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# + Datasheet EE310

## High-End Humidity and Temperature Sensor for Industrial Applications



# EE310

## High-End Humidity and Temperature Sensor for Industrial Applications

The EE310 is optimized for best reliability in industrial applications from -80 °C (-112 °F) up to 180 °C (356 °F) and 20 bar (290 psi). In addition to highly accurate measurement of the relative humidity (RH) and temperature (T), the device calculates all other humidity related parameters.

### Measurement Performance

The EE310 employs high-end E+E humidity sensing elements manufactured in state-of-the-art thin film technology, which enable the outstanding measurement accuracy.

### Long-Term Stability

The E+E proprietary coating protects the sensing elements against corrosive and electrically conductive pollution, which leads to outstanding long-term stability even in harsh environment. With the selection of the appropriate filter cap, the EE310 tackles even challenging industrial applications.

### Versatility

The EE310 is available for wall or duct mount as well as with remote probe. It features an IP65/NEMA 4X polycarbonate or stainless steel enclosure which facilitates installation and maintenance. The enclosure can accommodate a 100 - 240 V AC supply unit or various interface modules.

### Display and Outputs

The measured data is available on two analogue outputs and on the RS485 (Modbus RTU) or Ethernet-PoE (Modbus TCP) interface. The TFT colour display shows up to four measurands simultaneously and offers extensive setup and diagnosis features. The data logging function saves up to 20 000 measured values for each physical quantity. The logged data can be displayed graphically directly on the device or easily downloaded over the USB interface.

### Configurable and Adjustable

The configuration and the RH and T adjustment of the EE310 can be performed either using the display and the push buttons or with the free EE-PCS Product Configuration Software via the USB interface.



Stainless steel enclosure for wall mounting



Polycarbonate enclosure for duct mounting

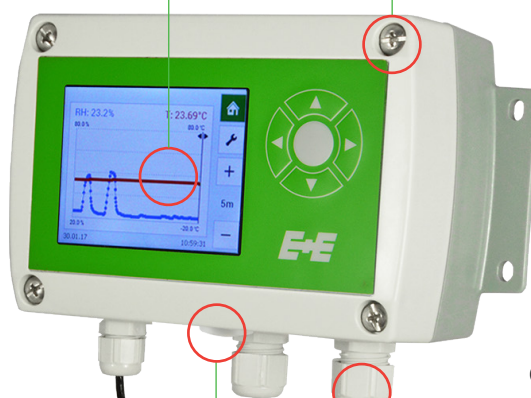
# Features

## 3.5" TFT colour display

- Shows up to 4 measurands simultaneously
- Layout and measurands freely selectable
- Data logger for 20 000 values per measurand
- Logged data shown graphically
- Diagnosis functions
- Intuitive device setup with push buttons

## Enclosure

- IP65/NEMA 4X protection rating
- Polycarbonate or stainless steel
- Easy mounting and service



## USB service interface

- Configuration, adjustment and firmware update
- Download logged data
- 4 status LEDs

## Outputs

- 2 analogue outputs current / voltage
- Error indication according to NAMUR
- Modbus RTU / Modbus TCP
- Configurable via display or software



## Probe

- Working range from -80 °C (-112 °F) up to +180 °C (+356 °F) and 20 bar (290 psi)
- Protective coating for sensing elements
- Pluggable versions available

## Inspection certificate

According to DIN EN 10204-3.1

# Features

## Protective Sensor Coating

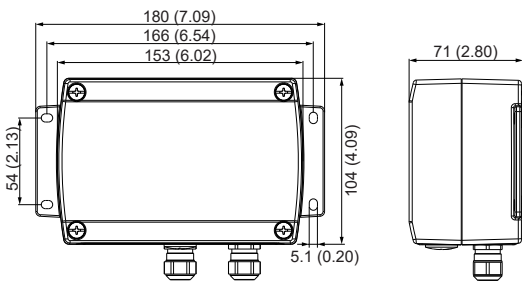
The E+E proprietary sensor coating is a protective layer applied to the sensing elements, their leads and soldering points. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves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

# Dimensions

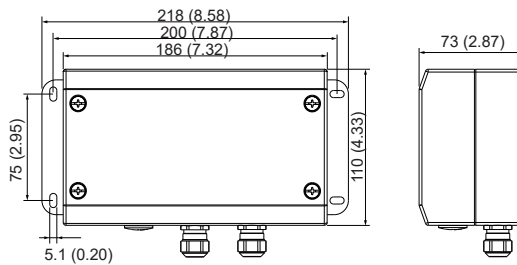
Values in mm (inch)

## Enclosure

Polycarbonate

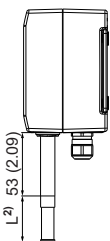


Stainless steel

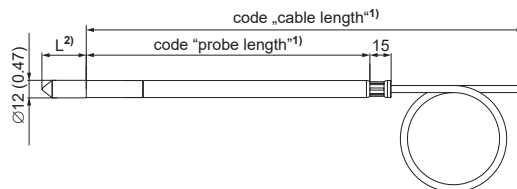


## Types

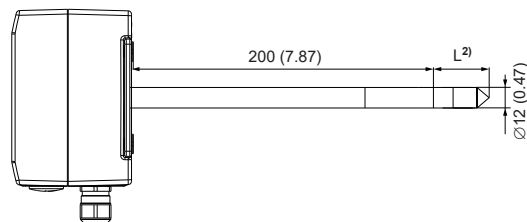
T1: Wall mount



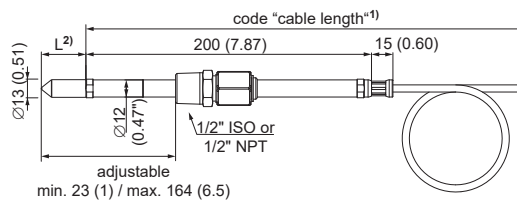
T5: Remote probe up to 180 °C (356 °F)



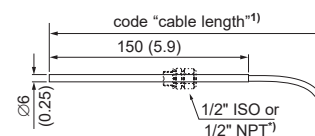
T2: Duct mount



T10: Pressure tight probe up to 20 bar (300 psi)



T24: T only remote probe (M3)



1) Refer to ordering guide  
2) L = filter length; refer to data sheet Accessories

\* Not included in the scope of supply:  
1/2" ISO Ø 6 mm HA011104  
1/2" NPT Ø 6 mm HA011105

# 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	-15...+40 °C (5...104 °F) RH ≤90 % ± (1.3 + 0.3 % * mv) %RH -15...+40 °C (5...104 °F) RH >90 % ± 2.3 %RH -25...+70 °C (-13...+158 °F) ± (1.4 + 1 % * mv) %RH -40...+180 °C (-40...+356 °F) ± (1.5 + 1.5 % * mv) %RH	
<b>Temperature dependence of electronics, typ.</b>	±0.01 % RH / °C (0.0055 %RH / °F)	
<b>Response time t<sub>90</sub></b> with metal grid filter at 20 °C (68 °F)	<15 s	

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 model T1 the accuracy data is valid only for air speed higher than 0.2 m/s.

### Temperature (T)

<b>Measuring range</b>	T1, wall mount T2, duct mount T5, remote probe T10, pressure tight probe T24, T only remote probe	-40...+60 °C (-40...+140 °F) -40...+80 °C (-40...+176 °F) -40...+180 °C (-40...+356 °F) -40...+180 °C (-40...+356 °F) -80...+180 °C (-112...+356 °F)
<b>Accuracy<sup>1)</sup></b>	± ΔT [°C]	
<b>Temperature dependence of electronics, typ.</b>	±0,001 °C / °C	

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 model T1 the accuracy data is valid only for air speed higher than 0.2 m/s.

### Calculated Parameters

	from	up to			unit
		EE310-T1	EE310-T2	EE310-T5, T10	
<b>Dew point temperature</b>	Td	-40 (-40)	60 (140)	80 (176) 100 (212)	°C (°F)
<b>Frost point temperature</b>	Tf	-40 (-40)	0 (32)	0 (32) 0 (32)	°C (°F)
<b>Wet bulb temperature</b>	Tw	0 (32)	60 (140)	80 (176) 100 (212)	°C (°F)
<b>Water vapour partial pressure</b>	e	0 (0)	200 (3)	500 (7.5) 1100 (15)	mbar (psi)
<b>Mixing ratio</b>	r	0 (0)	425 (2900)	999 (9999) 999 (9999)	g/kg (gr/lb)
<b>Absolute humidity</b>	dv	0 (0)	150 (60)	300 (120) 700 (300)	g/m <sup>3</sup> (gr/ft <sup>3</sup> )
<b>Specific enthalpy</b>	h	0 (0)	400 (180)	1000 (450) 2800 (1250)	kJ/kg (BTU/lb)

# Technical Data

## Outputs




### Analogue

Two analogue outputs freely selectable and scalable	0 - 1 / 5 / 10 V		-1 mA < I <sub>L</sub> < 1 mA	I <sub>L</sub> = load current R <sub>L</sub> = load resistance
	4 - 20 mA	3-wire	R <sub>L</sub> < 500 Ohm	
	0 - 20 mA	3-wire	R <sub>L</sub> < 500 Ohm	

### Digital

Digital interface Protocol	RS485 (EE310 = 1 unit load)
Factory settings	Modbus RTU
Supported Baud rates	9600 Baud, parity even, 1 stop bit, Modbus address 231
Digital interface Protocol	Ethernet-PoE
Digital interface Protocol	Modbus TCP

## General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	8 - 35 V DC      12 - 30 V AC 100 - 240 V AC, 50/60 Hz mit Option AM3 <sup>1)</sup>
Current consumption, (typ.) @ 24 V DC/AC  2 voltage outputs 2 current outputs with display additionally with Ethernet additionally	15 mA / 40 mA <sub>rms</sub> 35 mA / 100 mA <sub>rms</sub> 50 mA / 150 mA <sub>rms</sub> 30 mA / 90 mA <sub>rms</sub>
Electrical connection	Screw terminals max. 1.5 mm <sup>2</sup> (AWG 16)
Cable glands for polycarbonate enclosure for metal enclosure	M16x1.5, for cable Ø3...7 mm (0.12...0.28") M16x1.5, for cable Ø4.5...10 mm (0.18...0.39")
Pressure range for pressure tight probe	0.01...20 bar (0.15...300 psi)
Temperature range  Operation Storage	-40...+60 °C (-40...+140 °F) without display -20...+50 °C (-4...+122 °F) with display
Probe  Material Protection rating, probe body	Stainless steel 1.4404 / AISI 316L IP65
Enclosure  Material Protection rating	Polycarbonate, UL94 V-0 approved or Stainless steel 1.4404 / AISI 316 L IP65/NEMA 4X
Electromagnetic compatibility	EN 61326-1      EN 61326-2-3      Industrial Environment FCC Part15 ClassA      ICES-003 ClassA
Conformity	 

1) Appropriate for outdoor use, wet location, degree of pollution 2, overvoltage category II, altitude up to 3000 m (9843 ft)

# Ordering Guide

Feature	Description	Code					
		<b>EE310-</b>					
<b>Model</b>	RH + T T	No code				M3	
<b>Type</b>	Wall mount	T1					
	Duct mount		T2				
	Remote probe up to 180 °C (356 °F)			T5			
	Pressure tight probe up to 20 bar (300 psi)				T10		
	T only, remote probe Ø6 mm (0.25")					T24	
<b>Enclosure material</b>	Polycarbonate (PC)	No code	No code	No code	No code	No code	
	Stainless steel	HS2		HS2	HS2	HS2	
<b>Filter</b>	No filter					F0	
	Stainless steel sintered	No code	No code	No code	No code		
	Polytetrafluoroethylene (PTFE)	F5	F5	F5			
	Stainless steel - metal grid (up to 180 °C / 356 °F)	F9	F9	F9	F9		
<b>Probe cable length</b> (incl. probe length)	2 m (6.6 ft)			No code	No code	No code	
	5 m (16.4 ft)			K5	K5	K5	
	10 m (32.8 ft)			K10	K10		
	20 m (65.6 ft)			K20	K20		
<b>Probe length</b>	65 mm (2.55")			L65			
	150 mm (5.91")					L150	
	200 mm (7.84")			No code	No code		
	400 mm (15.75")			L400	L400		
<b>Process connection</b>	G1/2" ISO - sliding fitting, Ø13 mm (0.51")					PA23	
	1/2" NPT - sliding fitting, Ø13 mm (0.51")					PA25	
<b>Electrical connection</b>	Standard <sup>1)</sup>	No code	No code	No code	No code	No code	
	1 x plug for power supply and outputs	E4	E4	E4	E4	E4	
	2 x plugs for power supply + outputs and for RS485 (requires option J3)	E6	E6	E6	E6	E6	
<b>Optional features</b>	3.5" TFT display with integrated data logger	D2	D2	D2	D2	D2	
	RS485 module - Modbus RTU	J3	J3	J3	J3	J3	
	Ethernet-PoE with Modbus TCP <sup>2)3)</sup>		J4	J4	J4	J4	
	Pluggable probe <sup>2)</sup>			PC4	PC4		
	Sensor coating	C1	C1	C1	C1		
	Integrated power supply 100 - 240 V AC, 50/60 Hz <sup>3)4)</sup>	AM3	AM3	AM3	AM3	AM3	
<b>Setup Analogue Outputs</b>	<b>Output 1 measurand</b>	Relative humidity RH [%]	No code				
		Temperature T [°C]			MA1		MA1
		Temperature T [°F]			MA2		MA2
		Other measurands (xx see measurand code)			MAxx		
	<b>Output 1 signal<sup>5)</sup></b>	0 - 1 V			GA1		
		0 - 5 V			GA2		
		0 - 10 V			GA3		
		0 - 20 mA			GA5		
		4 - 20 mA			GA6		
	<b>Output 1 scaling low</b>	0			No code		
		Value			SALValue		
	<b>Output 1 scaling high</b>	100			No code		
		Value			SAHValue		
	<b>Output 2 measurand</b>	Temperature T [°C]			No code		
		Temperature T [°F]			MB2		
		Other measurands (xx see measurand code)			MBxx		
	<b>Output 2 signal<sup>5)</sup></b>	0 - 1 V			GB1		
0 - 5 V				GB2			
0 - 10 V				GB3			
0 - 20 mA				GB5			
4 - 20 mA				GB6			
<b>Output 2 scaling low</b>	Value			SBLValue			
<b>Output 2 scaling high</b>	Value			SBHValue			

- 1) Standard = 2 x M16 cable glands, except for AM3 option: 2 plugs for power supply and outputs
- 2) Only with polycarbonate enclosure
- 3) Combination of Ethernet module (J4) and integrated power supply (AM3) is not possible
- 4) With electrical connection standard only (no other plug options possible)
- 5) Both analogue outputs shall be either voltage or current

# Measurand Code

For Output 1 and 2 in the Ordering Guide

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



Please note: no mix of SI/US units allowed

# Order Example

**EE310-T5D2J3C1GA3GB3SBL-40SBH180**

Feature	Code	Description
Model	No code	RH + T
Type	<b>T5</b>	Remote probe up to 180 °C (356 °F)
Enclosure material	No code	Polycarbonate (PC)
Filter	No code	Stainless steel sintered
Probe cable length	No code	2 m (6.6")
Probe length	No code	200 mm (7.87")
Electrical connection	No code	Standard
Optional features	<b>D2</b> <b>J3</b> <b>C1</b>	Display with integrated data logger RS485 module - Modbus RTU Sensor coating
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 signal	<b>GA3</b>	0 - 10 V
Output 1 scaling low	No code	0
Output 1 scaling high	No code	100
Output 2 measurand	No code	Temperature T [°C]
Output 2 signal	<b>GB3</b>	0 - 10 V
Output 2 scaling low	<b>SBL-40</b>	-40
Output 2 scaling high	<b>SBH180</b>	180

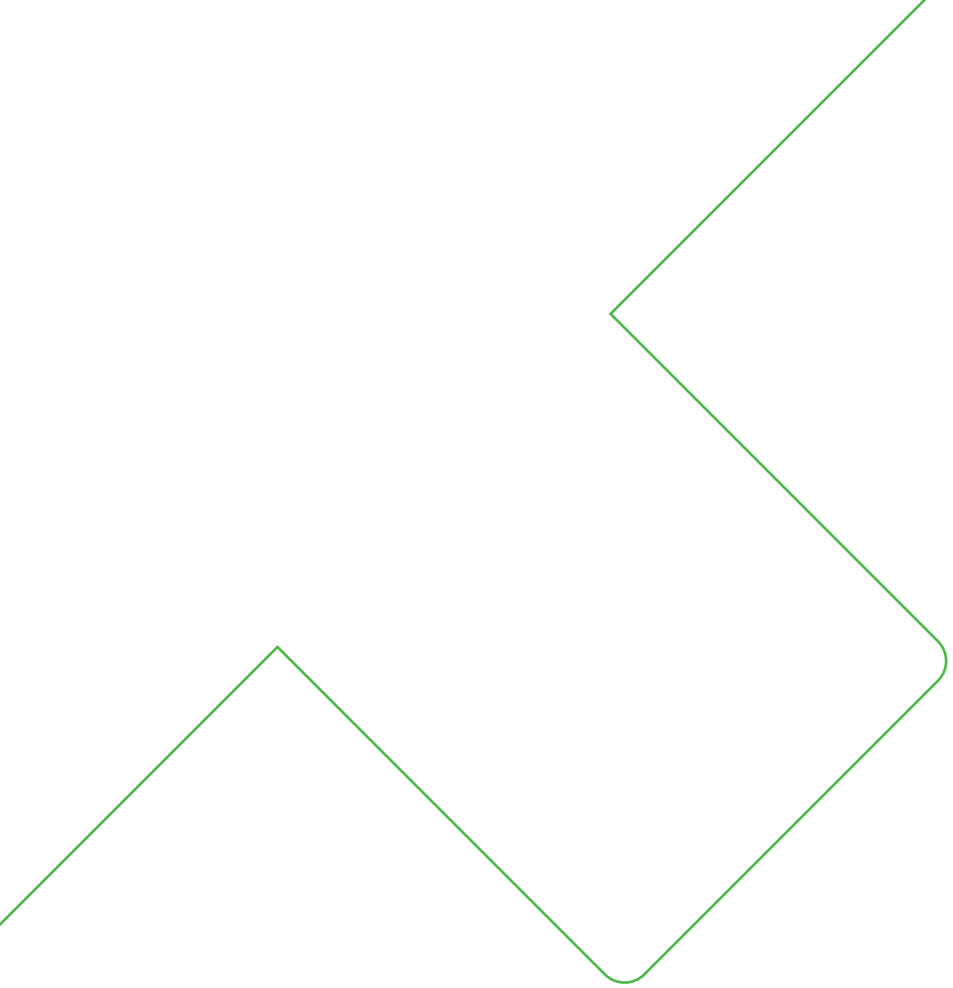


# Accessories

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

Description		Code
Mounting flange stainless steel		HA010201
Drip water protection		HA010503
Bracket for installation onto mounting rails <sup>1)</sup>		HA010203
Mounting bracket for remote probe		HA010211
Humidity calibration kit		See data sheet <a href="#">Humidity Calibration Kit</a>
Stainless steel wall mounting clip Ø12 mm (0.5")		HA010225
Mounting flange stainless steel (Ø6 mm/0.25",T24)		HA010207
Pressure tight screw connectors Ø6 mm (0.25") (T24)	1/2" ISO	HA011104
	1/2" NPT	HA011105
Immersion well, stainless steel Ø6x135 mm (0.25 x 5.4")	1/2" ISO	HA400202
	1/2" NPT	HA400212

1) For polycarbonate enclosure only. Two pieces are necessary for each EE310.



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