

+ 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 VAC 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 E+E PCS10 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

Outputs

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

USB service interface

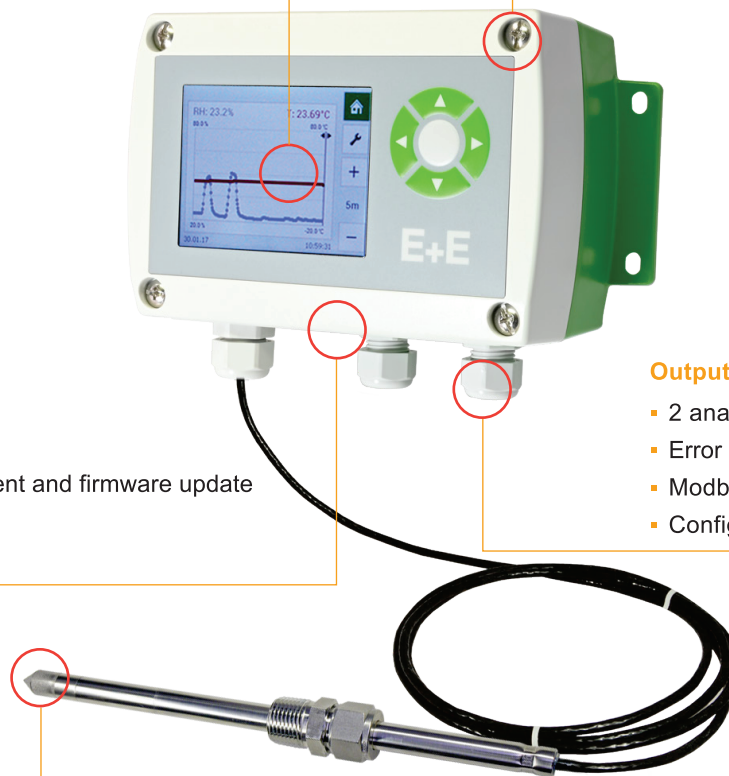
- Configuration, adjustment and firmware update
- Download logged data
- 4 status LEDs

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

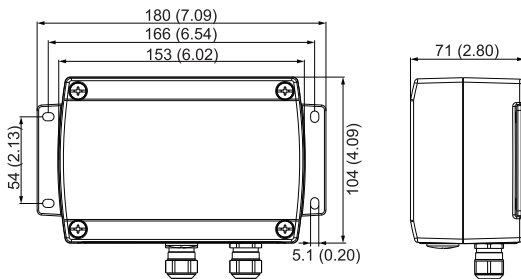
The E+E proprietary sensor coating is a protective layer applied to the sensing elements, their leads and soldering points. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves 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

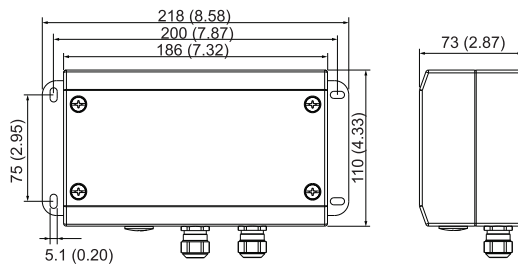
Values in mm (inch)

Enclosure

Polycarbonate

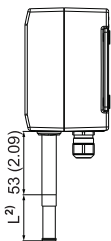


Stainless steel

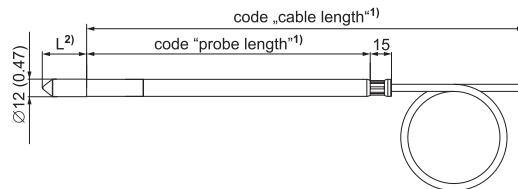


Types

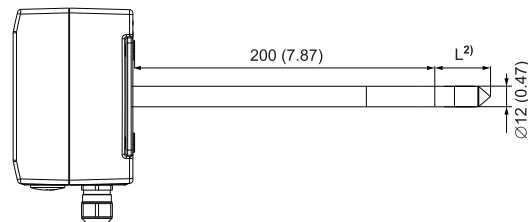
T1: Wall mount



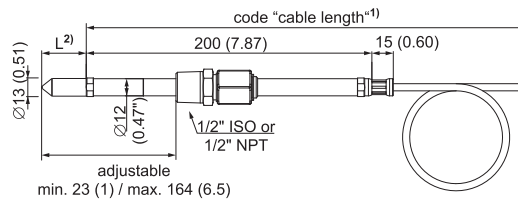
T5: Remote probe up to 180 °C (356 °F)



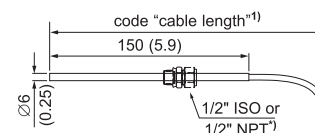
T2: Duct mount



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

³⁾ 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)

Measuring range	0...100 %RH
Accuracy ¹⁾ , incl. hysteresis, non-linearity and repeatability	$\pm(0.95 + 0.0013 \cdot mv) \%RH$ $\pm 1.8 \%RH$ $\pm(1.05 + 0.0084 \cdot mv) \%RH$ $\pm(1.15 + 0.013 \cdot mv) \%RH$
Factory calibration uncertainty ²⁾	$\pm(0.7 + 0.003 \cdot mv) \%RH$ $\pm 1 \%RH$
Temperature dependency of electronics, typ.	$\pm 0.01 \% RH / ^\circ C$ ($0.0056 \%RH / ^\circ F$)
Response time t_{90} with metal grid filter at 20 °C (68 °F)	<15 s

1) Defined against E+E calibration reference.

2) Defined at 23 °C with an enhancement factor k=2, corresponding to a confidence level of 95 %.

Temperature (T)

Measuring range	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)
Accuracy ¹⁾		
Factory calibration uncertainty ²⁾ @ 23 °C (73 °F)	$\pm 0.05 ^\circ C$	
Temperature dependence of electronics, typ.	$\pm 0.001 ^\circ C / ^\circ C$	

1) Defined against E+E calibration reference.

2) Defined at 23 °C with an enhancement factor of k=2, corresponding to a confidence level of 95 %.

Calculated Quantities

		from		up to						unit	
				EE310-T1		EE310-T2		EE310-T5, T10			
Dew point temperature	Td	-40	(-40)	60	(140)	80	(176)	100	(212)	°C	(°F)
Frost point temperature	Tf	-40	(-40)	0	(32)	0	(32)	0	(32)	°C	(°F)
Wet bulb temperature	Tw	0	(32)	60	(140)	80	(176)	100	(212)	°C	(°F)
Water vapour partial pressure	e	0	(0)	200	(3)	500	(7.5)	1100	(15)	mbar	(psi)
Mixing ratio	r	0	(0)	425	(2900)	999	(9999)	999	(9999)	g/kg	(gr/lb)
Absolute humidity	dv	0	(0)	150	(60)	300	(120)	700	(300)	g/m³	(gr/ft³)
Specific enthalpy	h	0	(0)	400	(180)	1000	(450)	2800	(1250)	kJ/kg	(BTU/lb)

Technical Data

Outputs

Analogue

Two freely selectable and scalable analogue outputs	0 - 1 / 5 / 10 V 0 - 20 mA / 4 - 20 mA (3-wire) Both outputs have the same electrical quantity (voltage, current)	-1 mA < I_L < 1 mA R_L < 500 Ω	I_L = load current R_L = load resistance
Accuracy @ 23 °C (68 °F)	±0.05 % FS	FS = full scale (20 mA, 10 V)	
Temperature dependency¹⁾	±0.005 % FS/°C	FS = full scale (20 mA, 10 V)	

1) Deviating from 23 °C (68 °F), defined at 12 mA or 5 V, respectively.

Digital

Digital interface Protocol Factory settings Supported Baud rates Measured data types	Option J3	RS485 (EE310 = 1 unit load) Modbus RTU 9600 Baud, parity even, 1 stop bit, Modbus address 231 9600, 19200, 38400, 57600 and 76800 FLOAT32 and INT16
Digital interface Protocol	Option J4	Ethernet-PoE 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 ¹⁾		
Current consumption, (typ.) @ 24 V DC/AC 2 voltage outputs 2 current outputs with display additionally with Ethernet additionally	15 mA / 40 mA _{rms} 35 mA / 100 mA _{rms} 50 mA / 150 mA _{rms} 30 mA / 90 mA _{rms}		
Electrical connection	Screw terminals max. 1.5 mm ² (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 FCC Part15 ClassA	EN 61326-2-3 ICES-003 ClassA	Industrial Environment
Conformity	 		
Configuration software	E+E PCS10 Product Configuration Software Free download from www.epluse.com/pcs10		

1) Degree of pollution 2, overvoltage category II, altitude up to 3000 m (9843 ft).

Ordering Guide

Feature	Description	Code				
Hardware Configuration		EE310-				
	Model	No code				M3
	Type	T1	T2	T5	T10	T24
	Wall mount					
	Duct mount					
	Remote probe up to 180 °C (356 °F)					
	Pressure-tight probe up to 20 bar (300 psi)					
	T only, remote probe Ø6 mm (0.25")					
	Enclosure material	No code	No code	No code	No code	No code
	Polycarbonate (PC)	HS2		HS2	HS2	HS2
	Stainless steel					
	Filter	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	
Setup Analogue Outputs	Probe cable length (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	
	Probe length	65 mm (2.55")		L65		
	150 mm (5.91")					L150
	200 mm (7.84")			No code	No code	
	400 mm (15.75")			L400	L400	
	Process connection	G1/2" ISO - sliding fitting, Ø13 mm (0.51")			PA23	
	1/2" NPT - sliding fitting, Ø13 mm (0.51")				PA25	
	Electrical connection	Standard ¹⁾	No code	No code	No code	No code
	1 x plug for power supply and outputs		E4	E4	E4	E4
	2 x plugs for power supply + outputs and for RS485 (requires option J3)		E6	E6	E6	E6
	Optional features	3.5" TFT display with integrated data logger	D2	D2	D2	D2
	RS485 module - Modbus RTU		J3	J3	J3	J3
	Ethernet-PoE with Modbus TCP ²⁾³⁾		J4	J4	J4	J4
	Pluggable probe ²⁾			PC4	PC4	
	Sensor coating		C1	C1	C1	
	Integrated power supply 100 - 240 V AC, 50/60 Hz ³⁾⁴⁾		AM3	AM3	AM3	AM3
	Output 1 measurand	Relative humidity RH [%]	No code			
	Temperature T [°C]		MA1			
	Temperature T [°F]		MA2			
	Other measurands (xx see measurand code)		MAxx			
	Output 1 signal ⁵⁾	0 - 1 V	GA1			
	0 - 5 V		GA2			
	0 - 10 V		GA3			
	0 - 20 mA		GA5			
	4 - 20 mA		GA6			
	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)		MBxx			
	Output 2 signal ⁵⁾	0 - 1 V	GB1			
	0 - 5 V		GB2			
	0 - 10 V		GB3			
	0 - 20 mA		GB5			
	4 - 20 mA		GB6			
	Output 2 scaling low	Value	SBLValue			
	Output 2 scaling high	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
		MAxx / MBxx
Relative humidity	%	10
Temperature	°C °F	1 2
Dew point temperature	Td °C °F	52 53
Frost point temperature	Tf °C °F	65 66
Mixing ratio	r g/kg gr/lb	60 61
Absolute humidity	dv g/m ³ gr/ft ³	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

PLEASE NOTE

No mix of SI/US units allowed.

Order Example

EE310-T5D2J3C1GA3GB3SBL-40SBH180

Feature	Code	Description
Model	No code	RH + T
Type	T5	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	D2 J3 C1	Display with integrated data logger RS485 module - Modbus RTU Sensor coating
Output 1 measurand	No code	Relative humidity RH [%]
Output 1 signal	GA3	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	GB3	0 - 10 V
Output 2 scaling low	SBL-40	-40
Output 2 scaling high	SBH180	180

Accessories

For further information please refer to the [Accessories](#) datasheet.

Description		Code
PCS10 Product Configuration Software (Free download: www.epluse.com/pcs10)		PCS10
USB-C to USB-A configuration cable		HA010327
Mounting flange stainless steel		HA010201
Drip water protection		HA010503
Bracket for DIN rail mounting ¹⁾		HA010203
Humidity calibration kit		See data sheet Humidity Calibration Kit
Wall mounting clip for remote probe		HA010211
Stainless steel wall mounting clip Ø12 mm (0.5")		HA010225
Stainless steel mounting flange Ø6 mm/0.25" (T24)		HA010207
Pressure-tight feed-through 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.

