

## EE33-M

## Humidity and Temperature Sensor for High-end Meteorological Applications

The E33-M is optimised for accurate and reliable measurement under demanding outdoor conditions like meteorology, wind power generation or offshore measurements. Besides relative humidity (RH) and temperature (T) measurement, the device calculates derived physical quantities such as dew point temperature, absolute humidity and mixing ratio.

### Measurement Performance

The dual heating system prevents condensation on the monolithic RH sensing element, on the probe head and on the filter cap, which leads to extremely short response time and fast recovery after condensing. The measurement principle with separate RH and T probes enables accurate continuous measurement even at permanent high humidity.

The proprietary E+E coating protects the RH sensing element and its leads against corrosive and electrically conductive pollution. The probes are compatible with modern, ventilated radiation shields, like the LAM630.

### User Configurable and Adjustable

The free EE-PCS Product Configuration Software and an optional connecting cable facilitate the configuration and adjustment of the EE33-M.



## Features

### Measurement Performance

- » Highest RH/T accuracy
- » Outstanding long term stability
- » Dual heating system against condensation
- » Calculated quantities
  - 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)

### RH and T Sensing Element

- » Heated (dual heating system)
- » Monolithic structure
- » Protected by
  - E+E proprietary coating
  - PTFE membrane filter on stainless steel body



### Enclosure

- » Polycarbonate
- » IP65/NEMA 4X protection rating
- » Versatile connection options

### Remote probes

- » Specific design for best fit in high end radiation shields
- » Heated RH probe body against condensation (dual heating system)
- » Separate RH and T probe allow for easy calibration and adjustment



### Outputs

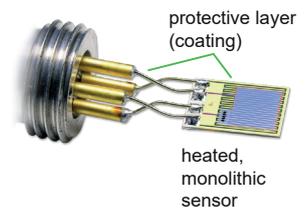
- » 2 freely scalable analogue outputs current/voltage
- » Configurable via EE-PCS
- » Digital RS232/RS485 interface with E+E industry protocol

### Inspection certificate

- » according to DIN EN 10204-3.1

## Monolithic Humidity Sensing Element

The heart of EE33-M is the monolithic HMC01 sensing element, developed and manufactured in thin-film technology by E+E Elektronik. HMC01 combines the moisture and heating element on a single substrate. Condensation is prevented by controlled heating of the sensor. The proprietary E+E coating protects the sensor and its leads against pollution and corrosion.



## Heating Mode

The EE33-M features overheating (OH) which is a continuous, regulated warming of the sensing element and the probe body (dual heating system) to prevent condensation on it. This ensures accurate measurement of relative humidity even under persistent high humidity and condensing conditions.

## Radiation Shield

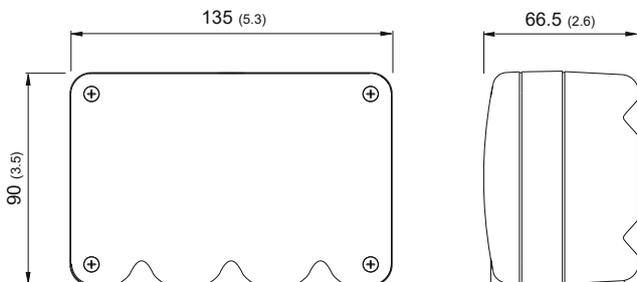
In order to minimize the impact of rain, snow, ice and solar radiation on the measurement the EE33-M must be mounted inside a radiation shield. The radiation shield LAM630 is suitable for mounting onto a mast with 30 - 35 mm diameter. Forced ventilation is provided by the control unit STEG6003. Up to 4 probes can be mounted using cable glands (Ø18 - 25 mm).



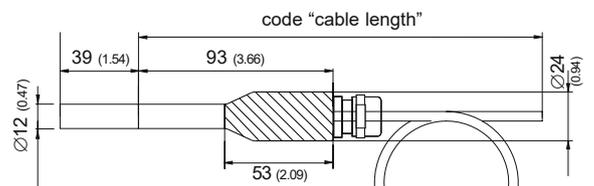
## Dimensions

Values in mm (inch)

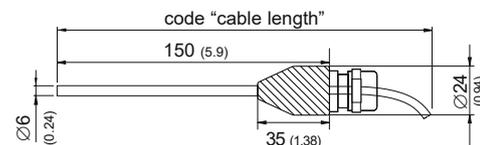
### Enclosure



### Humidity probe



### Temperature probe



## Technical Data

### Measurands

#### Relative humidity

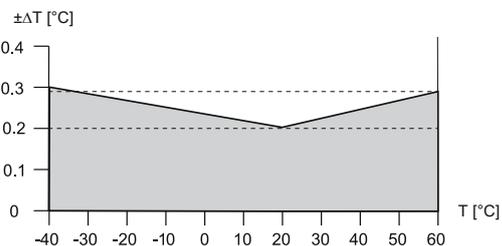
Measuring range	0...100 %RH		
Accuracy <sup>1)</sup> (including hysteresis, non-linearity and repeatability)			
-15...40 °C (5...104 °F)      ≤90 %RH	± (1.3 + 0.003*mv) %RH	mv = measured value	
-15...40 °C (5...104 °F)      >90 %RH	± 2.3 %RH		
-25...70 °C (-13...158 °F)	± (1.4 + 0.01*mv) %RH		
-40...180 °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 $t_{63}$ , typ.	< 20 s		

#### Temperature

##### Working range

Enclosure	-40...60 °C (-40...248 °F)
Probe	-40...180 °C (-40...356 °F)

##### Accuracy<sup>1)</sup>



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

### Calculated quantities

		Unit	from	to
<b>Dew point temperature</b>	Td	°C (°F)	40 (-40)	100 (212)
<b>Frost point temperature</b>	Tf <sup>*)</sup>	°C (°F)	40 (-40)	0 (32)
<b>Wet bulb temperature</b>	Tw	°C (°F)	0 (32)	100 (212)
<b>Water vapour partial pressure</b>	e	mbar (psi)	0 (0)	1100 (15)
<b>Mixture ratio</b>	r	g/kg (gr/lb)	0 (0)	999 (9999)
<b>Absolute humidity</b>	dv	g/m <sup>3</sup> (gr/ft <sup>3</sup> )	0 (0)	700 (300)
<b>Specific enthalpy</b>	h	kJ/kg (BTU/lb)	0 (0)	2800 (99999)

<sup>\*)</sup> Equals Td above 0 °C (32 °F)

### Output

#### Analogue

2x freely selectable and scalable 0 - 1 V / 5 V / 0 - 10 V -1 < I<sub>L</sub> < 1 mA

#### Digital interface

RS232, RS485 (with Option J3, EE33 = 1 Unit Load)

Protocol E+E Industrial Transmitter Protocol

Default settings Baudrate 9600, parity even, 1 stop bit, ID = unique factory set

### General

Power supply class III  $\diamond > 2)$  8 - 35 V DC / 12 - 30 V AC

Current consumption, typ.

at 24 V DC / AC 2x voltage output 40 mA / 80 mA<sub>rms</sub>

at 24 V DC / AC 2x current output 80 mA / 160 mA<sub>rms</sub>

Enclosure material/Protection rating Polycarbonate/IP65/NEMA 4X

Probe material Stainless steel 1.4404/Adapter (black) Polyoxymethylene

Cable gland M16x1.5 cable Ø4.5 - 10 mm (0.18 - 0.39")

Electrical connection	Screw terminals max. 1.5 mm <sup>2</sup> (AWG 16)	
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial Environment FCC Part15 Class A ICES-003 Class A	UK CA CE
Storage conditions	-40...60 °C (-40...248 °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) USA & Canada: class 2 supply required.

## Accessories

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

E+E Product Configuration Software (free download: <a href="http://www.epluse.com/configurator">www.epluse.com/configurator</a> )	EE-PCS
EE33 Configuration cable (for EE-PCS)	HA010304
Radiation shield LAM630 with control unit	HA010508
Mounting set for mast with Ø34 - 54 mm (1.2 - 2.1")	HA010213
Humidity calibration Kit	see data sheet "Humidity Calibration Kit"
RS232 interface cable for plug option E5	HA010311
RS485 kit for network	HA010605

## Ordering Guide

		EE33-	
Hardware Configuration	<b>Model</b>	RH + T	<b>M1</b>
	<b>Type</b>	Two remote probes for meteorological applications	<b>T28</b>
	<b>Enclosure material</b>	Polycarbonate	<b>no code</b>
	<b>Filter</b>	PTFE membrane, stainless steel body	<b>F11</b>
	<b>Cable length</b>	1 m	<b>K1</b>
		2 m	<b>K2</b>
	<b>Electrical connection</b>	Standard <sup>1)</sup>	<b>no code</b>
		1 plug for power supply and outputs	<b>E4</b>
		1 cable gland / 1 plug for RS232	<b>E5</b>
	<b>Digital interface</b>	2 plugs for power supply / outputs and RS485 network	<b>E7</b>
RS232		<b>no code</b>	
<b>Sensing element protection</b>	RS485	<b>J3</b>	
	With E+E proprietary coating	<b>C1</b>	
Software Setup	<b>Output signal<sup>2)</sup></b>	0 - 1 V	<b>GA1</b>
		0 - 5 V	<b>GA2</b>
		0 - 10 V	<b>GA3</b>
		0 - 20 mA	<b>GA5</b>
		4 - 20 mA	<b>GA6</b>
		<b>Output 1 measurand</b>	Relative humidity [%]
	Other measurand (xx see measurand code)		<b>MAxx</b>
	<b>Scaling 1 low</b>	0	<b>no code</b>
		Value	<b>SALValue</b>
	<b>Scaling 1 high</b>	100	<b>no code</b>
Value		<b>SAHValue</b>	
<b>Output 2 measurand</b>	Temperature [°C]	<b>no code</b>	
	Other measurand (xx see measurand code)	<b>MBxx</b>	
<b>Scaling 2 low</b>	-40	<b>no code</b>	
	Value	<b>SBLValue</b>	
<b>Scaling 2 high</b>	60	<b>no code</b>	
	Value	<b>SBHValue</b>	

1) Standard = 2 x M16 cable glands  
 2) Applies to both outputs

## 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	[%]	<b>10</b>
Temperature	[°C]	<b>1</b>
	[°F]	<b>2</b>
Dew point Td	[°C]	<b>52</b>
	[°F]	<b>53</b>
Frost point Tf	[°C]	<b>65</b>
	[°F]	<b>66</b>
Mixing ratio r	[g/kg]	<b>60</b>
	[gr/lb]	<b>61</b>

		MAxx / MBxx
Absolute humidity dv	[g/m <sup>3</sup> ]	<b>56</b>
	[gr/ft <sup>3</sup> ]	<b>57</b>
Wet bulb temperature Tw	[°C]	<b>54</b>
	[°F]	<b>55</b>
Water vapour partial pressure e	[mbar]	<b>50</b>
	[psi]	<b>51</b>
Specific enthalpy h	[kJ/kg]	<b>62</b>
	[BTU/lb]	<b>64</b>

## Order Example

### EE33-M1T28F11K2J3C1GA3

Model: RH + T  
 Type: Two remote probes for meteorological applications  
 Filter: PTFE membrane, stainless steel body  
 Cable length: 2 m  
 Electrical Connection: Standard (2 cable glands)

Digital Interface: RS485  
 Sensing element protection: With E+E proprietary coating  
 Output signal: 0 - 10 V  
 Output 1: Relative humidity  
 Output 2: Temperature  
 Scaling 2: -40...60 °C