

EE23 Series

Humidity / Temperature Transmitter for Industrial Applications

Calculation of Dew Point and Frost Point Temperature

The EE23 series stands for multifunctionality, highest accuracy, easy mounting and service.

The new IP65 water proof housing concept is based on three modules:

- back module with connectors
- middle module which accommodates the electronics
- cover module with optional display

It offers easy installation and the possibility for fast exchange of the sensor unit for service purposes.

For use in harsh industrial environments all models of the EE23 are available in a robust metal housing.

The EE23 can be employed in all common applications by choosing the appropriate housing combination.

- **Model A / B:** wall / duct mounting
- **Model C:** remote sensing probe has a working temperature range $-40...120^{\circ}\text{C}$ ($-40...248^{\circ}\text{F}$)
- **Model F:** wall mounting version with rear cable outlets is dedicated for clean room applications. Connection cables do not disturb the cleaning process.
- **Model G:** version with optional radiation shield is dedicated for outdoor and meteorological applications.
- **Model H:** with remote miniature probe for concealed mounting (e.g. in museums) or in tight spaces.

The high quality HC series humidity sensor elements and newest microprocessor technology are the guarantee for:

- best accuracy over the whole working range
- display and output of relative humidity, temperature, dew point and frost point temperature
- small hysteresis
- excellent long term stability
- highest resistance to pollutants.

Easy configuration of the humidity and temperature outputs is made possible by the innovative design of the EE23 electronics. One can select between various current or voltage output signals.

Optionally the transmitters are available with passive temperature sensor elements with a free choice of the sensor type.

One can very easily perform a two point humidity and temperature adjustment on site by using two push buttons on the PCB.

The three modules concept makes it also possible to perform a loop calibration according to FDA (Food and Drug Administration) recommendations.

Further options are the integrated display, cable outlets via connectors, sensor coating and an hygrostate output for control and alarm purposes.



Model A + F



Model B



Model C



Model G
(radiation shield is not included in the scope of supply)



Model H

Typical Applications

high end HVAC
 climate chambers
 process technology
 dryers
 meteorology
 clean rooms
 green houses
 stocks

Features

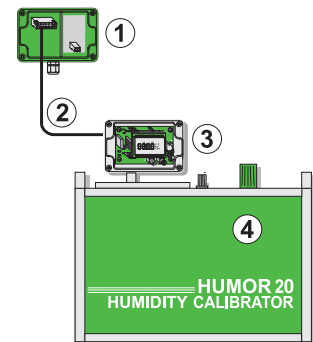
temperature range **-40...120°C (-40...248°F)**
 traceable calibration
 calculation of dew point / frost point temperature
 two point humidity and temperature calibration
 very easy mounting and maintenance
 on site calibration
 best accuracy over whole temperature range
 remote sensing probe up to 20m (65.6ft)
 alarm output

Field Calibration

The three modules housing design allows a fast and easy dismounting of the EE23 for humidity field calibration. No interruption of the measurement is necessary for loop calibration which is essential for the calibration procedure recommended by FDA (Food and Drug Administration).

- ① EE23 back module mounted on the wall
- ② EE23 extension cable (can be ordered separately)
- ③ EE23 middle module mounted in the calibrator
- ④ Humidity reference system (e.g. HUMOR 20)

Utilization of the extension cable enables the user to perform full loop calibration as recommended by FDA.



Two Point Adjustment

With an easy routine the user can perform a fast and accurate two point adjustment of relative humidity and temperature.



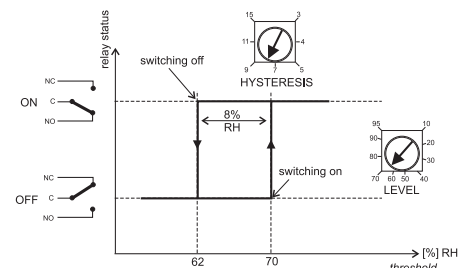
Display

The actual measured data can be indicated on the optional integrated display. It is possible to choose between relative humidity (RH), temperature (T), dew point (Td), frost point (Tf) or an alternating display of two values.



Alarm Output

Simple control applications can be solved by the optional alarm output of the EE23. The user can set threshold and hysteresis by potentiometers.



Integrated power supply

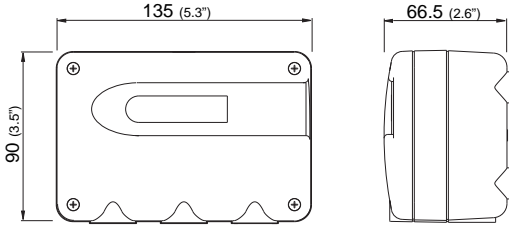
A power supply, integrated in the back module of the housing, can be ordered optionally (100...240V AC, 50/60Hz; ordering code V01). The power supply V01 is available for both polycarbonate and metal housing and comes standard with two plugs for supply and outputs to allow an easy connection.



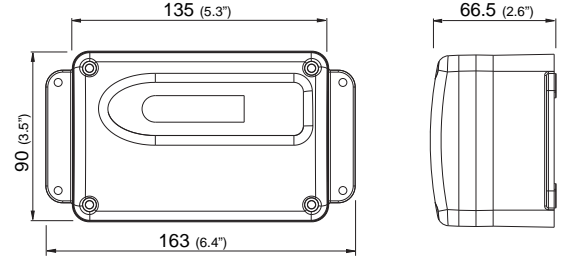
Dimensions in mm

Housing:

polycarbonate housing

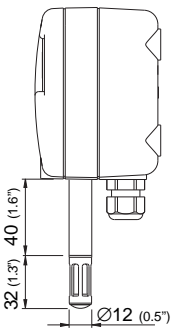


metal housing

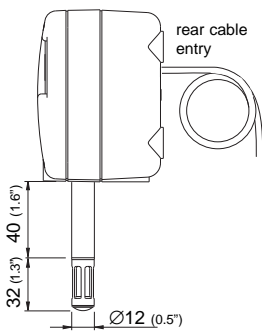


For use in harsh industrial environments all models of the EE23 are available in a robust metal housing. The very smooth surface and the rounded outlines allow for the use in clean rooms as well.

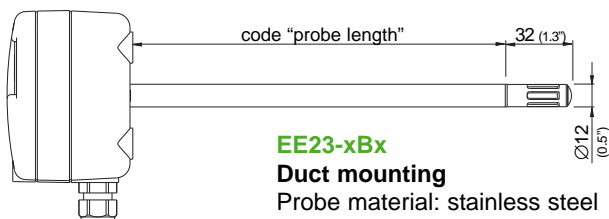
Models:



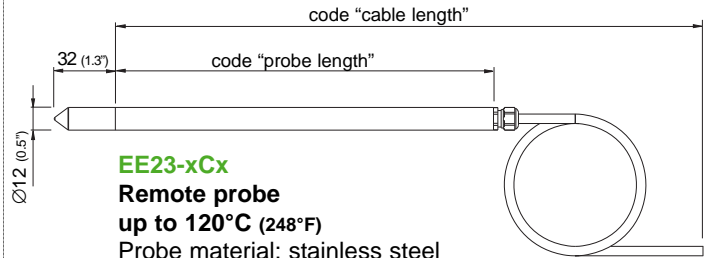
EE23-xAx
Wall mounting
Probe material: PC



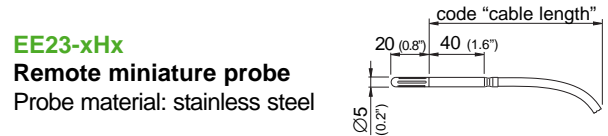
EE23-xFx
Wall mounting with rear cable entry
Probe material: PC



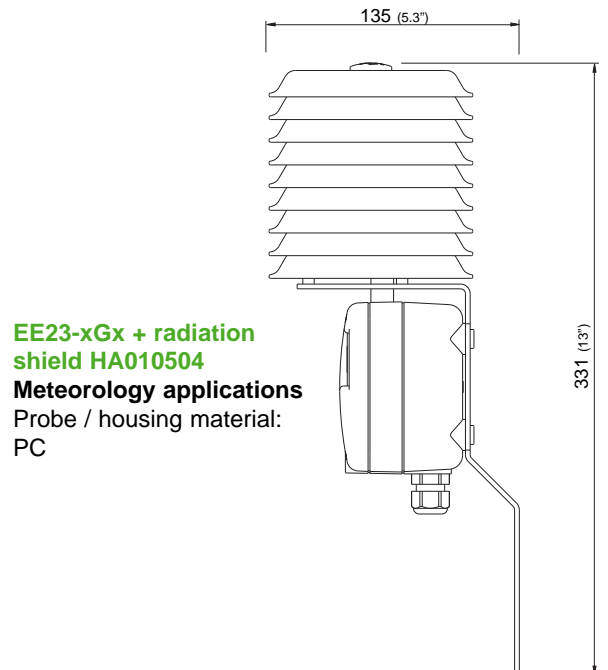
EE23-xBx
Duct mounting
Probe material: stainless steel



EE23-xCx
Remote probe
up to 120°C (248°F)
Probe material: stainless steel



EE23-xHx
Remote miniature probe
Probe material: stainless steel



EE23-xGx + radiation shield HA010504
Meteorology applications
Probe / housing material: PC

Technical Data EE23

Measured quantities

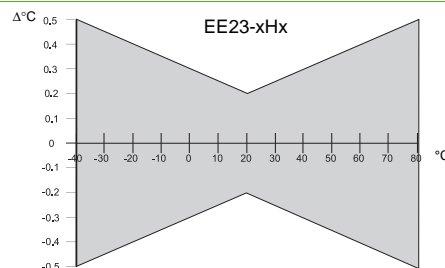
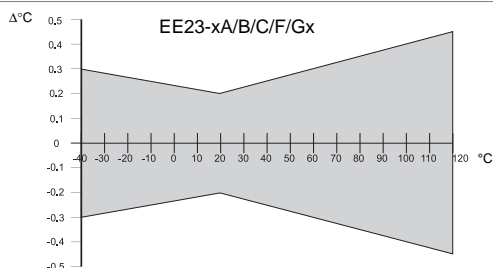
Relative humidity

Humidity sensor ¹⁾	EE23-xA/B/C/F/Gx EE23-xHx	HC1000-200 HC105
Working range ¹⁾	0...100% RH	
Accuracy ²⁾ (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...120°C (-40...248°F)		± (1.5 + 1.5%*mv) % RH
Temperature dependence electronics	typ. ± 0.015% RH/°C	
Response time with metal grid filter at 20°C / t ₉₀	< 15 sec.	

Temperature

Temperature sensor element	EE23-xA/B/C/F/Gx EE23-xHx	Pt1000 (class A, DIN EN 60751) Pt1000 (class B, DIN EN 60751)
Working range sensing head	EE23-xAx -40...60°C (-40...140°F) EE23-xCx -40...120°C (-40...248°F) EE23-xGx -40...60°C (-40...140°F)	EE23-xBx -40...80°C (-40...176°F) EE23-xFx -40...60°C (-40...140°F) EE23-xHx -40...80°C (-40...176°F)

Accuracy



Temperature dependence of electronics	typ. 0.002°C/°C	
Outputs 0...100% RH / xx...yy°C ³⁾ (temperature output scale adjustable by E+E or with configuration kit)	0 - 1 V	-0.5 mA < I _L < 0.5 mA
	0 - 5 V	-1 mA < I _L < 1 mA
	0 - 10 V	-1 mA < I _L < 1 mA
	0 - 20mA	R _L < 350 Ohm
	4 - 20 mA	R _L < 350 Ohm

Max. adjustable output scaling ⁴⁾

		from	up to			units
			EE23-A, F, G	EE23-B, H	EE23-C	
Humidity	RH	0	100	100	100	% RH
Temperature	T	-40 (-40)	60 (140)	80 (176)	120 (248)	°C (°F)
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)

General

Supply voltage		
for 0 - 5 V outputs	10.5 - 28V DC or 12 - 28V AC	
for 0 - 10 V, 0 - 20 mA and 4-20 mA outputs	15.0 - 28V DC or 15 - 28V AC (optional 100...240V AC, 50/60Hz)	
Current consumption for voltage output		
for DC supply ≤ 25 mA	with alarm module: for DC supply ≤ 35 mA	
for AC supply ≤ 35 mA _{eff}	for AC supply ≤ 60 mA _{eff}	
Current consumption for current output		
for DC supply ≤ 50 mA	with alarm module: for DC supply ≤ 60 mA	
for AC supply ≤ 90 mA _{eff}	for AC supply ≤ 110 mA _{eff}	
Housing / protection class	PC or Al Si 9 Cu 3 / IP65; Nema 4	
Cable gland ⁵⁾	M16x1.5 cable Ø 4.5 - 10 mm (0.18 - 0.39")	
Electrical connection ⁵⁾	screw terminals max. 1.5 mm ² (AWG 16)	
Working temperature range of electronics	-40...60°C (-40...140°F)	
Working temperature range with display	-30...60°C (-22...140°F)	
Storage temperature range	-40...60°C (-40...140°F)	

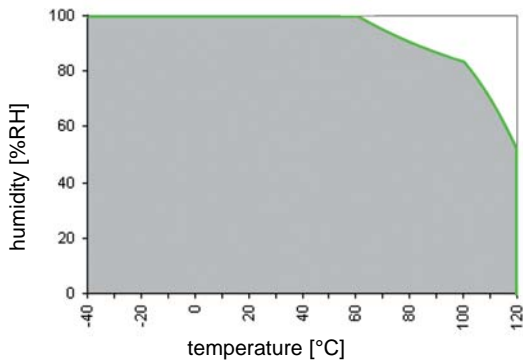
1) Refer to the working range of the humidity sensor 3) Refer to ordering guide 4) Refer to accuracies of calculated values (page 140) 5) Connection plugs refer to ordering guide
 2) The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

CE compatibility according	EN61000-6-2	FCC Part15 ClassB	CE
	EN50081-1	EN61010-1 ICES-003 ClassB	

Alarm Module - optional

Output	SPDT-Switch up to 250V AC/8A or 28V DC/8A	
	threshold	hysteresis
Setting range	10...95% RH	3...15% RH
Setting accuracy	± 3% RH	

Humidity Sensor - Working Range



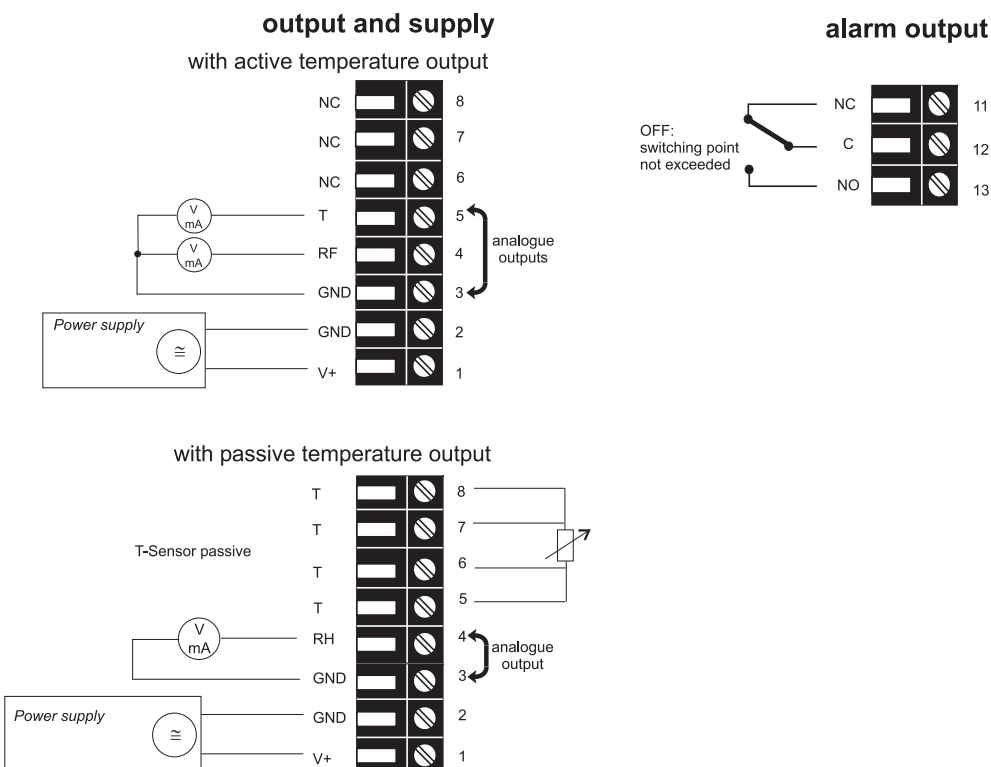
The working range of the humidity sensor element is shown in terms of humidity / temperature limits.

Although the sensors would not deteriorate beyond the limits, their performance can only be specified within the limits of the working range.

Sensor Coating

Operation in heavily polluted and/or corrosive environments is typical for many industrial processes and can lead to drift or damage of the humidity sensor and thus to false measured values. The unique protective coating developed by E+E for the sensing probe (ordering code: - HC) brings a significant improvement on the long-term stability of the transmitter in very dirty and aggressive environments.

Connecting Diagram



Ordering Guide

		EE23-	EE23-
Hardware Configuration			
Housing	metal housing polycarbonate housing	M P	M P
Type	humidity + temperature humidity + Ptxxx passive (available for models A, F and G only)	FT FPtxxx	FT
Model	wall mounting duct mounting remote probe up to 120°C (248°F) wall mounting - rear cable entry wall mounting - for meteorology ¹⁾ remote miniature probe	A B C F G	H
Filter	membrane filter 5mm stainless steel sintered filter PTFE filter metal grid filter	3 5 6	1
Cable length (incl. probe length; models C and H only)	2m (6.6ft) 5m (16.4ft) 10m (32.8ft) 20m (65.6ft)	02 05 10 20	02 05 10 20
Probe length (models B and C only)	65mm (2.6") 200mm (7.9") 400mm (15.8")	2 5 6	
Display (refer to software-code)	no display with display	D03	D03
Alarm output²⁾ (not available for model F)	no alarm output with alarm output	SW	SW
Plug	standard cable 1 gland M16x1.5; cable Ø 4.5 - 10 mm (0.18 - 0.39") 2 glands M16x1.5 1 plug for supply + outputs	C11 C03	C11 C03
Coating Sensor	no yes	HC01	
Supply voltage	8...35V DC / 12...30V AC integrated power supply 100...240V AC, 50/60Hz ³⁾	V01	V01
Software Settings			
Physical parameters of outputs⁴⁾	relative humidity RH [%] (A) temperature T [°C or °F] (B) dew-point temperature Td [°C or °F] (C) frost-point temperature Tf [°C or °F] (D)	Output 1 Output 2	Select according to Ordering Guide (A - D)
Type of output signals	0 - 1V (1) 0 - 5V (2) 0 - 10V (3) 0 - 20mA (5) 4 - 20mA (6)		Select according to Ordering Guide (1 - 6)
Temperature unit	°C °F	E01	E01
Scaling of T-output	-40...60 (T02) -40...120 (T12) -40...248 (T78)	Output T	Select according to Ordering Guide (Txx)
Scaling of Td-output	-10...50 (T03) 20...120 (T15) 0...140 (T85)		
Scaling of Tf-output in °C or °F	0...50 (T04) -30...60 (T20) 0...248 (T87) 0...100 (T05) 0...80 (T21) 32...120 (T90) 0...60 (T07) -40...80 (T22) 32...140 (T91) -30...70 (T08) -20...80 (T24) 32...248 (T93) -30...120 (T09) -20...60 (T25) 32...132 (T96) -20...120 (T10) -30...50 (T45) -10...70 (T11) -20...50 (T48)	Output Td Output Tf	Select according to Ordering Guide (Tdx) Select according to Ordering Guide (Tfxx) Other T/Td/Tf-scaling refer to page 134
Display mode	measurand output 1+2 alternating measurand output 1 measurand output 2	M12 M01 M02	M12 M01 M02

1) Model G is not available in combination with metal housing!

2) Combination alarm output and plugs is not possible (with cable glands only) / combination alarm output and integrated power supply is not possible / alarm output for RH only

3) Integrated power supply includes 2 plugs for power supply and outputs / further plug options are not possible

4) EE23-xFPtxxx: only relative humidity [%] can be selected as physical parameter of output!

Accessories (additional information see data sheet "Accessories", page 128)

- filter caps	(HA0101xx)
- radiation shield	(HA010504)
- external power supply unit	(V02)
- display + housing cover in metal	(D03M)
- display + housing cover in polycarbonate	(D03P)
- mounting flange	(HA010201)
- mounting flange 5mm (for model H only)	(HA010208)
- bracket for installation onto mounting rails	(HA010203)
- replacement humidity sensors	(FE09)
- drip water protection	(HA010503)
- calibration set	(HA0104xx)
- extension cable for field calibration	(HA010302)
- 1% calibration	(EE90/3H)

Order example

EE23-MFTC6025D03/AC2-Td04-M01

housing:	metal housing
type:	humidity + temperature
model:	remote sensor probe
filter:	metal grid
cable length:	2 m (6.6ft)
probe length:	200 mm (7.9")
display:	with display
output 1:	rF
output 2:	Td
output signal:	0-5V
scaling of T-output:	0...50°C
display mode:	measurand output 1