

EE33

Humidity/Temperature Sensor for High Humidity and Chemical Applications

The EE33 sensors are designed to meet the highest demands of stable and highly accurate measurements of relative humidity (RH) and temperature (T) under the most challenging conditions. EE33 is suitable for a wide range of applications from -40 °C (-112 °F) up to 180 °C (356 °F) and 100 bar (1450 psi).

Outstanding Measurement Performance

The employed high-end E+E RH and T sensing element is heated and enables reliable and long-term stable measurements in extremely humid or chemically polluted environment. The monolithic structure of the sensor allows a fast return to normal conditions after condensation or chemical contamination. In addition it is perfectly protected by the E+E proprietary coating.

Versatility and Robustness

The EE33 is available in six remote probe types and with various probe and cable lengths. With different heating modes of the monolithic RH and T sensing element, the EE33 can be perfectly tailored to the specific needs of each measurement task. It features an IP65/NEMA 4 polycarbonate or metal enclosure which can accommodate various interface modules and electrical connection options.

Outputs and Configuration

The measured data is available on two freely scalable analogue outputs, on the RS232 or RS485 interface and on the alarm (relay) outputs. The configuration and the RH and T adjustment of the EE33 can be performed either using the push buttons or with the free EE-PCS Product Configuration Software.



Type T4
Type T5



Type T7
Type T8
Type T10



Type T17

Features

Measurement Performance

- » High RH/T accuracy
- » Working range from -40 °C (-112 °F) up to 180 °C (356 °F) and 100 bar (1450 psi)
- » Designed for conditions with chemical contamination and condensation
- » Calculated parameters
 - Dew point temperature (Td)
 - Frost point temperature (Tf)
 - Wet bulb temperature (Tw)
 - Water vapour partial pressure (e)
 - Mixing ratio (r)
 - Absolute humidity (dv)
 - Specific enthalpy (h)

Enclosure

- » Polycarbonate IP65/NEMA 4X
- » Metal (AlSi₉Cu₃) IP65/NEMA 4
- » Display with MIN/MAX function
- » Versatile connection options



Outputs

- » 2 freely scalable analogue outputs current/voltage
- » Configurable via EE-PCS
- » Digital RS232/RS485 interface with E+E industry protocol

RH and T Sensing Element

- » With different heating modes
 - Condensation Prevention (CP)
 - Automatic ReCovery (ARC)
 - Overheating (OH)
- » Protected by
 - E+E proprietary coating
 - Wide choice of filter caps

Remote probes

- » Specific types according
 - T range
 - P range
 - Environmental condition
- » Various probe and cable lengths



Inspection certificate

- » according to DIN EN 10204-3.1

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.

Heating Modes

Condensation Prevention (CP) describes an intense heating of the sensing element in order to get rid of temporary condensation. It is triggered by a certain RH setpoint (configurable via EE-PCS).

Automatic ReCover (ARC) describes an intense heating of the sensing element in order to get rid of chemical pollution. It is triggered either by a certain time interval (configurable via EE-PCS), externally using the ARC module option (AM1) or manually via push button on the PCB.

Overheating (OH) means a continuous, regulated warming of the sensing element and the probe body (dual heating system) to prevent condensation on it. Thanks to the monolithic structure of the sensing element precise RH measurement even under continuously high humidity and condensing conditions is enabled.

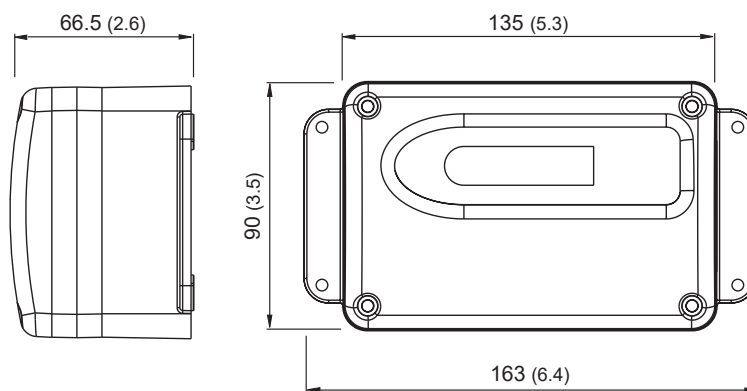
Heating Mode	Condensation Prevention (CP)	Automatic ReCover (ARC)	OverHeating (OH) with Dual Heating System
Use	Against temporary condensation	Against chemical pollution	In environments with continuous high humidity and condensation
Function Trigger	RH setpoint ^{*)}	Cyclic, externally, manually	Always ON
EE33 Type			
EE33 Type T4/T5/T8/T10	✓	✓	Not available
EE33 Type T7/T17	Not usable due to OH	✓	✓

^{*)} Factory setting: disabled, RH setpoint preset to 99 %.

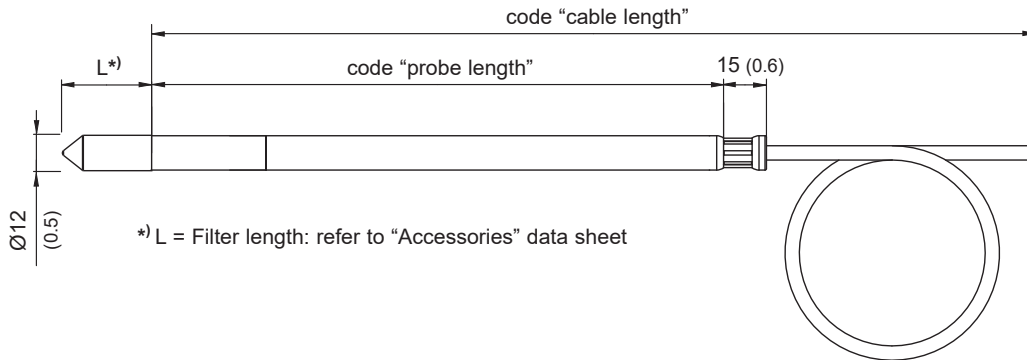
Dimensions

Values in mm (inch)

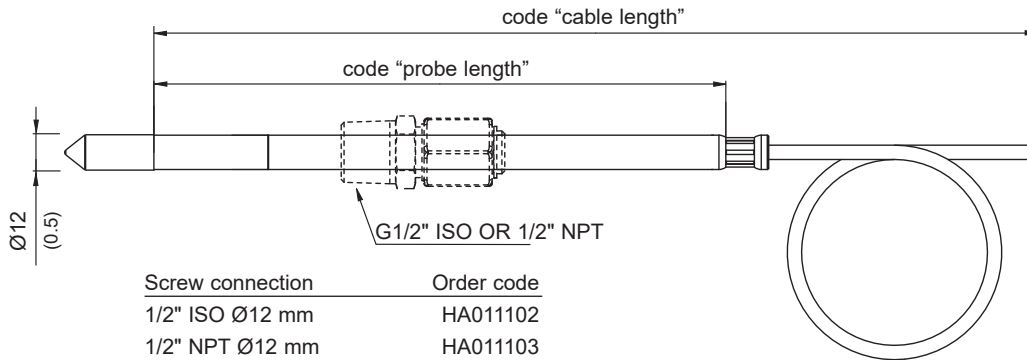
Enclosure



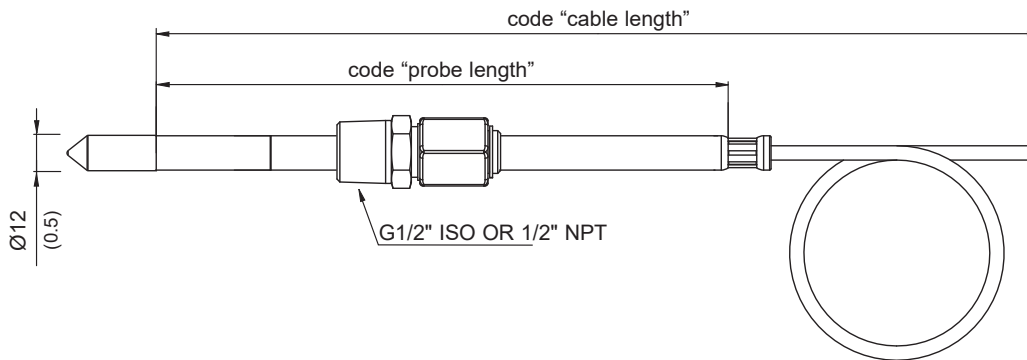
Type T4/T5



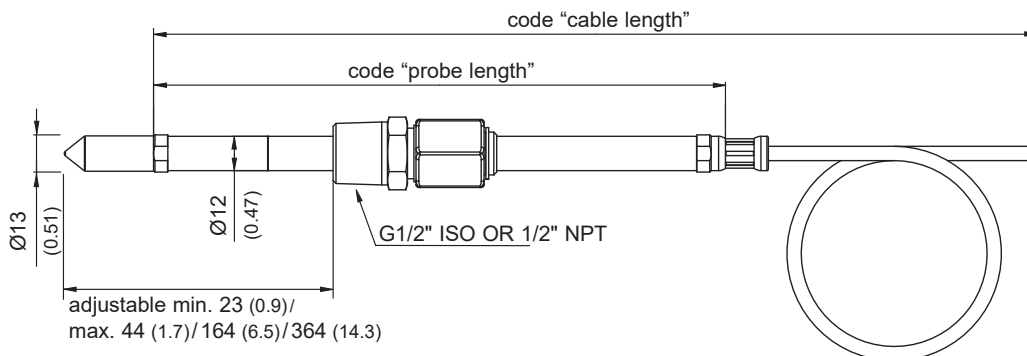
Type T7, pressure tight up to 20 bar (300psi) for Td measurement with optional cut in fitting



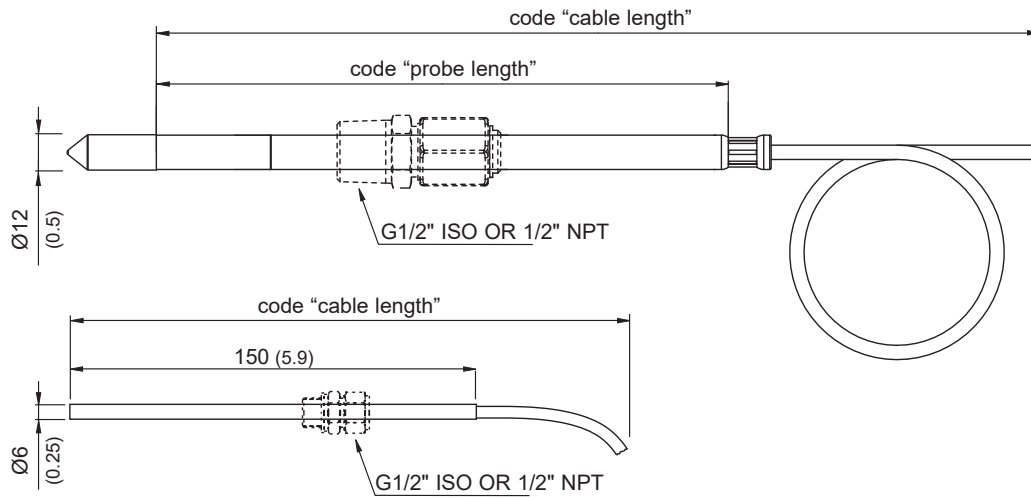
Type T8, pressure tight up to 100 bar (1450 psi) with cut in fitting



Type T10, pressure tight up to 20 bar (300 psi) with sliding fitting



Type T17, two remote probes pressure tight up to 20 bar (300 psi) with optional cut in sliding fitting



Screw connection	Order code
1/2" ISO Ø12 mm	HA011102
1/2" NPT Ø12 mm	HA011103
1/2" ISO Ø6 mm	HA011104
1/2" NPT Ø6 mm	HA011105

Technical Data

Measurands

Relative humidity

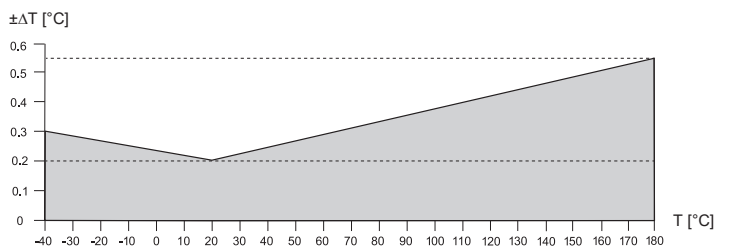
Measuring range	0...100 %RH		
Accuracy ¹⁾ (including hysteresis, non-linearity and repeatability)			
-15...40 °C (5...104 °F)	≤90 %RH	± (1.3 + 0.003*mv) %RH	mv = measured value
-15...40 °C (5...104 °F)	>90 %RH	± 2.3 %RH	
-25...70 °C (-13...158 °F)		± (1.4 + 0.01*mv) %RH	
-40...180 °C (-40...356 °F)		± (1.5 + 0.015*mv) %RH	
Temperature dependency of electronics, typ.	± 0.01 %RH/°C (0.0055 %RH/°F)		
Response time t_{90} , typ.	< 15 s		
<i>with stainless steel grid filter at 20°C (68°F)</i>			

Temperature

Working range

Enclosure	-40...60 °C (-40...140 °F)
Enclosure with display	-20...50 °C (-4...122 °F)
Probes	
Type T4	-40...120 °C (-40...248 °F)
Type T5/T7/T8/T10/T17	-40...180 °C (-40...356 °F)

Accuracy¹⁾



Temperature dependence of electronics, typ. ± 0.005 °C/°C

Calculated parameters



	Unit	from	to			
			EE33-xT4	EE33-xT5/T8/T10/T17	EE33-xT7	
Dew point temperature	Td	°C (°F)	-40 (-40)	100 (212)	100 (212)	100 (212)
Frost point temperature	Tf*)	°C (°F)	-40 (-40)	0 (32)	0 (32)	0 (32)
Wet bulb temperature	Tw	°C (°F)	0 (32)	100 (212)	100 (212)	—
Water vapour partial pressure	e	mbar (psi)	0 (0)	1100 (15)	1100 (15)	—
Mixture ratio	r	g/kg (gr/lb)	0 (0)	999 (9999)	999 (9999)	—
Absolute humidity	dv	g/m ³ (gr/ft ³)	0 (0)	700 (300)	700 (300)	—
Specific enthalpy	h	kJ/kg (BTU/lb)	0 (0)	2800 (1250)	2800 (1250)	—

*) Equals Td above 0 °C (32 °F)

Output

Analogue	0 - 1 V / 5 V / 0 - 10 V	-1 < I _L < 1 mA
2x freely selectable and scalable	0 - 20 mA / 4 - 20 mA (3-wire)	Load resistance ≤ 500 Ohm
Digital interface	RS232, RS485 (with Option J3, EE33 = 1 unit load)	
Protocol	E+E Industrial Transmitter Protocol	
Default settings	Baudrate 9600, parity even, stop bits 1, ID = unique factory set	
Alarm outputs	2x changeover contact	
with option AM2 ²⁾	250 V AC / 6 A, 28 V DC / 6 A (measurand, threshold and hysteresis configurable via EE-PCS)	

General

Power supply class III  ³⁾	8 - 35 V DC 12 - 30 V AC	
Current consumption, typ.		
at 24 V DC / AC 2x voltage output	40 mA / 80 mA _{rms}	
at 24 V DC / AC 2x current output	80 mA / 160 mA _{rms}	
Pressure range for pressure tight probe		
Type T7/T10/T17	0.01...20 bar (0.15...300 psi)	
Type T8	0.01...100 bar (0.15...1450 psi)	
Enclosure material/Protection rating	Polycarbonate/IP65/NEMA 4X AlSi ₉ Cu ₃ / IP65/NEMA 4	
Probe material	Stainless steel 1.4404	
Cable gland	M16x1.5 cable Ø4.5 - 10 mm (0.18 - 0.39")	
Electrical connection	Screw terminals max. 1.5 mm ² (AWG 16)	
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial Environment FCC Part15 Class A ICES-003 Class A	
Storage conditions	without display with display	-40...60 °C (-40...140 °F), non-condensing -20...50 °C (-4...122 °F), non-condensing
Configuration and adjustment	EE-PCS (Product Configuration Software, free download) and configuration cable HA010304	

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)

2) Appropriate for outdoor use, wet location, degree of pollution 2, overvoltage category II, altitude up to 3 000 m (9 843 ft)

3) USA & Canada: class 2 supply required, max. supply voltage 30 V DC

Ordering Guide

		EE33-						
		M1				M4		
Hardware Configuration	Model	RH + T						
		Td						
	Type	Remote probe up to 120 °C (248 °F)	T4					
		Remote probe up to 180 °C (356 °F)		T5				
		Remote probe, pressure tight up to 20 bar (300 psi) and 180 °C (356 °F)			T10			
		Remote probe, pressure tight up to 100 bar (1450 psi) and 180 °C (356 °F)				T8		
		Two remote probes, pressure tight up to 20 bar (300 psi) and 180 °C (356 °F)					T17	
	Remote probe for cut-in fitting, pressure tight up to 20 bar (300 psi) and 180 °C (356 °F)						T7	
	Enclosure material	Polycarbonate					no code	
		Metal (AlSi ₉ Cu ₃)	HS3	HS3	HS3	HS3	HS3	HS3
	Filter	Stainless steel sintered	F4	F4	F4	F4		
		PTFE	F5	F5	F5	F5		
		Stainless steel - metal grid (up to 180 °C / 356 °F)	F9	F9	F9	F9	F9	F9
		PTFE membrane, stainless steel body					F11	F11
Cable length	2 m	K2	K2	K2	K2	K2	K2	
	5 m	K5	K5	K5	K5	K5	K5	
	10 m	K10	K10	K10	K10	K10	K10	
Probe length	65 mm	L65	L65			L65	L65	
	80 mm			L80				
	200 mm	L200	L200	L200	L200	L200	L200	
	400 mm	L400	L400	L400		L400	L400	
Process connection	G1/2" ISO - sliding fitting, Ø13 mm (0.51")			PA23				
	1/2" NPT - sliding fitting, Ø13 mm (0.51")			PA25				
	G1/2" ISO - cut-in fitting, Ø12 mm (0.47")				PA20			
	1/2" NPT - cut-in fitting, Ø12 mm (0.47")				PA22			
Electrical connection	Standard ¹⁾	no code						
	1 plug for power supply and outputs 2 plugs for power supply / outputs and RS485 network	E4 E7						
Digital interface	RS232	no code						
	RS485	J3						
Display	Without display	no code						
	With display with backlight	D2						
Probe connection	Fixed	no code						
	Connectable on electronics board	PC6						
Sensing element protection	With E+E proprietary coating	C1						
Additional modules	Without	no code						
	ARC module for external trigger of sensor heating ²⁾³⁾	AM1						
	Alarm output with relay ²⁾	AM2						
Output signal⁴⁾	0 - 1 V	GA1						
	0 - 5 V	GA2						
	0 - 10 V	GA3						
	0 - 20 mA	GA5						
	4 - 20 mA	GA6						
Software Setup	Output 1 measurand	Relative humidity [%]	no code					
		Other measurand (xx see measurand code)	MAxx				MAxx ⁵⁾	
	Scaling 1 low	0	no code					
		Value	SALValue				SALValue	
	Scaling 1 high	100	no code					
		Value	SAHValue				SAHValue	
	Output 2 measurand	Temperature [°C]	no code					
		Other measurand (xx see measurand code)	MBxx				MBxx ⁵⁾	
Scaling 2 low	-40	no code						
	Value	SBLValue				SBLValue		
Scaling 2 high	60	no code						
	Value	SBHValue				SBLValue		

1) Standard = 2 x M16 cable glands

2) With electrical connection standard only (no plug options possible)

3) Sensor needs to be supplied with 24V AC/DC +/- 20%, digital interface occupied

4) Applies to both outputs

5) Only with Measurand Codes Mx52/53/65/66

Measurand Code

For Output 1 and 2 in the Ordering Guide

i Please note: no mix of SI/US units allowed.

		MAxx/MBxx
Relative humidity RH	[%]	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

Ordering Examples

EE33-M1T10HS3F9K2L200PA23E4C1GA6

Model: RH + T
 Type: Remote Probe, pressure tight up to 20 bar (300 psi) and 180 °C (356 °F)
 Enclosure material: Metal (AlSi₉Cu₃)
 Filter: Stainless steel - metal grid (up to 180 °C / 356 °F)
 Cable length: 2 m
 Probe length: 200 mm
 Process connection: G1/2" ISO - sliding fitting, Ø 13 mm (0.51")
 Electrical connection: 1 plug for power supply and outputs
 Digital interface: RS232
 Display: Without
 Probe connection: Fixed
 Sensing element protection: With E+E proprietary coating
 Additional modules: Without
 Output signal: 4 - 20 mA
 Output 1 measurand: Relative humidity [%RH]
 Scaling 1 low: 0
 Scaling 1 high: 100
 Output 2 measurand: Temperature [°C]
 Scaling 2 low: -40
 Scaling 2 high: 60

EE33-M1T17F11K5L200D2C1AM1GA3MB52SBL0SBH100

Model: RH + T
 Type: Two remote probes, pressure tight up to 20 bar (300 psi) and 180 °C (356 °F)
 Enclosure material: Polycarbonate
 Filter: PTFE membrane, stainless steel body
 Cable length: 5 m
 Probe length: 200 mm
 Process connection: Without
 Electrical connection: Standard
 Digital interface: RS232
 Display: With Display with backlight
 Probe connection: Fixed
 Sensing element protection: With E+E proprietary coating
 Additional modules: ARC module for external trigger of sensor heating
 Output signal: 0 - 10 V
 Output 1 measurand: Relative humidity [%RH]
 Scaling 1 low: 0
 Scaling 1 high: 100
 Output 2 measurand: Dew Point [°C]
 Scaling 2 low: 0
 Scaling 2 high: 100

Accessories

(For further information, see data sheet "Accessories")

E+E Product Configuration Software

(free download: www.epluse.com/configurator)

EE33 Configuration cable (for EE-PCS)

Stainless steel mounting flange Ø12 mm (0.47")

Stainless steel mounting flange for Ø6 mm (0.24") T probe

Stainless steel wall mounting clip Ø12 mm (0.47")

Pressure tight screw connections

G1/2" ISO Ø12 mm

1/2" NPT Ø12 mm

G1/2" ISO Ø6 mm

1/2" NPT Ø6 mm

Humidity calibration kit

RS232 interface cable for plug option E5

RS485 kit for network

Adapter M16x1.5 to NPT 1/2"

Drip water protection

Radiation shield for RH probe

Radiation shield for T probe

EE-PCS

HA010304

HA010201

HA010207

HA010225

HA011102

HA011103

HA011104

HA011105

see data sheet "Humidity Calibration Kit"

HA010311

HA010605

HA011101

HA010503

HA010502

HA010506