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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 optimised for best reliability in industrial applications from -80 °C (-112 °F) up to +200 °C (+392 °F) and 20 bar (300 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

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 +200 °C (+392 °F) and 20 bar (300 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.

Accredited Traceable Calibration Certificate



Internationally recognised certificates for the calibration of measuring instruments from accredited laboratories document the traceability of the measurements to the International System of Units (SI). The E+E Elektronik calibration laboratory offers two levels of traceable calibrations.

- As a Designated Institute (DI) of the Republic of Austria, the E+E calibration laboratory maintains Austria's national measurement standards for humidity, dew point temperature, air velocity and CO₂. This authorises the E+E calibration laboratory to issue calibration certificates at the level of a National Metrological Institute (NMI).
- The E+E calibration laboratory is accredited by Akkreditierung Austria in accordance with DIN EN ISO/IEC 17025 with the identification number 0608. This allows the laboratory to issue ISO 17025 certificates for the measurands humidity, temperature, dew point temperature, air velocity, flow, pressure and CO₂.

Visit www.eplusecal.com for detailed information on calibration and to enquire a certificate of accredited traceable calibration for the EE310 from the Designated Institute.

ISO 9001 Calibration Certificate

An ISO 9001 calibration certificate documents the comparative measurement of a device against high quality reference equipment (factory level standard). The comparison is performed in accordance with internal procedures that comply with ISO 9001 and provides information on the specimen's measuring accuracy. The reference equipment is traceable to national standards, however, the calibration process is not accredited. Therefore, an ISO 9001 calibration is neither traceable nor internationally comparable.

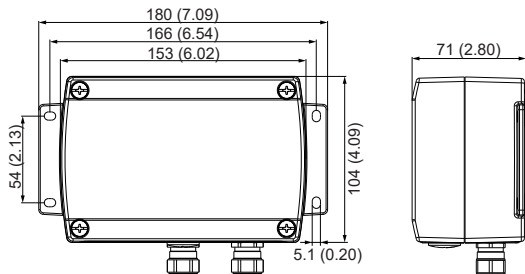
Visit www.epluse.com/iso9001cal for detailed information on calibration and to enquire an ISO 9001 calibration certificate.

Dimensions

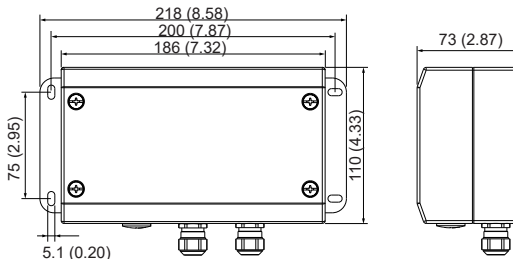
Values in mm (inch)

Enclosure

Polycarbonate

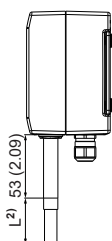


Stainless steel

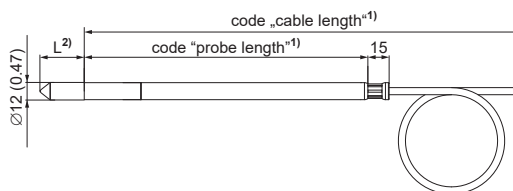


Types

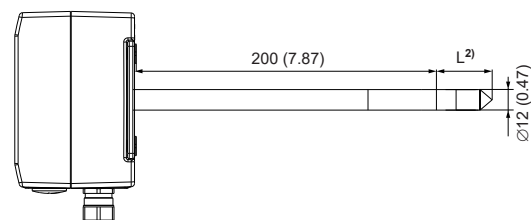
T1: Wall mount



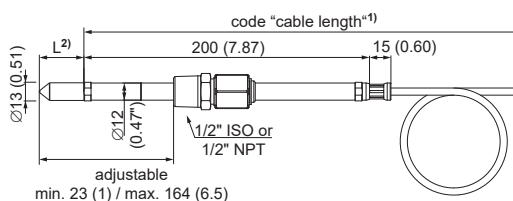
T5: Remote probe up to 190 °C (374 °C)³⁾



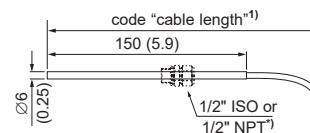
T2: Duct mount



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



T24: T only remote probe (M3)



1) Please refer to ordering guide

2) L = filter length; please refer to the accessories data sheet

3) Peak load up to 200 °C (392 °F) for a maximum of 500 working hours, see manual for further details.

*) 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	$\pm(0.95 + 0.0013 \cdot mv) \%RH$ $\pm 1.8 \%RH$ $\pm(1.05 + 0.0084 \cdot mv) \%RH$ $\pm(1.15 + 0.013 \cdot mv) \%RH$ $\pm 3.85 \%RH$ $\pm 2.5 \%RH$
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

mv = measured value

mv = measured value

1) Defined against E+E calibration reference.

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

Temperature (T)

Measuring range	T1, wall mount -40...+60 °C (-40...+140 °F) T2, duct mount -40...+80 °C (-40...+176 °F) T5, remote probe -70...+190 °C (-94...+374 °F)²⁾ T10, pressure-tight probe -40...+190 °C (-40...+374 °F)²⁾ T24, T only remote probe -80...+190 °C (-112...+374 °F)²⁾
Accuracy ¹⁾	$\pm \Delta T [^{\circ}C]$
Factory calibration uncertainty ³⁾ @ 23 °C (73 °F)	$\pm 0.1 ^{\circ}C$
Temperature dependence of electronics, typ.	$\pm 0.001 ^{\circ}C/^{\circ}C$

1) Defined against E+E calibration reference. For type T1, the accuracy data is valid only for air speed higher than 0.2 m/s.

2) Peak load up to 200 °C (392 °F) for a maximum of 500 working hours, see manual for further details.

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

Technical Data

Calculated Quantities

		from		up to						unit	
				EE310-T1		EE310-T2		EE310-T5, T10			
Dew point temperature ¹⁾	Td	-70	(-94)	60	(140)	80	(176)	100	(212)	°C	(°F)
Frost point temperature ²⁾	Tf	-70	(-94)	0	(32)	0	(32)	0	(32)	°C	(°F)
Ice bulb temperature ³⁾	Ti	-70	(-94)	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)

1) Td accuracy according to RH and T uncertainties, please use the [E+E Humidity Calculator](#) for details.

2) Equals Td above 0 °C (32 °F).

3) Equals Tw above 0 °C (32 °F).

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 dependency ¹⁾	±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
Digital interface Protocol	Option J4	Ethernet-PoE Modbus TCP

Technical Data

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 EN 61326-2-3 Industrial Environment FCC Part15 ClassA ICES-003 ClassA
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 EE310

Feature		Description		Code				
Hardware Configuration				EE310-				
	Model	RH + T		No code				
		T						M3
	Type	Wall mount	T1					
		Duct mount		T2				
		Remote probe up to 190 °C (374 °F)			T5			
		Pressure-tight probe up to 20 bar (300 psi)				T10		
		T only, remote probe Ø6 mm (0.25")						T24
	Enclosure material	Polycarbonate (PC)	No code	No code	No code	No code	No code	No code
		Stainless steel	HS2		HS2	HS2	HS2	HS2
	Filter	No filter						F0
		Stainless steel sintered	No code	No code	No code	No code		
		Polytetrafluoroethylene (PTFE)	F5	F5	F5			
		Stainless steel - metal grid	F9	F9	F9	F9		
	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	No code	No code
		1 x plug for power supply and outputs	E4	E4	E4	E4	E4	E4
		2 x plugs for power supply + outputs and for RS485 (requires option J3)	E6	E6	E6	E6	E6	E6
	Display	Without display	No code	No code	No code	No code	No code	No code
		3.5" TFT display with integrated data logger	D2	D2	D2	D2	D2	D2
	Digital Interface	Without digital interface	No code	No code	No code	No code	No code	No code
		RS485 module - Modbus RTU	J3	J3	J3	J3	J3	J3
		Ethernet-PoE with Modbus TCP ²⁾³⁾		J4	J4	J4	J4	J4
	Probe connection	Fixed	No code	No code	No code	No code	No code	No code
		Pluggable probe ²⁾			PC4	PC4		
	Sensing element protection	Without, for very low temperature applications only -70 °C...-40 °C (-94° C...-40 °F)			No code			
		E+E proprietary coating	C1	C1	C1	C1		
	Additional module	Without additional module	No code	No code	No code	No code	No code	No code
		Integrated power supply 100–240 V AC 50/60 Hz ³⁾⁴⁾	AM3	AM3	AM3	AM3	AM3	AM3

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).

Ordering Guide EE310 (cont'd)

		T1	T2	T5	T10	T24
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)		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 ¹⁾	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			
Accredited Traceable Calibration Certificate in accordance with DIN EN ISO/IEC 17025		see www.eplusecal.com				
ISO 9001 Calibration Certificate		see www.epluse.com/iso9001cal				

1) 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
Ice bulb temperature	Ti °C °F	118 119
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

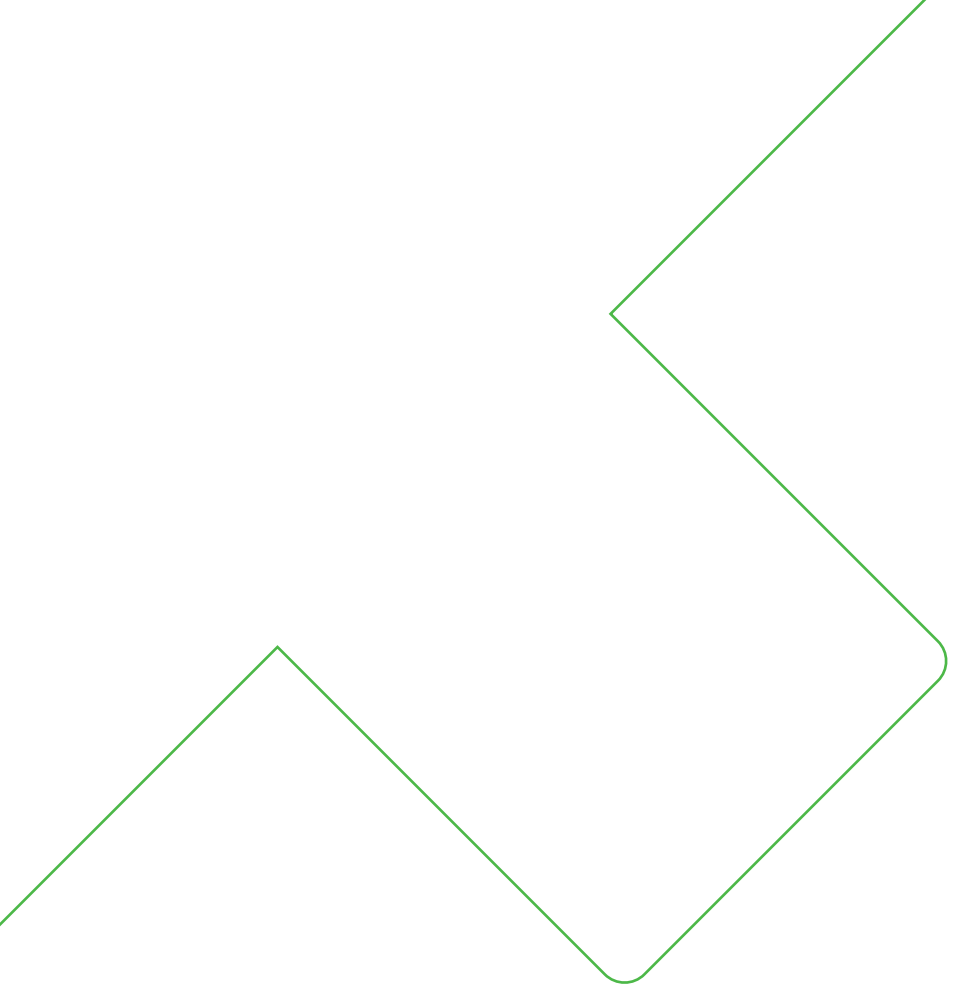
Feature	Code	Description
Model	No code	RH + T
Type	T5	Remote probe up to 190 °C (374 °F)
Enclosure material	No code	Polycarbonate (PC)
Filter	No code	Stainless steel sintered
Probe cable length	No code	2 m (6.6")
Probe length	No code	200 mm (7.87")
Electrical connection	No code	Standard
Display	D2	Display with integrated data logger
Digital interface	J3	RS485 module - Modbus RTU
Probe connection	No code	Fixed
Sensing element protection	C1	E+E proprietary coating
Additional module	No code	Without additional module
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
Stainless steel mounting flange Ø12 mm (0.47")	HA010201
Drip water protection	HA010503
Bracket for DIN rail mounting ¹⁾	HA010203
Humidity calibration kit	See data sheet Humidity Calibration Kit
Wall mounting clip, Ø12 mm (0.47") for remote probe	HA010211
Stainless steel wall mounting clip Ø12 mm (0.5")	HA010225
Stainless steel mounting flange Ø6 - 8 mm (0.24" - 0.31") (T24)	HA010207
Pressure-tight feed-through, probe Ø6 mm (0.24") (T24)	G 1/2" ISO 1/2" NPT HA011104 HA011105
Immersion well, stainless steel Ø6x135 mm (0.24 x 5.3")	G 1/2" ISO 1/2" NPT HA400202 HA400212

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



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