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Datasheet
EE310 UL Listed

High-End Humidity and Temperature Sensor for Industrial Applications

Modbus

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EE310-UL

High-End Humidity and Temperature Sensor for Industrial Applications

The UL listed EE310 is optimized for best reliability in industrial applications up to 180 °C (356 °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 are the prerequisite for 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 UL Type 4 polycarbonate enclosure which facilitates installation and maintenance. The enclosure can accommodate a 100 - 240 VAC supply unit or various interface modules.

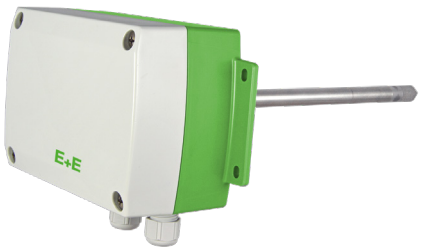
Outputs

The measured data is available on two analogue outputs and on the RS485 (Modbus RTU) 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.

Polycarbonate enclosure for wall mounting



Polycarbonate enclosure for duct mounting

EE310 with remote probe

EE310 with optional display and remote probe

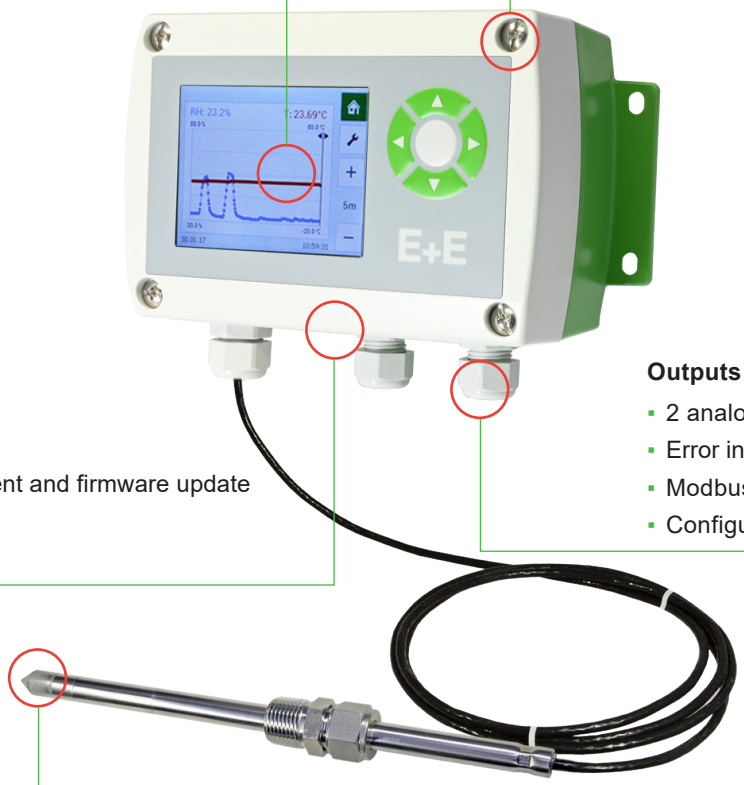
Features

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 (300 psi)
- Protective coating for sensing elements
- Pluggable versions available

Inspection certificate

According to DIN EN 10204-3.1

Features

Protective Sensor Coating

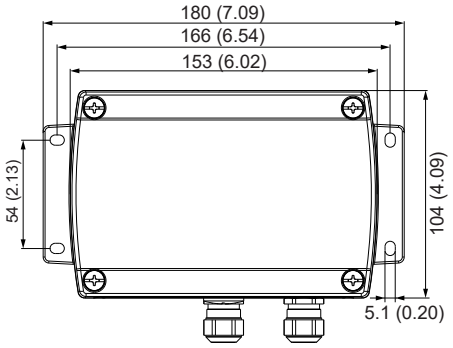
The E+E proprietary sensor coating is a protective layer applied to the sensing elements, their leads and soldering points. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves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

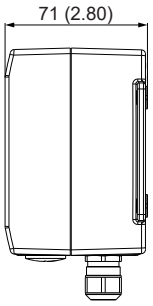
Dimensions

Values in mm (inch)

Enclosure

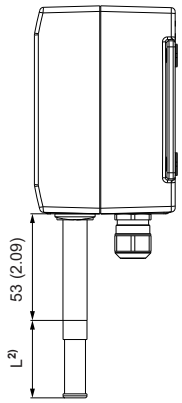
Polycarbonate



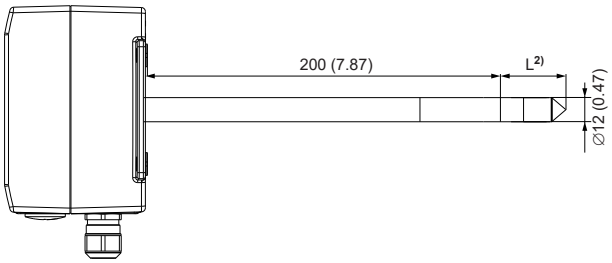


Types

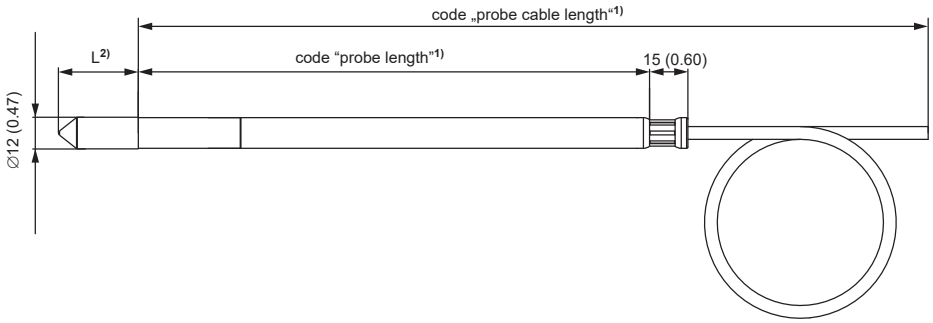
T1: Wall mount



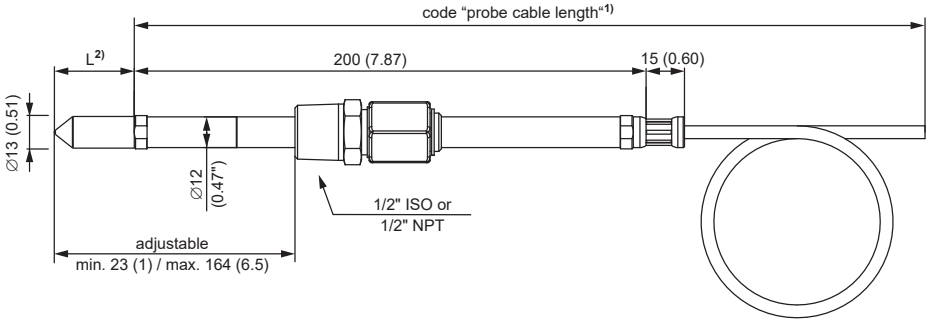
T2: Duct mount



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



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



Technical Data

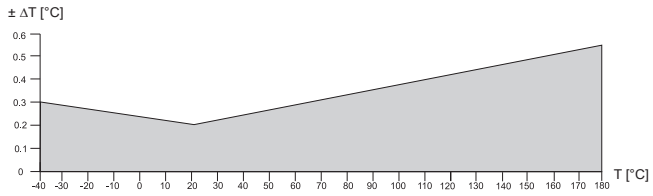
Measurands

Relative Humidity (RH)

Measuring range	0...100 %RH
Accuracy[1], incl. hysteresis, non-linearity and repeatability	
-15...+40 °C (5...104 °F) RH ≤90 %	±(0.95 + 0.0013 * mv) %RH
-15...+40 °C (5...104 °F) RH >90 %	±1.8 %RH
-25...+70 °C (-13...+158 °F)	±(1.05 + 0.0084 * mv) %RH
-40...+180 °C (-40...+356 °F)	±(1.15 + 0.013 * mv) %RH mv = measured value
Factory calibration uncertainty[2] **0...90 %RH**	±(0.7 + 0.003 * mv) %RH
90...100 %RH	±1 %RH mv = measured value
Temperature dependency of electronics, typ.	±0.01 % RH / °C (0.0056 %RH / °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	-40...+60 °C (-40...+140 °F)
T2, duct mount	-40...+80 °C (-40...+176 °F)
T5, remote probe	-40...+180 °C (-40...+356 °F)
T10, pressure-tight probe	-40...+180 °C (-40...+356 °F)
Accuracy[1]	
Factory calibration uncertainty[2] @ 23 °C (73 °F)	±0.05 °C
Temperature dependence of electronics, typ.	±0.001 °C / °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/m^3	(gr/ft^3)
Specific enthalpy	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 4 - 20 mA 0 - 20 mA	 3-wire 3-wire	-1 mA < I_L < 1 mA R_L < 500 Ω 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)

Digital

Digital interface	**Option J3**	RS485 (EE310 = 1 unit load)
Protocol		Modbus RTU
Factory settings		9600 Baud, parity even, 1 stop bit, Modbus address 231
Supported Baud rates		300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 76800
Measured data type		FLOAT32

General

Power supply	**Input voltage range**	**Power requirements**	**Conductor temperature rating**
	8 - 35 V DC (LPS)	max. 2 W*)	min. 75 °C (167 °F)
	Indoor use: 12 - 30 V AC, 50/60 Hz (Class 2 supply) 100 - 240 V AC, 50/60 Hz[1)] Outdoor use: 12 - 16 V AC, 50/60 Hz (Class 2 supply)	max. 4 VA*) max. 5 VA*) max. 4 VA*)	min. 75 °C (167 °F)
	*) Including 2 voltage or current outputs		
Electrical connection	Screw terminals max. 1.5 mm² (AWG 16)		
Cable gland	M16x1.5, for cable Ø4...8 mm (0.16...0.31")		
Pressure working range with pressure-tight probe	0.01...20 bar (0.15...300 psi)		
Temperature range			
Without display	-40...+60 °C (-40...+140 °F)		
With display	-20...+50 °C (-4...+122 °F)		
Remote sensing probe cable	-40...+150 °C (-40...+302 °F)		
Storage temperature range			
Without display	-40...+60 °C (-40...+140 °F)		
With display	-20...+50 °C (-4...+122 °F)		
Material **Probe**	Stainless steel 1.4404 (AISI 316L)		
Enclosure	PC (Polycarbonate), UL94-V0 approved		
Protection rating	UL Type 4[2)3)], IP65[4)]		
Electromagnetic compatibility	EN 61326-1 FCC Part15 Class A	EN 61326-2-3 ICES-003 Class A	Industrial environment
Compliance	c UL us LISTED **United States:** UL Listed, CCN QUYX, Under UL 61010-1, Process Control Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A **Canada:** UL Listed, CCN QUYX7, Under CSA C22.2 No. 61010-1, Signal Equipment; Industry Canada Compliant, ICES-003		
Configuration software	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).
2) Valid only with cable glands.
3) Display option: Type 1, for indoor use only.
4) Valid for probe body and enclosure. IP65 not evaluated by UL.

Ordering Guide

	Feature	Description	Code			
			EE310-AP1			
Hardware Configuration	**Model**	RH + T	No code			
		T				
	Type	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")				
	Filter	No filter				
		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
	Probe cable length (incl. probe length)	2 m (6.6 ft)			No code	No code
		5 m (16.4 ft)			K5	K5
		10 m (32.8 ft)			K10	K10
		20 m (65.6 ft)			K20	K20
	Probe length	65 mm (2.55")			L65	
		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			
		1 x plug for power supply and outputs[2]	E4			
		2 x plugs for power supply + outputs and for RS485 (requires option J3)[2]	E6			
	Optional features	3.5" TFT display with integrated data logger[2]	D2			
		RS485 module - Modbus RTU	J3			
		E+E proprietary coating	C1			
		Integrated power supply 100 - 240 V AC, 50/60 Hz for NFPA79 applications[3]	AM3			
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 signal[4]	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	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 signal[4]	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	SBL*Value*			
	Output 2 scaling high	Value	SBH*Value*			

1) Standard = 2 x M16 cable glands, except for AM3 option: 2 plugs for power supply and outputs.
2) For indoor use only.
3) With electrical connection standard only (no other plug options possible) and for NFPA79 applications only, NFPA = National Fire Protection Association
4) Both analogue outputs must 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	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/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-AP1T5E6D2J3C1GA3GB3SBL-40SBH180

Feature	Code	Description
Approval	AP1	UL listing cULus QUYX.E500367
Type	T5	Remote probe up to 180 °C (356 °F)
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	E6	2 x plugs for power supply + outputs and for RS485
Optional features	D2 J3 C1	3.5" TFT display with integrated data logger RS485 module - Modbus RTU E+E proprietary 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
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
Stainless steel wall mounting clip Ø12 mm (0.5")	**HA010225**

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

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datasheet_EE310-UL | Version v1.3 | 11-2024

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