

EE300Ex-HT

Humidity/Temperature Transmitter for Intrinsically Safe Applications



The EE300Ex humidity / temperature transmitter has been designed specifically for measurement in explosion hazard areas. It complies with the classifications for **Europe (ATEX), International (IECEX) and USA / Canada (FM)**.

Accurate measurement over the full range of 0...100 % RH and -40...180 °C (-40...356 °F) is also possible in applications under pressure from 0.01 ... 300 bar (4351 psi).

The EE300Ex can be used in flammable gas and dust applications. The entire transmitter can be placed in an explosion hazardous area. With the remote sensing probe a temperature classification up to T6 can be reached.

With a stainless steel enclosure and sensing probe the EE300Ex is the ideal transmitter for challenging industrial applications. The 2-part construction facilitates simple installation and rapid replacement of the measuring section without time-consuming wiring. The well-proven E+E humidity sensors ensure reliable measurement performance and long-term stability.

Based on 2-wire technology, the transmitter can be powered by any intrinsically safe power source or via Zener barriers. The measured values are available on two 4...20mA analog outputs. In addition to the measured values for humidity and temperature, the EE300Ex calculates dew point, frost point, absolute humidity, mixing ratio and other humidity-related physical quantities.

When outside of the hazardous measurement area, the setup of the EE300Ex can be easily customized by using the supplied configuration software. This includes the configuration of the analog outputs and the calibration of the humidity and temperature during service.

Measurement of moisture in oil:

Besides measurement in the air, the EE300Ex can be employed for measurement of both absolute water content (x) in ppm or relative water activity (aw) in oils.

Typical applications include oil purifiers and online monitoring of lubrication and hydraulic oils on off-shore oil rigs.

The USA and Canada approval is valid for air and gas measurement only.

Dew point measurement in natural gas.

EE300Ex measures reliably dew point in natural gas down to -20 °C (-4 °F) at a line pressure up to 250 bar (3625 psi). The optional sensor retraction tool (see accessories) allows for easy installation and removal of the sensing probe for service or calibration without interruption of the gas flow in the pipeline.



EE300Ex - wall mounting



EE300Ex - remote sensing probe

Typical Applications

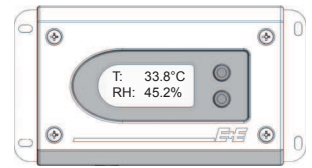
chemical process control
 pharmaceutical applications
 explosive / hazardous storage rooms
 flour mills
 moisture in oil measurement
 dew point measurement in natural gas hubs

Features

approved for gas and dust installation in zone 0 / Div. 1
 calculation of related physical quantities
 stainless steel housing and probe
 highest accuracy up to 180 °C (356 °F)
 pressure tight up to 300 bar (4351 psi)

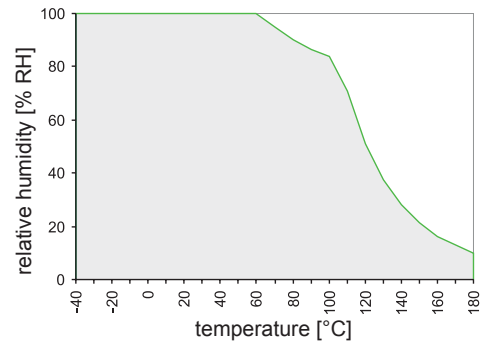
Display

Two of the measured or calculated physical quantities can be selected with push buttons on the front cover to be shown on the optional display. EE300Ex version with display is not available for environments with combustible dust, Fibers and Flyings and gases with EPL Ga IIC (Group A&B).



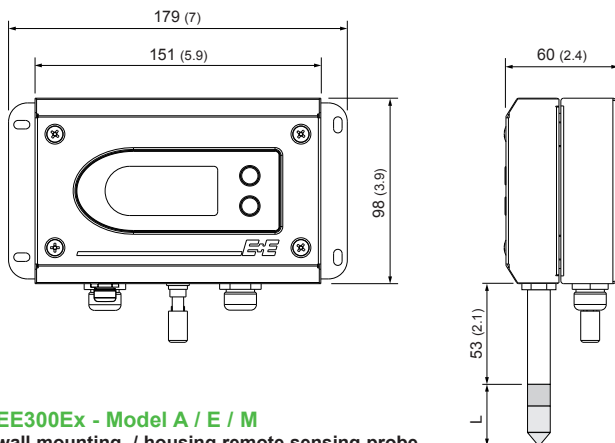
Humidity Sensor - Working Range and Coating

The gray area shows the allowed measurement range for the humidity sensor. Operating points outside of this range do not lead to destruction of the sensing element, but the specified measurement accuracy cannot be guaranteed. Harsh industrial processes as well as heavily contaminated and/or corrosive environments may affect the humidity sensor and lead to measurement drift. The E+E proprietary coating significantly reduces these effects and considerably improves the long-term stability of the transmitter.



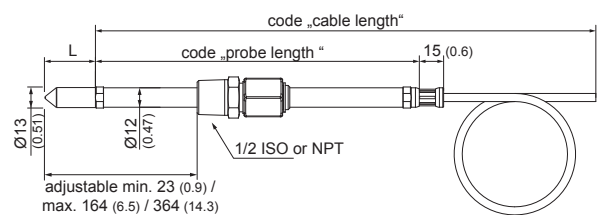
Models and Dimensions in mm (inches)

Model	pressure range	working range	Ø-probe
A - wall mounting		-40...60°C (-40...140°F)	12 (0.47)
remote sensing probe up to 20 bar (300 psi)	0.1...20 bar (1.5...300 psi)	-40...180°C (-40...356°F)	12 (0.47)
E - remote sensing probe up to 20 bar (300 psi) with sliding fitting for assembly / disassembly under pressure	0.1...20 bar (1.5...300 psi)	-40...180°C (-40...356°F)	13 (0.51)
M - remote sensing probe up to 300 bar (4351 psi)	0.01...300 bar (0.15...4351 psi)	-40...180°C (-40...356°F)	12 (0.47)
U - remote sensing probe for sensor retraction tool PN250	0.01...300 bar (0.15...4351 psi)	-40...180°C (-40...356°F)	12/15 (0.47/0.59)

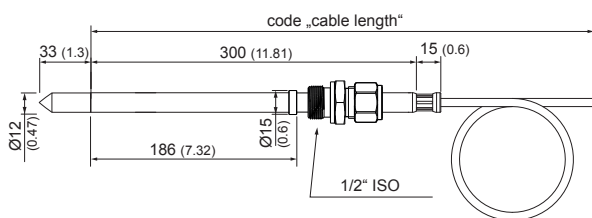


EE300Ex - Model A / E / M
wall mounting / housing remote sensing probe

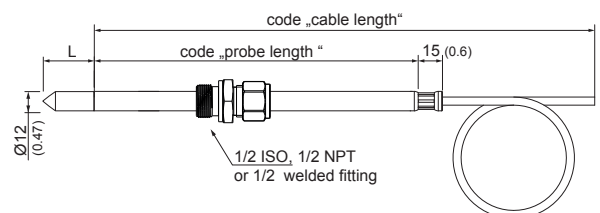
L - length of filter [mm]	
stainless steel sintered filter	33 (1.3)
PTFE-filter	33 (1.3)
stainless steel grid filter	39 (1.5)
oil filter	32 (1.26)



EE300Ex - Model E
remote sensing probe 20 bar (300 psi) with sliding fitting



EE300Ex - Model U
remote sensing probe for sensor retraction tool 250 bar (3625 psi)



EE300Ex - Model E / M
remote sensing probe 20 bar (300 psi) / 300 bar (4351 psi) with cut-in fitting

Technical Data EE300Ex

Measuring values

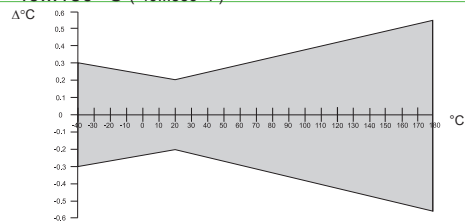
Relative humidity

Humidity sensor ¹⁾	HC1000
Measuring range ¹⁾	0...100 % RH
Accuracy ²⁾ (including hysteresis, non-linearity and repeatability, traceable to international standards, administrated by NIST, PTB, BEV...)	
-15...40 °C (5...104 °F) ≤ 90 % RH	± (1.3 + 0.3%*mv) % RH
-15...40 °C (5...104 °F) > 90 % RH	± 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 electronics	typ. 0.03 % RH/°C
Response time with filter at 20 °C (68 °F) / t ₉₀	< 30 sec.

Temperature

Temperature sensor	Pt1000 (Tolerance class A, DIN EN 60751)
Measuring range sensor head	wall mounting: -40...60 °C (-40...140 °F)
	remote sensing probe: -40...180 °C (-40...356 °F)

Accuracy



Temperature dependence of electronics

typical 0.005 °C/°C

Calculation functions

	from	to	unit
		wall mounting	remote sensing probe
Dew/Frost point temp. Td/Tf	-40 (-40)	60 (140)	100 (212)
Wet bulb temperature Tw	0 (32)	60 (140)	100 (212)
Water vapour pressure e	0 (0)	200 (3)	1100 (15)
Mixing ratio r	0 (0)	425 (2900)	999 (9999)
Absolute humidity dv	0 (0)	150 (60)	700 (300)
Specific enthalpy H	0 (0)	400 (150000)	2800 (999999)
Water activity aw	0	-	1
Water content x	0	-	100000

Outputs

freely selectable and scalable outputs 2 x 4 - 20 mA (2-wire) galvanically isolated R_L=(V_{cc}-9V)/20mA
 Output 1 (CH1) must be connected!

General

Supply voltage (Class III)	V _{cc min} =(9+R _L *0.02) VDC V _{cc max} =28 V DC
Current consumption	max 20 mA per channel
Pressure range for pressure tight sensor probe	refer to model
Serial interface for communication ³⁾	RS232
System requirements for software	WINDOWS XP or later
Protection class of housing	IP65 / Nema 4
Cable gland	M16 for cable diameter 5 - 10 mm (0.2 - 0.4)
Electrical connection	screw terminals max. 1.5 mm ² (AWG 16)
Temperature range	sensor head according measuring range
	electronic -40...60 °C (-40...140 °F)
	electronic with display -20...60 °C (-4...140 °F)
Storage temperature range	electronic and sensor head -20...60 °C (-22...140 °F)
Electromagnetic compatibility according	EN61326-1 EN61326-2-3 ICES-003 ClassB
	Industrial Environment FCC Part15 ClassB
Material	
Housing	Stainless Steel 1.4404
Probe cable	PTFE
Probe (without Filter)	Stainless Steel 1.4301



1) Refer to the working range of the humidity sensor.

2) 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).

3) Configuration adapter E-PCA and cable HA011061 necessary.

Ex - Classifications

Europe (ATEX)

Certificate: TPS 13 ATEX 38892 003 X by TÜV SÜD Product Service GmbH

Safety factors: $U_i = 28V$; $I_i = 100mA$; $P_i = 700mW$; $C_i = 2.2nF$; $L_i \approx 0mH$

Ex-Designation:

Transmitter without display	II 1 G Ex ia IIC T4 Ga	/	II 1 D Ex ia IIIC T80°C Da
Transmitter with display	II 2 G Ex ia IIC T4 Gb	/	II 1 G Ex ia IIB T4 Ga
Remote sensing probe	II 1 G Ex ia IIC T6-T1 Ga	/	II 1 D Ex ia IIIC T80°C...220°C Da

International (IECEx)

Certificate: IECEx FMG 14.0017 X by FM Approvals

Safety factors: $6.4 Vdc \leq U_i \leq 28Vdc$; $I_i = 100mA$; $P_i = 700mW$; $C_i = 2.2nF$; $L_i = 0mH$

Ex-Designation:

Transmitter without display	Ex ia IIC T4 Ta = -40°C to 60°C Ga	/	Ex ia IIIC T131°C Da
Transmitter with display	Ex ia IIC T4 Ta = -40°C to 60°C Gb	/	Ex ia IIB T4 Ta = -40°C to 60°C Ga
Remote sensing probe	Ex ia IIC T6-T1 Ta = -70°C to 200°C Ga	/	Ex ia IIIC T80°C Da

USA and Canada (FM)

Certificate: by FM Approvals

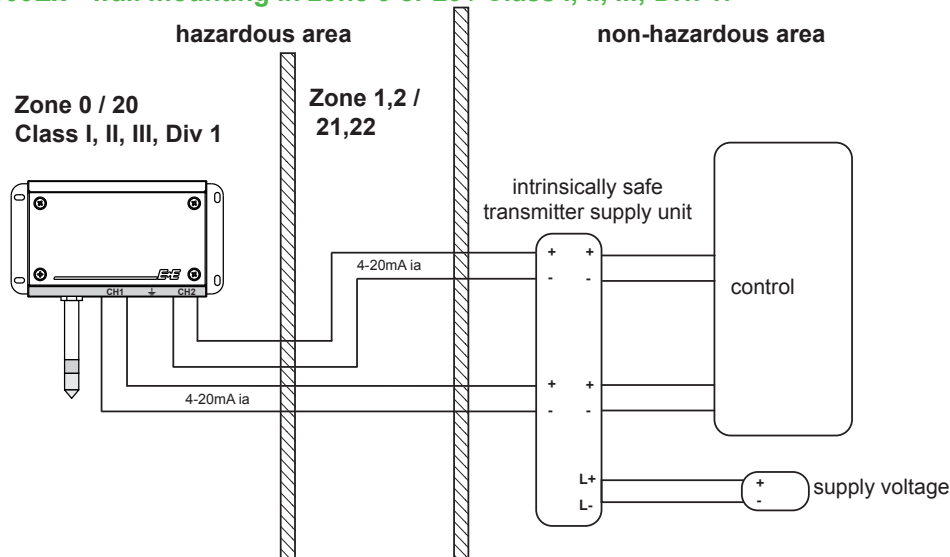
Safety factors: $6.4 Vdc \leq V_{max}$ (or U_i) $\leq 28Vdc$; I_{max} (or I_i) = 100mA; $P_i = 700mW$; $C_i = 2.2nF$; $L_i = 0mH$

Ex-Designation:

Transmitter without display	IS/I,II,III/1/ABCDEFGH/T4 -40°C < Ta < 60°C; Entity – M1_1309080; IP65 USA: NI/I,II,III/2/ABCDEFGH/T4 -40°C < Ta < 60°C Canada: NI/I/2/ABCD/T4 -40°C < Ta < 60°C I/0/AEx ia IIC T4 -40°C < Ta < 60°C; Entity – M1_1309080; IP65 I/0/Ex ia IIC T4 -40°C < Ta < 60°C Ga; Entity – M1_1309080; IP65 20/ AEx ia IIIC T131°C -40°C < Ta < 60°C; Entity – M1_1309080; IP65
Transmitter with display	IS/I/1/CD/T4 -40°C < Ta < 60°C; Entity – M1_1309080 IS/I/2/ABCD/T4 -40°C < Ta < 60°C; Entity – M1_1309080 NI/I/2/ABCD/T4 -40°C < Ta < 60°C I/0/AEx ia IIB T4 -40°C < Ta < 60°C; Entity – M1_1309080 I/1/AEx ia IIC T4 -40°C < Ta < 60°C; Entity – M1_1309080 I/0/Ex ia IIB T4 -40°C < Ta < 60°C Ga; Entity – M1_1309080 I/1/Ex ia IIC T4 -40°C < Ta < 60°C Gb; Entity – M1_1309080
Remote sensing probe	IS/I,II,III/1/ABCDEFGH/T6-T1 Entity – M1_1309080; IP65 USA: NI/I,II,III /2/ABCDEFGH/T6-T1 Canada: NI/I/2/ABCD/T6-T1 I/0/AEx ia IIC T6-T1 Entity – M1_1309080; IP65 I/0/Ex ia IIC T6-T1 Ga Entity – M1_1309080; IP65 20/ AEx ia IIIC T80°C Entity – M1_1309080; IP65

Mounting Example

EE300Ex - wall mounting in zone 0 or 20 / Class I, II, III; Div. 1:



Ordering Guide EE300Ex-HT

		EE300Ex-HT6S			
		A	E	M	U
Hardware Configuration	Model	wall mounting			
		remote sensing probe up to 20 bar (300p si)			
		remote sensing probe up to 300 bar (4351 psi)			
		remote sensing probe for sensor retraction tool PN250			U
	Display	without display	x	x	x
		with display ¹⁾	D	D	D
	Electrical Connection	2 x M16 cable gland	B	B	B
	Probe - Cable Length	wall mounting	x		
		1 m (3.3 ft)		C	C
		2 m (6.6 ft)		E	E
		5 m (16.4 ft)		G	G
	Probe Length	10 m (32.8 ft)		H	H
		wall mounting	x		
65 mm (2.56)			C	C	
200 mm (7.9)			F	F	
Zone Feedthrough (probe fitting)	300 mm (11.8)			G	
	400 mm (15.8)		H	H	
	without probe fitting	x	x	x	
	1/2 ISO - cut-in fitting; 12 mm (0.47)		A	A	
Filter	1/2 weld cut-in fitting; 12 mm (0.47)		B	B	
	1/2 NPT - cut-in fitting; 12 mm (0.47)		C	C	
	1/2 ISO - sliding fitting; 13 mm (0.51)		F		
	1/2 NPT - sliding fitting; 13 mm (0.51)		H		
Sensor Protection	stainless steel sintered filter	D	D	D	
	PTFE filter ²⁾	E	E	E	
	stainless steel grid filter on stainless steel body	I	I	I	
	H2O2 filter ²⁾	L	L	L	
Ex-Certification	oil filter	M	M	M	
	without coating	x	x	x	
Special option	with coating ³⁾	1	1	1	
	Europe (ATEX)	AT	AT	AT	
	International (IECEX)	IC	IC	IC	
Software Configuration	USA / Canada (FM)	FM	FM	FM	
	no				
	dew point measurement in natural gas		Gx	Gx	
	Measured Value Units				
	metric / SI [°C]	M	M	M	
	non metric / US [°F]	N	N	N	
	Physical Parameters Output 1	relative humidity	UW	UW	UW
		temperature	Tx	Tx	Tx
		dew point temperature	TD	TD	TD
		frost point temperature	TF	TF	TF
		wet bulb temperature	TW	TW	TW
		water vapour partial pressure	Ex	Ex	Ex
		mixture ratio	Rx	Rx	Rx
absolute humidity		DV	DV	DV	
specific enthalphy		Hx	Hx	Hx	
water activity		AW	AW	AW	
water content in mineral transformer oil		Xm	Xm	Xm	
water content customized oil		Xk	Xk	Xk	
Scaling Range Output 1		UW, Tx,...	yyy (select according „scaling ranges“, next page)		
Physical Parameters Output 2	relative humidity	UW	UW	UW	
	temperature	Tx	Tx	Tx	
	dew point temperature	TD	TD	TD	
	frost point temperature	TF	TF	TF	
	wet bulb temperature	TW	TW	TW	
	water vapour partial pressure	Ex	Ex	Ex	
	mixture ratio	Rx	Rx	Rx	
	absolute humidity	DV	DV	DV	
	specific enthalphy	Hx	Hx	Hx	
	water activity	AW	AW	AW	
	water content in mineral transformer oil	Xm	Xm	Xm	
	water content customized oil	Xk	Xk	Xk	
	Scaling Range Output 2	UW, TD,...	yyy (select according „scaling ranges“, next page)		

¹⁾ No display possible for environments with combustible dust, fibers and flyings and in gases with EPL Ga IIC (Group A&B)

²⁾ Filter cap must not be used in EPL Ga IIC (Gas Group A&B)

³⁾ Do not use in oil

Scaling Ranges

UW - Relative Humidity [% RH]									
001	0...100								

Tx - Temperature / TD - Dew Point Temperature / TF - Frost Point Temperature / TW- Wet Bulb Temperature [°C or °F]									
002	-40...60	007	0...60	015	20...120	083	-40...140		
003	-10...50	008	-30...70	022	-40...80				
004	0...50	012	-40...120	024	-20...80				
005	0...100	014	-20...100	052	-40...180				

Ex - Water vapour partial pressure [mbar]									
001	0...200	002	0...1000						

Rx - Mixture ratio [g/kg]									
001	0...400	002	0...900						

DV - Absolute Humidity [g/m³]									
001	0...150	002	0...700						

Hx - Specific Enthalpy [kJ/kg]									
001	-50...400	002	-50...2800						

AW - Water Activity []									
001	0...1								

Xm or Xk - Water Content [ppm]									
001	0...100	005	0...6000	009	0...20000				
002	0...500	006	0...5000	010	0...200				
003	0...1000	007	0...300	011	0...100000				
004	0...10000	008	0...30000						

Other scaling ranges on request.

Order Example

Example 1:

EE300EX-HT6SMD BH FAD1AT/MTx052UW001

Model: remote sensing probe up to 300bar
 Display: with display
 Electrical Connection: 2 x M16 cable gland
 Probe - Cable Length: 10 m (32.8 ft)
 Probe Length: 200 mm (7.9)
 Zone feedthrough: 1/2 ISO - cut-in fitting
 Filter: stainless steel sintered filter
 Sensor Protection: with coating
 Ex-Certification: ATEX

Measured Value Units: metric
 Physical Parameters Output 1: temperature
 Scaling Range Output 1: -40...180 °C
 Physical Parameters Output 2: relative humidity
 Scaling Range Output 2: 0...100 %RH

Example 2:

EE300EX-HT6SAxBxxxlxFM/NTx083TD083

Model: wall mounting
 Display: without display
 Electrical Connection: 2 x M16 cable gland
 Probe - Cable Length: wall mounting
 Probe Length: wall mounting
 Zone feedthrough: without probe fitting
 Filter: stainless steel grid filter
 Sensor Protection: without coating
 Ex-Certification: USA / Canada (FM)

Measured Value Units: non metric
 Physical Parameters Output 1: temperature
 Scaling Range Output 1: -40...140 °F
 Physical Parameters Output 2: dew point temperature
 Scaling Range Output 2: -40...140 °F

Accessories

Configuration adapter for PC	(EE-PCA)
ATEX Connection cable with protective circuit - EE300Ex to configuration adapter	(HA011061)
Blank cover for housing base	(HA011401)
Safety Barrier, 1-channel, STAHL 9002/13-280-093-001	(HA011410)
Intrinsically safe Transmitter Supply Unit, 1-channel, STAHL 9160/13-11-11	(HA011405)
Intrinsically safe Transmitter Supply Unit, 2-channel, STAHL 9160/23-11-11	(HA011406)
Sealing plug for unused cable glands	(HA011402)
Ball valve with 1/2 ISO female thread with Ex-Certification	(HA011403)
Sensor retraction tool PN250	(ZM-WA-025-040-EST)
Sensor retraction tool PN40	(BG-WA-103-045-EST)