

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 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 appropriate choice of 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 4 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, on the RS485 (Modbus RTU) or Ethernet-PoE (Modbus TCP) interface and on the alarm (relay) outputs.

The TFT colour display shows simultaneously up to four measurands and offers extensive setup and diagnosis features. The data logging function saves up to 20000 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



Features

3.5" TFT Colour Display

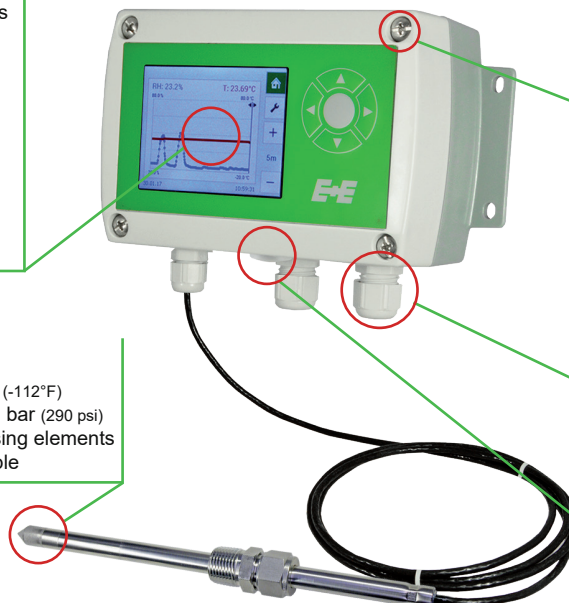
- » Shows up to 4 measurands simultaneously
- » Layout and measurands freely selectable
- » Data logger for 20 000 values per measurand
- » Logged data shown graphically
- » Diagnosis functions
- » Intuitive device setup with push buttons

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 certificat

- » According DIN EN 10204-3.1



Enclosure

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

Outputs

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

USB Service Interface

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

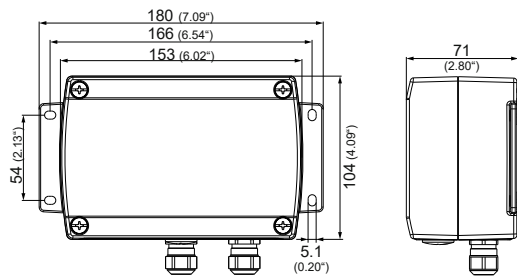
Protective sensor coating (option C1)

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

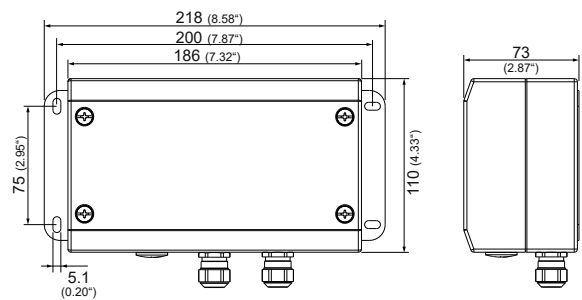
Dimensions in mm (inch)

ENCLOSURES

Polycarbonate

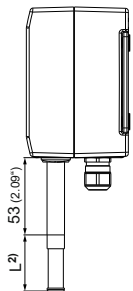


Stainless steel

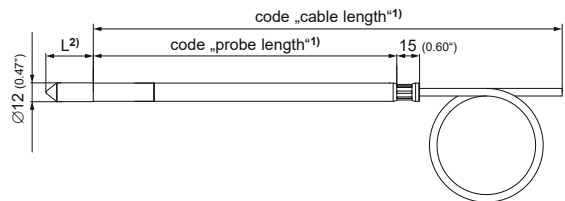


TYPES

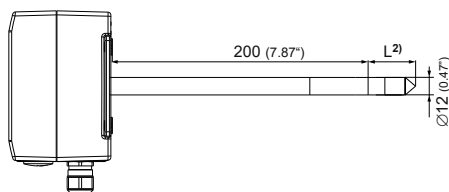
T1: Wall mount



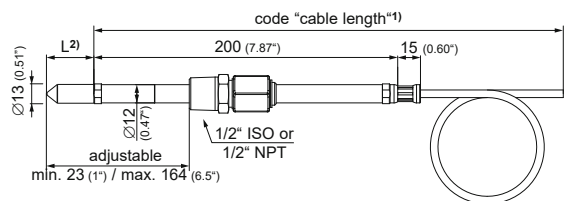
T5: Remote probe up to 180 °C (356 °F)



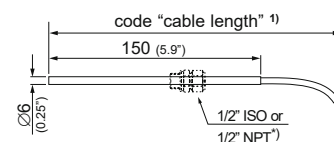
T2: Duct mount



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)

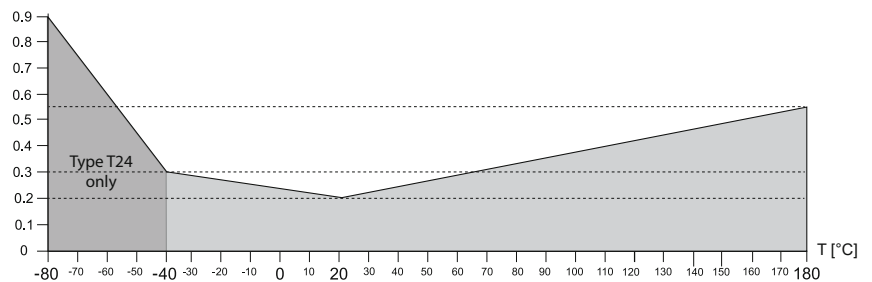
Working range	0...100 % RH	
Accuracy ¹⁾ (incl. hysteresis, non-linearity and repeatability)		
-15...40 °C (5...104 °F) RH ≤90 %	± (1.3 + 0.3 % * mv) % RH	<i>mv = measured value</i>
-15...40 °C (5...104 °F) RH >90 %	± 2.3 % RH	
-25...70 °C (-13...158 °F)	± (1.4 + 1 % * mv) % RH	
-40...180 °C (-40...356 °F)	± (1.5 + 1.5 % * mv) % RH	
Temperature dependence of electronics	typ. ± 0.01 % RH/°C (0.0055 %RH / °F)	
Response time	< 15 s with metal grid filter at 20 °C (68 °F) / t ₉₀	

Temperature (T)

Working range sensing probe	T1, wall:	-40...60 °C (-40...140 °F)
	T2, duct:	-40...80 °C (-40...176 °F)
	T5, remote:	-40...180 °C (-40...356 °F)
	T10, pressure tight:	-40...180 °C (-40...356 °F)
	T24, T only remote probe:	-40...180 °C (-40...356 °F) or -80...30 °C (-112...86 °F)

Accuracy¹⁾

± ΔT [°C]



Temperature dependence of electronics, typ. ±0.001°C/°C

Calculated parameters

	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/f ³)
Specific enthalp	h 0 (0)	400 (50000)	1000 (375000)	2800 (999999)	kJ/kg (Btu/lb)

Outputs

Two analogue outputs freely selectable and scalable		0 - 1 / 5 / 10 V	-1 mA < I _L < 1 mA
		4 - 20 mA	R _L < 500 Ohm
		0 - 20 mA	R _L < 500 Ohm
Digital interface / protocol	option J3	RS485 / Modbus RTU (EE310 = 1 unit load) Factory settings: 9600 bps, parity even, stop bit 1 / Modbus address 231	
	option J4	Ethernet-PoE with Modbus TCP	

General

Power supply class III ⚡ (EU) / class 2 (NA)	8 - 35 V DC	12 - 30 V AC
	100 - 240 V AC, 50/60 Hz with option AM3 ²⁾	
Current consumption at 24 V DC/AC (typ.)	15 mA / 40 mA _{rms} for 2 voltage outputs 35 mA / 100 mA _{rms} for 2 current outputs 50 mA / 150 mA _{rms} additional for display 30mA / 90 mA _{rms} additional for Ethernet	

Pressure range for pressure tight probe	0.01...20 bar (0.15...300 psi)		
Probe material	Stainless steel 1.4404 / AISI 316L		
Enclosure material	Polycarbonate, UL94-V0 approved or Stainless steel 1.4404 / AISI 316 L		
Protection rating	IP65 / NEMA 4		
Cable glands	for polycarbonate enclosure	M16 x 1.5, for cable Ø 3 - 7 mm (0.12 - 0.28")	
	for metal enclosure	M16 x 1.5, for cable Ø 4.5 - 10 mm (0.18 - 0.39")	
Electrical connection	Screw terminals max. 1.5 mm ² (AWG 16)		
Working and storage temperature range of electronics	-40...60 °C (-40...140 °F) without display		
	-20...50 °C (-4...122 °F) with display		
Electromagnetic compatibility	EN 61326-1	EN 61326-2-3	ICES-003 ClassA
	Industrial Environment	FCC Part15 ClassA	
Two alarm outputs ²⁾	Changeover contact		
	250 V AC / 6 A	28 V DC / 6 A	
System requirements for EE-PCS software	Windows XP or higher; USB port		



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 0.2m/s.

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

Ordering Guide

		EE310-					
		no code				M3	
Hardware configuration	Model	RH + T T					
	Type	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 Ø 6 mm (0.25")	T1	T2	T5	T10	T24
	Enclosure	Polycarbonate Stainless steel	no code HS2	no code	no code HS2	no code HS2	no code HS2
	Filter	No filter Plastic - metal grid (up to 120 °C / 248 °F) Stainless steel sintered PTFE Stainless steel - metal grid (up to 180 °C / 356 °F) H ₂ O ₂	F3 no code F5 F9 F12	F3 no code F5 F9 F12	no code F5 F9 F12	no code F9	F0
	Cable length (incl. probe length)	0.5 m (1.64 ft) 2 m (6.6 ft) 5 m (16.4 ft) 10 m (32.8 ft) 20 m (65.6 ft)			K0.5 no code K5 K10 K20	no code K5 K10 K20	no code K5
	Probe length	65 mm (2.55") 150 mm (5.91") 200 mm (7.87") 400 mm (15.75")			L65 no code L400	no code L400	L150
	Process connection	1/2" ISO thread 1/2" NPT thread				PA23 PA25	
	Electrical connection	Cable glands 1 plug for power supply and outputs 1 cable gland / 1 plug for Modbus RTU (requires option J3) 2 plugs for power supply / outputs and for Modbus RTU (requires option J3) 3 plugs for power supply / outputs and Modbus RTU (requires option J3) ¹⁾	no code E4 E5 E6 E12	no code E4 E5 E6 E12	no code E4 E5 E6 E12	no code E4 E5 E6 E12	no code E4 E5 E6 E12
	Optional features	3.5" TFT display with integrated data logger RS485 module - Modbus RTU Ethernet-PoE with Modbus TCP ¹⁾²⁾ Pluggable probe ¹⁾ Sensor coating Alarm outputs with cable glands ²⁾ Integrated power supply 100 - 240 V AC, 50/60 Hz ²⁾³⁾	D2 J3 C1 AM2 AM3	D2 J3 J4 C1 AM2 AM3	D2 J3 J4 PC4 C1 AM2 AM3	D2 J3 J4 PC4 C1 AM2 AM3	D2 J3 J4
	Output 1	Relative humidity RH [%] Temperature T [°C] Temperature T [°F] Other measurand (xx see measurand code below)	no code MA1 MA2 MAxx				MA1 MA2
	Output signal 1⁴⁾	0 - 1 V 0 - 5 V 0 - 10 V 0 - 20 mA 4 - 20 mA	GA1 GA2 GA3 GA5 GA6				
	Scaling 1 low	0 Value	no code SALValue				
	Scaling 1 high	100 Value	no code SAHValue				
	Output 2	Temperature T [°C] Temperature T [°F] Other measurand (xx see measurand code below)	no code MB2 MBxx				
Output signal 2⁴⁾	0 - 1 V 0 - 5 V 0 - 10 V 0 - 20 mA 4 - 20 mA	GB1 GB2 GB3 GB5 GB6					
Scaling 2 low	Value	SBLValue					
Scaling 2 high	Value	SBHValue					

1) Only with polycarbonate enclosure.
 2) Combination of alarm output (AM2), Ethernet module (J4) and integrated power supply (AM3) is not possible.
 3) Integrated power supply includes 2 plugs for power supply and outputs, other plug options are not possible.
 4) Both analogue outputs shall be either voltage or current.

Measurand Code for output 1 and 2 in the ordering guide

		MAxx / MBxx
relative humidity	%	10
temperature	°C	1
	°F	2
dew point Td	°C	52
	°F	53
frost point Tf	°C	65
	°F	66
mixing ratio r	g/kg	60
	gr/lb	61

		MAxx / MBxx
absolute humidity dv	g/m ³	56
	gr/ft ³	57
wet bulb temperature Tw	°C	54
	°F	55
water vapour partial pressure e	mbar	50
	psi	51
specific enthalpy h	kJ/kg	62
	BTU/lb	64

Order Example

EE310-T5D2J3C1GA3GB3SBL-40SBH180

Type:	T5	Remote probe up to 180 °C (356 °F)
Enclosure:	no code	Polycarbonate
Filter:	no code	Stainless steel sintered filter
Cable length:	no code	2 m (6.6')
Probe length:	no code	200 mm (7.87")
Electrical connection:	no code	Cable glands
Optional features:	D2	3.5" TFT display with integrated data logger
	J3	RS485 module - Modbus RTU
	C1	Sensor coating

Output 1:	no code	Relative humidity %
Output Signal 1:	GA3	0 - 10 V
Scaling 1 low:	no code	0
Scaling 1 high:	no code	100
Output 2:	no code	Temperature T [°C]
Output Signal 2:	GB3	0 - 10 V
Scaling 2 low:	SBL-40	-40
Scaling 2 high:	SBH180	180

Accessories (see data sheet "Accessories")

Mounting flange stainless steel	HA010201	
Drip water protection	HA010503	
Bracket for installation onto mounting rails ¹⁾	HA010203	
Mounting bracket for remote probe	HA010211	
Humidity calibration kit	see data sheet „Humidity calibration kit“	
Stainless steel wall mounting clip Ø 12 mm (0.5")	HA010225	
Mounting flange stainless steel (Ø 6 mm/0.25", T24)	HA010207	
Pressure tight screw connectors Ø 6 mm (0.25") (T24)	1/2" ISO	HA011104
	1/2" NPT	HA011105
Immersion well, stainless steel Ø 6 x 135 mm (0.25 x 5.4") (T24)	1/2" ISO	HA400202
	1/2" NPT	HA400212

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