

EE310 UL Listed

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 (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 UL Type 4 polycarbonate enclosure which facilitates installation and maintenance. The enclosure can accommodate a 100...240 V AC supply unit or various interface modules.

Outputs

The measured data is available on two analogue outputs, on the RS485 interface with Modbus RTU protocol and on the alarm (relay) outputs.

Configurable and Adjustable

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



Features

Enclosure

- » UL Type 4 protection class
- » easy mounting and service

Outputs

- » 2 analogue outputs current / voltage
- » error indication according NAMUR
- » Modbus RTU
- » 2 alarm outputs
- » configurable via software

Probe

- » working range up to 180°C (356 °F) and 20 bar (290 psi)
- » protective coating for sensing elements

USB Service Interface

- » configuration, adjustment and firmware update
- » 4 status LEDs

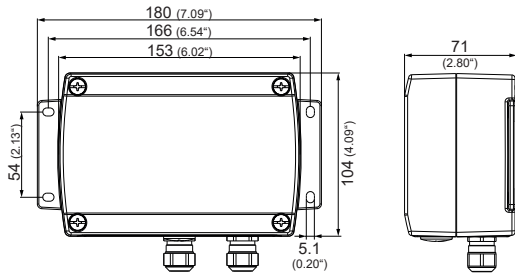
Inspection certificate according to DIN EN 10204 – 3.1

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.

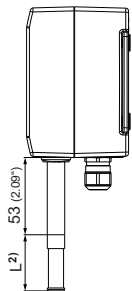
Dimensions in mm (inch)

ENCLOSURE

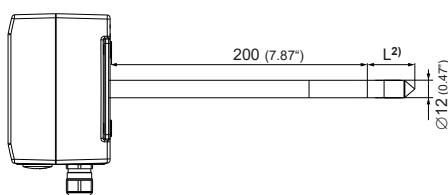


PROBES

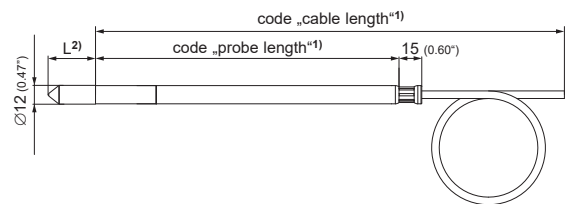
T1: Wall mount



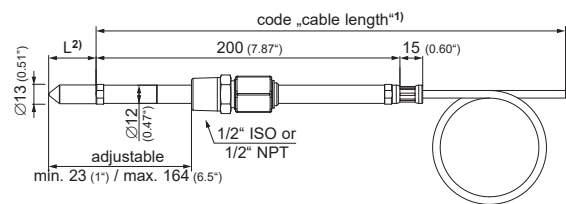
T2: Duct mount



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



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



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

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	

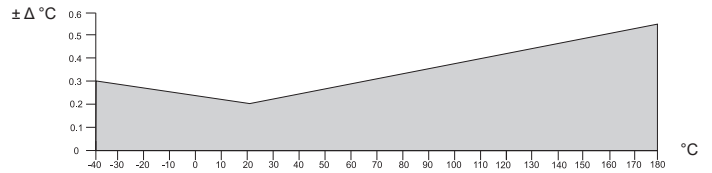
1) Traceable to intern. standards, administrated by NIST, PTB, BEV...
The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

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)

Accuracy



Temperature dependence of electronics

typ. ± 0.005 °C/°C

Calculated parameters

		from	Probe T1		Probe T2		Probe T5, T10		unit
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 enthalpy	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 3-wire	R _L < 500 Ohm
0 - 20 mA 3 wire	R _L < 500 Ohm

Digital interface / protocol (option J3)

RS485 / Modbus RTU, max. 32 unit load devices on one bus
 (EE310 = 1 unit load; factory settings: 9600 bps, parity even, stop bit 1 / slave-ID 231)

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)	max. 4 VA *)	min. 75 °C (167 °F)
outdoor use: 12...16 V AC, 50/60 Hz (Class 2 supply)		
100...240 V AC, 50/60 Hz ¹⁾	max. 5 VA **)	min. 75 °C (167 °F)

*) including 2 voltage or current outputs and relay option AM2 or AM6
 **) including 2 voltage or current outputs

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

Protection class

IP65²⁾, UL Type 4³⁾

Electrical connection

screw terminals max. 1.5 mm² (AWG 16)

Working and storage temperature range of electronics

-40...60 °C (-40...140 °F)

Working range remote sensing probe cable

-40...150 °C (-40...302 °F)

Electromagnetic compatibility

EN61326-1 EN61326-2-3 ICES-003 ClassA
 Industrial Environment FCC Part15 ClassA

Compliance

United States:

UL Listed, CCN QUXX, Under UL 61010-1, Process Control Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A

Canada:

UL Listed, CCN QUXX7, Under CSA C22.2 No. 61010-1, Signal Equipment; Industry Canada Compliant, ICES-003

Two alarm outputs¹⁾

changeover contact

250 V AC / 6 A, conductor temperature rating min. 90 °C (194 °F)

28 V DC / 6 A, conductor temperature rating min. 90 °C (194 °F)

System requirements for EE-PCS software

Windows XP or higher; USB port

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

2) IP65 not evaluated by UL.

3) Valid only with liquid-tight 1/2" conduit fitting (E24) and cable glands. Not valid with M12 plug (E4, E5, E6, E12), conduit fitting E23, option AM2 and AM3.

Ordering Guide

		EE310-AP1				
		T1	T2	T5	T10	
Hardware configuration	Type	wall mount duct mount remote probe up to 180 °C (356 °F) pressure tight probe up to 20 bar (300 psi)				
	Filter	plastic - metal grid (only up to 120 °C / 248 °F) stainless steel sintered PTFE stainless steel - metal grid H ₂ O ₂	F3 no code F5 F9 F12	F3 no code F5 F9 F12	no code F5 F9 F12	no code no code F9
	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
	Probe length	65 mm (2.55") 200 mm (7.87") 400 mm (15.75")			L65 no code L400	no code L400
	Process connection	1/2" ISO thread 1/2" NPT thread				PA23 PA25
	Electrical connection	cable glands 1 plug for power supply and outputs ¹⁾ 1 cable gland / 1 plug for Modbus RTU (requires option J3) ¹⁾ 2 plugs for power supply / outputs and for Modbus RTU (requires option J3) ¹⁾ 3 plugs for power supply / outputs and Modbus RTU (requires option J3) ¹⁾ conduit fitting ²⁾ liquid-tight 1/2" conduit fitting			no code E4 E5 E6 E12 E23 E24	
	Optional features	RS485 module - Modbus RTU sensor coating alarm outputs with cable glands for NFPA79 applications ³⁾ integrated power supply 100...240 V AC, 50/60 Hz for NFPA79 applications ^{3) 4)} integrated power supply 100...240 V AC, 50/60 Hz with liquid-tight 1/2" conduit fitting ³⁾ alarm outputs with liquid-tight 1/2" conduit fitting ³⁾			J3 C1 AM2 AM3 AM5 AM6	
	Output 1	relative humidity RH [%] other measurand (xx see measurand code below)			no code MAxx	
	Output signal 1 ⁵⁾	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		
Setup - analogue outputs	Output 2	temperature T [°C] temperature T [°F] other measurand (xx see measurand code below)			no code MB2 MBxx	
	Output signal 2 ⁵⁾	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) For indoor use only

2) For indoor use in dry location only

3) Combination of alarm output (AM2/AM6), and integrated power supply (AM3 / AM5) is not possible. NFPA = National Fire Protection Association

4) Integrated power supply for NFPA79 applications only; (AM3) includes 2 plugs for power supply and outputs, other plug options are not possible.

5) 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-AP1T5E24J3C1GA3GB3SBL-40SBH180

Approval:	AP1	UL listing cULus QUYX.E500367
Type:	T5	remote probe up to 180 °C (356 °F)
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:	E24	liquid-tight 1/2" conduit fitting
Optional features:	J3	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

1) Two pieces are necessary for each EE310.