < 1 mA R <sub>L</sub> ≤ 500 Ω 250 ≤ R <sub>L</sub> ≤ 500 Ω recommended for Type T13	I <sub>L</sub> = load current
	0 - 20 mA (3-wire)	R <sub>L</sub> ≤ 500 Ω	R <sub>L</sub> = load resistance

### Digital

<b>Digital interface</b>	RS485 (EE212 = 1 unit load)
<b>Protocol</b> <b>Factory settings</b> <b>Supported Baud rates</b> <b>Data types for measured values</b>	Modbus RTU Baud rate according to ordering guide, parity even, 1 stop bit, Modbus address 46 9600, 19200 and 38400 FLOAT32 and INT16

## General

<b>Power supply class III</b>  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	<b>4 - 20 mA (2-wire)</b>	(10 V + R <sub>L</sub> * 20 mA) < V+ < 30 V DC for Type T13: 24 V DC +/-10 % recommended	
	<b>0 - 5 V / 0 - 10 V</b> <b>0 - 20 mA (3-wire)</b> <b>RS485</b>	15 - 35 V DC or 24 V AC ±20%	
<b>Current consumption at 24 V</b>	<b>Voltage output</b>	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>
	<b>Current output 2-wire</b>	DC supply max. 40 mA	with display max. 40 mA
	<b>3-wire</b>	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>
	<b>Digital interface</b>	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>
<b>Electrical connection</b>	Screw terminals max. 1.5 mm <sup>2</sup>		
<b>Cable gland</b>	M16x1.5		
<b>Display<sup>1)</sup></b>	Available for Type T1/T2, 1, 2 or 3 lines, user configurable Optional 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>Enclosure</b>	<b>Material</b> <b>Protection rating</b>	PC (Polycarbonate), UL94 V-0 (with Display UL94 HB) approved IP65/NEMA 4X	
<b>Electromagnetic compatibility</b>	EN 61326-1:2013 FCC Part15 Class A	EN 61326-2-3:2013 ICES-003 Class A	Industrial environment
<b>Conformity</b>	 		

1) For display operation with EE212-xA6 (4 - 20 mA, 2-wire) both outputs must be connected.

# Ordering Guide

Feature	Description	Code			
		<b>EE212-</b>			
<b>Hardware Configuration</b>	<b>Type</b>	Wall mount	<b>T1</b>		
		Duct mount		<b>T2</b>	
		Outdoor		<b>T13</b>	
	<b>Probe length</b>	50 mm (2")		<b>L50</b>	
		200 mm (4")		<b>L200</b>	
	<b>Output</b>	0 - 5 V		<b>A2</b>	
		0 - 10 V		<b>A3</b>	<b>A3</b>
		0 - 20 mA (3-wire)		<b>A5</b>	
		4 - 20 mA (2-wire)		<b>A6</b>	<b>A6</b>
	<b>Filter</b>	Membrane		<b>F2</b>	
Metal grid			<b>F3</b>	<b>F3</b>	
Stainless steel sintered			<b>F4</b>		
<b>Display<sup>1)</sup></b>	Without display		<b>No code</b>	<b>No code</b>	
	Without backlight <sup>2)</sup>		<b>D1</b>		
	With backlight <sup>3)</sup>		<b>D2</b>		
<b>Setup Analogue Outputs</b>	<b>Output 1 measurand</b>	Relative humidity RH [%]		<b>No code</b>	
		Temperature T [°C]		<b>MA1</b>	
		Temperature T [°F]		<b>MA2</b>	
		Other measurand (xx see measurand code)		<b>MAxx</b>	
	<b>Output 1 scaling low</b>	0		<b>No code</b>	
		Value		<b>SALValue</b>	
	<b>Output 1 scaling high</b>	100		<b>No code</b>	
		Value		<b>SAHValue</b>	
	<b>Output 2 measurand</b>	Temperature T [°C]		<b>No code</b>	
		Temperature T [°F]		<b>MB2</b>	
		Other measurand (xx see measurand code)		<b>MBxx</b>	
	<b>Output 2 scaling low</b>	-40		<b>No code</b>	
Value			<b>SBLValue</b>		
<b>Output 2 scaling high</b>	60		<b>No code</b>		
	Value		<b>SBHValue</b>		
<b>RS485 Setup</b>	<b>Protocol</b>	Modbus RTU <sup>4)</sup>	<b>P1</b>		
	<b>Baud rate</b>	9600		<b>BD5</b>	
		19200		<b>BD6</b>	
		38400		<b>BD7</b>	
	<b>Units</b>	Metric (SI)		<b>No code</b>	
Non-metric (US/GB)			<b>U2</b>		

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

2) Not with output A5.

3) Not with output A6.

4) Modbus Map and setup instructions: See User Guide and Modbus Application Note at [www.epluse.com/ee212](http://www.epluse.com/ee212).



# Measurand Code

For Output 1 and 2 in the Ordering Guide

Measurand	Unit	Code
		<b>MAxx / MBxx</b>
Temperature	T °C °F	<b>1</b> <b>2</b>
Relative humidity	%	<b>10</b>
Water vapour partial pressure	e mbar psi	<b>50</b> <b>51</b>
Dew point temperature	Td °C °F	<b>52</b> <b>53</b>
Wet bulb temperature	Tw °C °F	<b>54</b> <b>55</b>
Absolute humidity	dv g/m <sup>3</sup> gr/ft <sup>3</sup>	<b>56</b> <b>57</b>
Mixing ratio	r g/kg gr/lb	<b>60</b> <b>61</b>
Specific enthalpy	h kJ/kg BTU/lb	<b>62</b> <b>64</b>
Frost point temperature	Tf °C °F	<b>65</b> <b>66</b>

# Order Example

EE212-T2L200J3F4P1BD7

Feature	Code	Description
Type	<b>T2</b>	Duct mount
Probe length	<b>L200</b>	200 mm (4")
Output	<b>J3</b>	RS485
Filter	<b>F4</b>	Stainless steel sintered
Display	<b>No code</b>	Without display
Protocol	<b>P1</b>	Modbus RTU
Baud rate	<b>BD7</b>	38400
Units	<b>No code</b>	Metric (SI)

# Order Example

## EE212-T1A6F2D1MB60SBL0SBH400

Feature	Code	Description
Type	T1	Wall mount
Output	A6	4 - 20 mA
Filter	F2	Membrane
Display	D1	Without 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	MB60	Mixing ratio [g/kg]
Output 2 scaling low	SBL0	0 g/kg
Output 2 scaling high	SBH400	400 g/kg

# Ordering Guide Sensing Module

Feature	Description	Code
Packaging		EE212M-
	Single packed	PK4
	Multipackage (Tray) <sup>1)</sup>	PK6

1) Minimum order quantity: 10 pcs

# Order Example Sensing Module

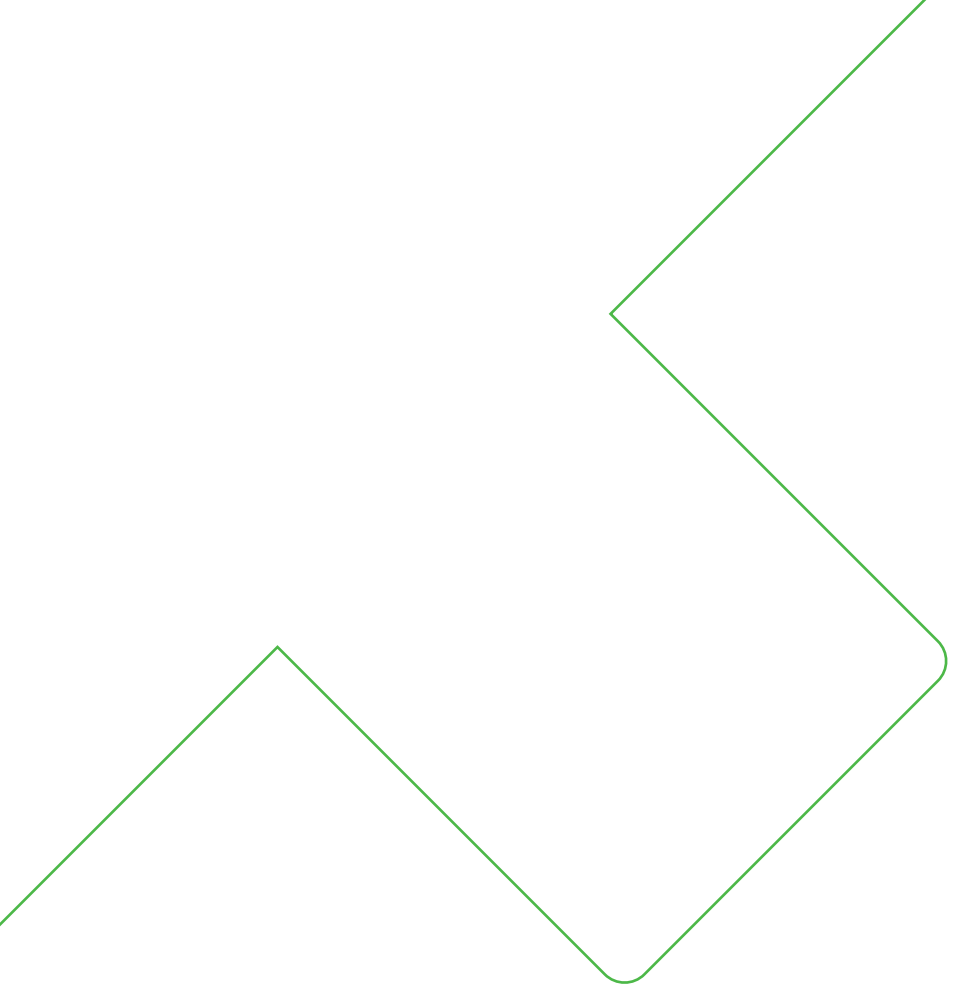
## EE212M-PK4

Feature	Code	Description
Packaging	PK4	Single packed

# Accessories

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

Description	Code
USB-C configuration stick	HA011070
PCS10 Product Configuration Software (free download: <a href="http://www.epluse.com/pcs10">www.epluse.com/pcs10</a> )	PCS10
Radiation shield for EE212 Outdoor (Type T13)	HA010501
Power supply adapter	V03
Protection cap for Ø12 mm probe	HA010783



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