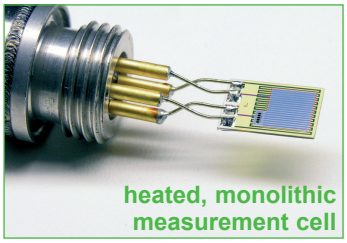
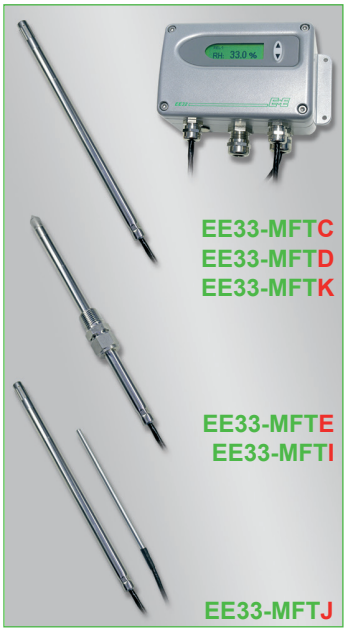
EE33

Humidity / Temperature Transmitter for High Humidity and Chemical Applications


heated, monolithic measurement cell

The highly accurate EE33 series are designed for fast and reliable measurement of relative humidity / dew point temperature / absolute humidity / ...under the most demanding conditions.
Neither condensation nor heavy chemical pollutions will affect prompt and reliable measurements. Process pressures as high as 100 bar (1450 psi) and continuous high humidity are also no problem for the EE33 series.
The core of the EE33 series is the new monolithic measurement cell type HMC01, manufactured in thin-film technology by E+E Elektronik.
Chemical contamination and also condensation will actually evaporate due to the innovative design of the HMC01 measurement cell. The monolithic construction of the sensor allows a fast return to normal conditions and a continuation of the measurement.
Additionally, with the inimitable E+E sensor coating the HMC01 measurement cell is even better protected against corrosive and short-circuit-causing conductive soils.
Distinctive models and mounting versions allow the EE33 series to be utilized in numerous applications:



- **Measurement of relative humidity during temporary condensation:**
  the measurement cell is briefly heated, but very intense
- **Measurement of dew point temperature at continuous high humidity:**
  the measurement cell is controlled and heated continuously
- **Measurement of relative humidity at continuous high humidity:**
  the measurement cell is controlled and heated continuously;
  an additional temperature sensor is added
- **Measurement of relative humidity at high chemical exposure and average humidity:**
  the measurement cell is briefly heated, but very intense
- **Measurement of relative humidity at process pressure up to 100 bar (1450 psi) and average humidity:**
  the measurement cell is installed in a special high pressure probe

The configuration software included in the scope of supply allows user friendly setup of the operation / sensor heating mode as well as selection and adjustment of the electrical outputs.

Model	Environmental Conditions
C - remote sensing probe up to 120 °C (248 °F)	chemical pollution, temporary condensation
D - remote sensing probe up to 180 °C (356 °F)	chemical pollution, temporary condensation
E - remote sensing probe, pressure tight up to 20 bar (300 psi)	chemical pollution, temporary condensation
I - remote sensing probe, pressure tight up to 100 bar (1450 psi)	chemical pollution, temporary condensation
J - 2 remote sensing probes (RH-measurement), pressure tight up to 20 bar (300 psi)	continuous high humidity and condensation
K - remote sensing probe (Td-measurement) pressure tight up to 20bar (300 psi)	continuous high humidity and condensation

Typical Applications

pharmaceutical and food industry
dryers for ceramics, wood, concrete and polyester, etc.
mushroom farms
high-humidity storage rooms
climate, test and curing chambers
meteorology

Features

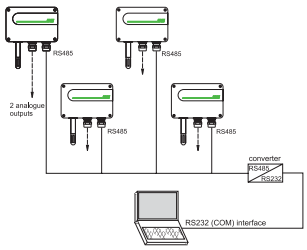
heated, monolithic measurement cell
working range 0...100 % RH / -40...+180 °C (-40...356 °F)
measurement near condensation
fast recovery after condensation
chemical purge after chemical exposure
pressure tight up to 100bar (1450psi)
calculation of additional physical quantities
optional sensor coating

Functions

	Comment
Measurement of humidity and temperature	✓
Calculation h, r, dv, Tw, Td, Tf, e	✓
2 freely scaleable and configurable analogue outputs	✓
Remote sensing probe up to 20m (65.6ft)	✓
On-site adjustment for relative humidity and temperature	✓
LED indication of transmitter status / error diagnosis of probes	✓
RS232 for transmitter configuration via PC	✓
Configuration software	✓
Alternating display with MIN/MAX indication	optional
2 freely configurable alarm outputs	optional
Removeable sensing probe	optional
Sensor protection with coating	optional
Pluggable electrical connections	optional
Data output via RS232 interface	✓
Data output via RS485 interface	optional
Networking for up to 32 transmitters via RS485 bus	optional
ARC-Module for external triggering of sensor-heating	optional

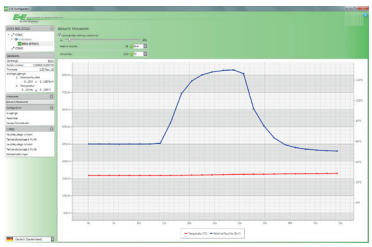
Networkability

The optional RS485 interface (order code N) allows for building a network of up to 32 transmitters.
The measurement data can be collected in a shared database and made available for all kinds of further processing.



Product Configuration Software (EE-PCS)

The configuration software allows flexible and simple adjustment of the analogue and alarm outputs in accordance with the requirements. The adjustment / calibration of the humidity and temperature outputs is possible as well. Furthermore the settings of the start and duration of the heating of the measurement cell can be defined.



Integrated Display

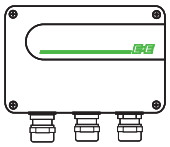
The actual measurement data and the corresponding Min/Max values can be indicated in an optional display (order code D05). The physical quantity to be displayed is selected by the push buttons next to the display.

Alarm Outputs

An optional alarm module with 2 relay outputs is available for control and alarm purposes (order code SW). The selection of the physical quantity and the setting of threshold and hysteresis can be made with the configuration software included in the scope of supply.

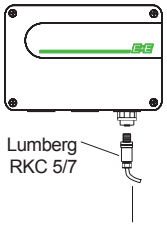
Connection Versions

standard

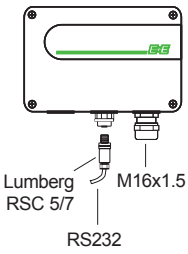


3x M16 x 1.5

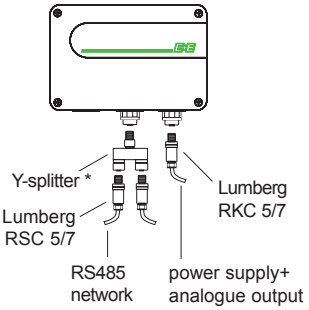
plug option C03



plug option C06



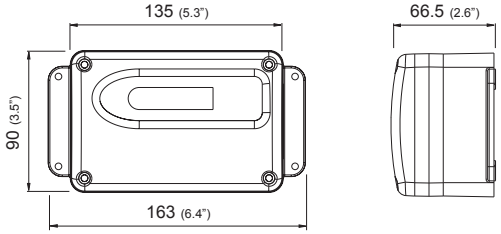
plug option C08



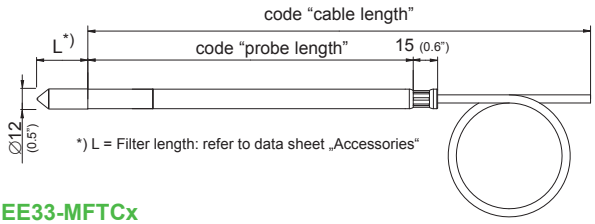
* Siemens 6ES7 194-1KA01-0XA0

Dimensions (mm)

Housing:

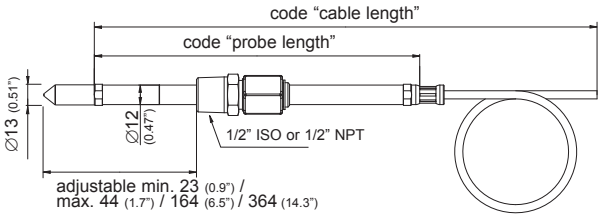


Remote Probe:

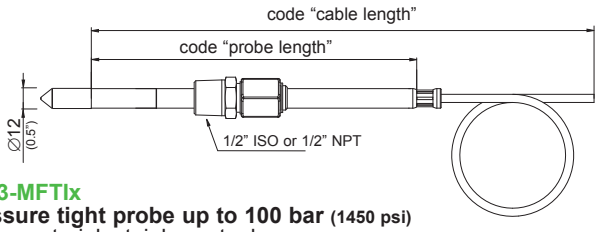


EE33-MFTCx
EE33-MFTDx
Remote sensing probe
Probe material: stainless steel

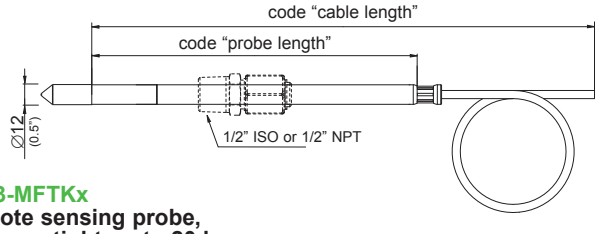
Sensing probes:



EE33-MFTEx
Pressure tight probe up to 20 bar (300 psi)
Probe material: stainless steel

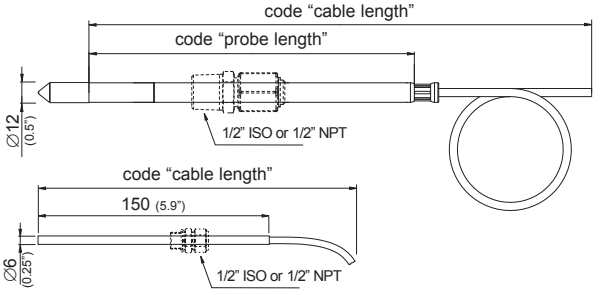


EE33-MFTIx
Pressure tight probe up to 100 bar (1450 psi)
Probe material: stainless steel



EE33-MFTKx
Remote sensing probe,
pressure tight up to 20 bar (300 psi)
(screw connection is not included in the scope of supply)
Probe material: stainless steel

screw connection:	order code:
1/2" ISO Ø12 mm	HA011102
1/2" NPT Ø12 mm	HA011103



EE33-MFTJx
Two remote sensing probes,
pressure tight up to 20 bar (300 psi)
(screw connections are not included in the scope of supply)
Probe material: stainless steel

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

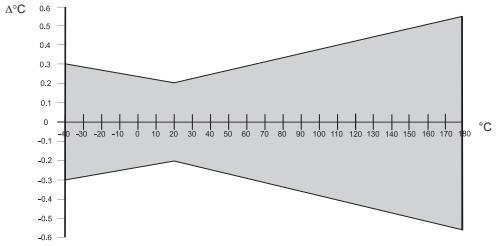
Technical Data

Measurement values

Relative humidity

Humidity sensor[1]		heated, monolithic measurement cell HMC01
Working range[1]		0...100 % RH
Accuracy[*] (including hysteresis, non-linearity and repeatability, traceable to intern. 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 of electronics		typ. ± 0.01 % RH/°C (0.0055 % RH/°F)
Response time with metal grid filter at 20°C (68°F) / t_{90}		< 15 s

Temperature

Temperature sensor element	monolithic measurement cell HMC01
Working range sensing head	EE33-MFTC: -40...120 °C (-40...248 °F) EE33-MFTD/E/I/J/K: -40...180 °C (-40...356 °F)
Accuracy	
Temperature dependence of electronics	typ. ± 0.005 °C/°C
External temperature probe	Pt1000 (DIN A)

Outputs[2]

Two freely selectable and scaleable analogue outputs	0 - 1 V	-1mA < I_L < 1 mA	
	0 - 5 V	-1mA < I_L < 1 mA	
	0 - 10 V	-1mA < I_L < 1 mA	
	4 - 20 mA	R_L < 500 Ohm	
	0 - 20 mA	R_L < 500 Ohm	
Digital interface	RS232	optional: RS485	

Max. adjustable measurement range[2)3)]

		from	to			Unit
			EE33-C	EE33-D/E/I/J	EE33-K	
Humidity	RH	0	100	100	/	% RH
Temperature	T	-40 (-40)	120 (248)	180 (356)	/	°C (°F)
Dew point temperature	Td	-40 (-40)	100 (212)	100 (212)	100	°C (°F)
Frost point temperature	Tf	-40 (-40)	0 (32)	0 (32)	0	°C (°F)
Wet bulb temperature	Tw	0 (32)	100 (212)	100 (212)	/	°C (°F)
Water vapour partial pressure	e	0 (0)	1100 (15)	1100 (15)	/	mbar (psi)
Mixture ratio	r	0 (0)	999 (9999)	999 (9999)	/	g/kg (gr/lb)
Absolute humidity	dv	0 (0)	700 (300)	700 (300)	/	g/m3 (gr/ft³)
Specific enthalpy	h	0 (0)	2800 (99999)	2800 (99999)	/	kJ/kg (Btu/lb)

General

Supply voltage		8...35 V DC 12...30 V AC (optional 100...240 V AC, 50/60 Hz)
Current consumption	- 2x voltage output	for 24 V DC/AC: typ. 40 mA / 80 mA
	- 2x current output	typ. 80 mA / 160 mA
Pressure range for pressure tight probe		EE33-MFTEx/Jx/Kx: 0.01...20 bar (0.15...300 psi) EE33-MFTIx: 0...100 bar (0...1450 psi)
System requirements for software		WINDOWS 2000 or later; serial interface
Housing / protection class		Al Si 9 Cu 3 / IP65; (NEMA 4)
Cable gland		M16 x 1.5 cable Ø 4.5 - 10 mm (0.18 - 0.39")
Electrical connection		screw terminals up to max. 1.5 mm² (AWG 16)
Working and storage temperature range of electronics		-40...60 °C (-40...140 °F) -20...50 °C (-4...122 °F) - housing with display
Electromagnetic compatibility according to		EN61326-1 EN61326-2-3 ICES-003 ClassA Industrial Environment FCC Part15 ClassA CE

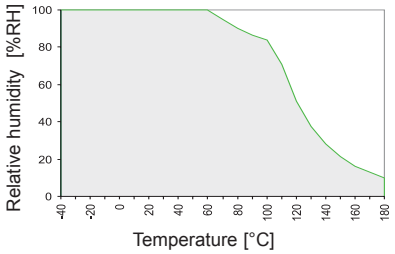
1) Refer to the working range of the humidity sensor.
2) Can be easily changed by software.
3) Refer to accuracies of calculated values (www.epluse.com/feuchtemessung)
*) The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

Technical Data for Options

Display	graphical LC display (128x32 pixels), with integrated push-buttons for selecting parameters and MIN/MAX function
Alarm outputs	2 x 1 switch contact 250 V AC / 6A 28 V DC / 6A threshold + hysteresis: can be adjusted with configuration software switching parameters:

freely selectable between		EE33-MFTC/D/E/I/J	EE33-MFTK
RH	Relative humidity	✓	
T	Temperature	✓	
Td	Dew point temperature	✓	✓
Tf	Frost point temperature	✓	✓
Tw	Wet bulb temperature	✓	
e	Water vapour partial pressure	✓	
r	Mixture ratio	✓	
dv	Absolute humidity	✓	
h	Specific enthalpy	✓	

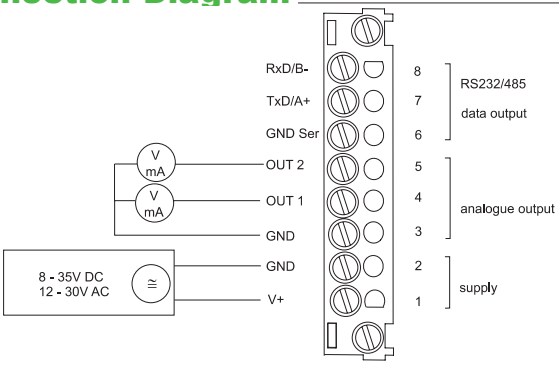
Working Range Humidity Sensor



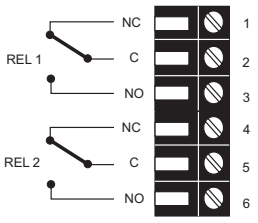
The grey area shows the allowed measurement range for the humidity sensor.

Operating points outside of this range do not lead to destruction of the sensor, but the specified measurement accuracy cannot be guaranteed.

Connection Diagram



Terminal configuration - Alarm output
(order code SW)



Accessories / Replacement Parts (For further information, see data sheet "Accessories")

- Filter caps	(HA0101xx)	- Calibration set	(HA0104xx)
- Display + housing cover	(D05M)	- Pressure tight screw connections	
- Interface cable for PCB	(HA010304)	1/2" ISO ∅12 mm	(HA011102)
- Interface cable for plug C06	(HA010311)	1/2" NPT ∅12 mm	(HA011103)
- Mounting flange 12 mm (RH probe)	(HA010201)	1/2" ISO ∅6 mm	(HA011104)
- Mounting flange 6 mm (T probe)	(HA010207)	1/2" NPT∅6 mm	(HA011105)
- Adapter M16x1.5 to NPT ½"	(HA011101)	- Radiation shield for RH-probe	(HA010502)
- Drip water protection	(HA010503)	- Radiation shield for T-probe	(HA010506)

Scope of Supply

	Included in all versions	According to ordering guide
EE33 according to ordering guide	✓	
Manual EE33 German/English/French	✓	
Inspection certificate according to DIN EN 10204 - 3.1	✓	
Allen key 3.0		only for metal housing
Mating plug for integrated power supply		V01
Mating plug RKC 5/7		V01 / C03 / C08
Y-junction for network connection		C08 & N
Mating plug RSC 5/7		C06 / C08
M16 cable gland metal		except C03, C06, C08, V01
Cutting ring fitting		EE33-xFTI

Ordering Guide

						EE33-	EE33-	EE33-	EE33-	EE33-	EE33-
Hardware Configuration											
Housing	metal housing					M	M	M	M	M	M
	polycarbonate									P	
Type	humidity					FT	FT	FT	FT	FT	FT
Model						C	D	E	I	J	K
Filter	PTFE stainless steel filter									2	2
	stainless steel sintered filter					3	3	3	3		
	PTFE filter					5	5	5	5		
	H_2O_2 filter					8	8	8	8		
	stainless steel grid filter(up to 180°C/ 356 °F)					9	9	9	9	9	9
Cable length	2 m (6.6 ft)					02	02	02	02	02	02
(incl. probe length)	5 m (16.4 ft)					05	05	05	05	05	05
	10 m (32.8 ft)					10	10	10	10	10	10
Probe length	65 mm (2.6") (for model E: 80mm (3.1"))					2	2	2		2	2
	200 mm (7.9")					5	5	5	5	5	5
	400 mm (15.8")					6	6	6		6	6
Pressure tight	1/2" male thread							HA03	HA03		
feedthrough	1/2" NPT thread							HA07	HA07		
Interface	RS232										
	RS485					N	N	N	N	N	N
Display	without display										
	with display					D05	D05	D05	D05	D05	D05
Alarm output [1) 2)]	without relay										
	with relay					SW	SW	SW	SW	SW	SW
ARC-Module [1) 3) 4)]	without external triggering of sensor-heating										
	with external triggering of sensor-heating					ARC	ARC	ARC	ARC	ARC	ARC
Plug [2) 3) 5)]	cable glands										
	1 plug for power supply and outputs					C03	C03	C03	C03	C03	C03
	1 cable gland / plug for RS232					C06	C06	C06	C06	C06	C06
	2 plugs for power supply / outputs and RS485 network					C08	C08	C08	C08	C08	C08
Sensing probe	fixed										
	connectable in the housing					P03	P03	P03	P03	P03	P03
Coating sensor	no										
	yes					HC01	HC01	HC01	HC01	HC01	HC01
Supply voltage	8...35 V DC / 12...30 V AC										
	integrated power supply 100 ...240 V AC, 50/60 Hz [1) 5)]					V01	V01	V01	V01	V01	V01
Software Configuration						Select according to Ordering Guide (A - J)					C
Physical parameters of outputs	Relative humidity	RH	[%]	(A)	Output 1						
	Temperature	T	[°C]	(B)							
	Dew point temperature	Td	[°C]	(C)	Output 2	Select according to Orderin Guide (A-J)					D
	Frost point temperature	Tf	[°C]	(D)							
	Wet bulb temperature	Tw	[°C]	(E)							
	Water vapour partial pres.	e	[mbar]	(F)							
	Mixture ratio	r	[g/kg]	(G)							
	Absolute humdity	dv	[g/m³]	(H)							
	Specific enthalphy	h	[kJ/kg]	(J)							
Type of output signal	0-1 V					1	1	1	1	1	1
	0-5 V					2	2	2	2	2	2
	0-10 V					3	3	3	3	3	3
	0-20 mA					5	5	5	5	5	5
	4-20 mA					6	6	6	6	6	6
Measured value units	metric / SI										
	non metric / US					E01	E01	E01	E01	E01	E01
T-Scaling	-40...60 (T02)	-20...100 (T14)			Output T	Select according to Ordering Guide (Txx)					
Td-Scaling	-10...50 (T03)	+20...120 (T15)									
Tf-Scaling	0...50 (T04)	0...120 (T16)			Output Td	Select according to Ordering Guide (Tdxx)					
Tw-Scaling	0...100 (T05)	0...80 (T21)									
(in °C or °F)	0...60 (T07)	-40...80 (T22)			Output Tf	Select according to Ordering Guide (Tfxx)					
	-30...70 (T08)	-20...80 (T24)									
	-30...120 (T09)	-40...160 (T33)			Output Tw	Select according to Ordering Guide(Twxx)					
	-20...120 (T10)	+20...180 (T40)				Other T/Td/Tf/Tw-scaling refer to data sheet „T-Scalings“					
	-40...120 (T12)	-40...180 (T52)									

1) Following combinations are not possible: alarm output / ARC-Module / integrated power supply
2) Combination alarm output and plugs is not possible (with cable glands only)
3) Plug options are not possible / If using an ARC-Module the transmitter has to be supplied with 24V AC/DC +/- 20 %
4) Digital interface occupied
5) Integrated power supply includes 2 plugs for power supply and outputs / further plug options are not possible

Order Example

EE33-MFTD5025ND05SW/BC3-T02-Td07

Hardware Configuration:

Housing:	metal	Display:	with display
Type:	humidity + temperature	Alarm output:	with relay
Model:	remote sensing probe	ARC-Module:	without
Filter:	PTFE filter	Plug:	cable glands
Cable length:	2 m (6.6 ft)	Sensing probe:	fixed
Probe length:	200 mm (7.9")	Coating sensor:	no
Interface:	RS485	Supply voltage:	8...35 V DC / 12...30 V AC

Software Configuration:

Output 1:	T
Output 2:	Td
Output signal:	0-10 V
Measurand value unit:	metric / SI
T-Scaling:	-40...60 °C
Td-Scaling:	0...60 °C