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+ Datasheet EE33-M

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



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 connection cable facilitate configuration and adjustment of the EE33-M.



EE33-M enclosure and remote probes



EE33-M mounted in radiation shield

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

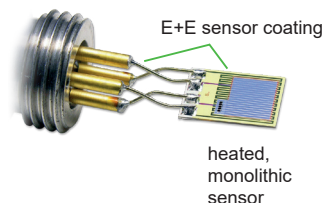
Inspection certificate

According to DIN EN 10204-3.1

Features

Monolithic Humidity Sensing Element

The heart of EE33-M is the monolithic sensing element, developed and manufactured in thin-film technology by E+E Elektronik. The unique, monolithic design 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.



E+E monolithic humidity sensing element

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).

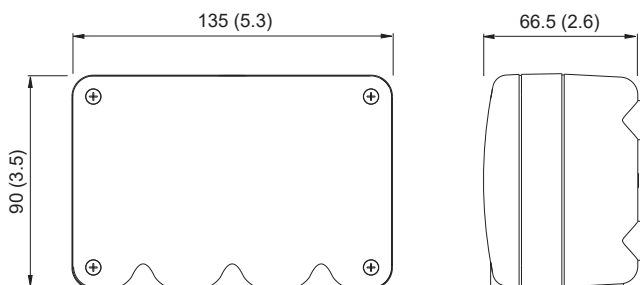


EE33-M compatible radiation shield

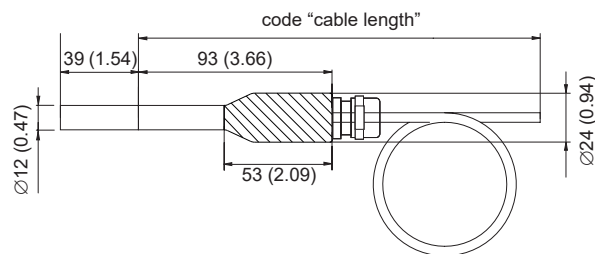
Dimensions

Values in mm (inch)

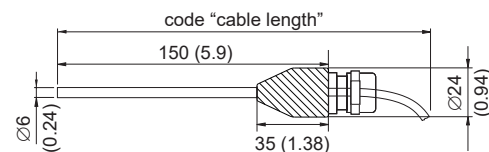
Enclosure



Humidity probe



Temperature probe



Technical Data

Measurands

Relative Humidity (RH)

| | |
|--|---|
| Measuring range | 0...100 %RH |
| Accuracy¹⁾ incl. hysteresis, non-linearity and repeatability -15...+40 °C (5...104 °F) RH ≤90 % -15...+40 °C (5...104 °F) RH >90 % -25...+70 °C (-13...+158 °F) -40...+180 °C (-40...+356 °F) | ± (1.3 + 0.003 * mv) %RH ± 2.3 %RH ± (1.4 + 0.01 * mv) %RH ± (1.5 + 0.015 * mv) %RH mv = measured value |
| Temperature dependency of electronics, typ. | ±0.01 %RH / °C (0.0055 %RH / °F) |
| Response time t₆₃ with metal grid filter at 20 °C (68 °F) | <20 s |

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).

Technical Data

Measurands

Temperature (T)

| | |
|---|------------------------------|
| Measuring range | -40...+60 °C (-40...+140 °F) |
| Accuracy ¹⁾ | |
| Temperature dependence of electronics, typ. | ±0.005 °C/°C |

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).

Calculated Quantities

| | | from | to | unit |
|-------------------------------|----------------|-----------|-------------|--|
| Dew point temperature | T _d | -40 (-40) | 100 (212) | °C (°F) |
| Frost point temperature | T _f | -40 (-40) | 0 (32) | °C (°F) |
| Wet bulb temperature | T _w | 0 (32) | 100 (212) | °C (°F) |
| Water vapour partial pressure | e | 0 (0) | 1100 (15) | mbar (psi) |
| Mixing ratio | r | 0 (0) | 999 (9999) | g/kg (gr/lb) |
| Absolute humidity | dv | 0 (0) | 700 (300) | g/m ³ (gr/ft ³) |
| Specific enthalpy | h | 0 (09) | 2800 (1250) | kJ/kg (BTU/lb) |

Outputs

Analogue




| | | | |
|--|--|---|---|
| Two analogue outputs freely selectable and scalable | 0 - 1 / 5 / 10 V 4 - 20 mA 3-wire 0 - 20 mA 3-wire | -1 mA < I _L < 1 mA R _L < 500 Ω R _L < 500 Ω | I _L = load current R _L = load resistance |
|--|--|---|---|

Digital

| | |
|---|---|
| Digital interface Protocol Factory settings Supported Baud rates | RS232, RS485 (EE33 = 1 unit load) E+E Industrial Transmitter Protocol 9600 Baud, parity even, 1 stop bit, Modbus address = individual, device-specific setting 9600, 19200, 38400, 57600 and 76800 |
|---|---|

Technical Data

General

| | | |
|--|---|--|
| Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC | 8 - 35 V DC | 12 - 30 V AC |
| Current consumption , typ. @ 24 V DC/AC 2 voltage outputs 2 current outputs | 40 mA / 80 mA _{rms} 80 mA / 160 mA _{rms} | |
| Electrical connection | Screw terminals max. 1.5 mm ² (AWG 16) | |
| Cable gland | M16x1.5, cable Ø4.5...10 mm (0.18...0.39") | |
| Probe material | Stainless steel 1.4404/Adapter (black) POM (Polyoxymethylene) | |
| Temperature working range Probe Enclosure | -80...+180 °C (-112...+356 °F) -40...+60 °C (-40...+140 °F) | |
| Storage conditions | -40...+60 °C (-40...+140 °F), non-condensing | |
| Enclosure Material Protection rating | PC (Polycarbonate) IP65/NEMA 4X | |
| Electromagnetic compatibility | EN 61326-1 FCC Part15 Class A | EN 61326-2-3 ICES-003 Class A Industrial Environment |
| Conformity |   | |
| Configuration and adjustment | EE-PCS Product Configuration Software (free download) and configuration cable | |

Ordering Guide

| Feature | Description | | |
|----------------------------|--|---|----------|
| Hardware Configuration | | EE33- | |
| | Model | RH + T | M1 |
| | Type | Two remote probes for meteorological applications | T28 |
| | Enclosure material | PC (Polycarbonate) | No code |
| | Filter | PTFE (Polytetrafluoroethylene) membrane, stainless steel body | F11 |
| | Probe cable length (incl. probe length) | 1 m (3.3 ft) | K1 |
| | | 2 m (6.6 ft) | K2 |
| | Electrical connection | Standard ¹⁾ | No code |
| | | 1 plug for power supply and outputs | E4 |
| | | 2 plugs for power supply + outputs and for RS485 (requires option J3) | E7 |
| Digital interface | RS232 | No code | |
| | RS485 | J3 | |
| Sensing element protection | With E+E proprietary coating | C1 | |
| Software Setup | Output signal ²⁾ | 0 - 1 V | GA1 |
| | | 0 - 5 V | GA2 |
| | | 0 - 10 V | GA3 |
| | | 0 - 20 mA | GA5 |
| | | 4 - 20 mA | GA6 |
| | | | |
| | Output 1 measurand | Relative humidity RH [%] | No code |
| | | Other measurands (xx see measurand code below) | MAxx |
| | Output 1 scaling low | 0 | No code |
| | | Value | SALValue |
| | Output 1 scaling high | 100 | No code |
| | | Value | SAHValue |
| Output 2 measurand | Temperature T [°C] | No code | |
| | Other measurands (xx see measurand code below) | MBxx | |
| Output 2 scaling low | -40 | No code | |
| | Value | SBLValue | |
| Output 2 scaling high | 60 | No code | |
| | Value | SBHValue | |

1) Standard = 2 x M16 cable glands

2) Applies to both outputs

Measurand Code

For Output 1 and 2 in the Ordering Guide

| Measurand | Unit | Code |
|-------------------------------|---------------------|--------------------|
| | | MAxx / MBxx |
| Relative humidity | % | 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 |
| 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 |

i PLEASE NOTE

No mix of SI/US units allowed.

Order Example

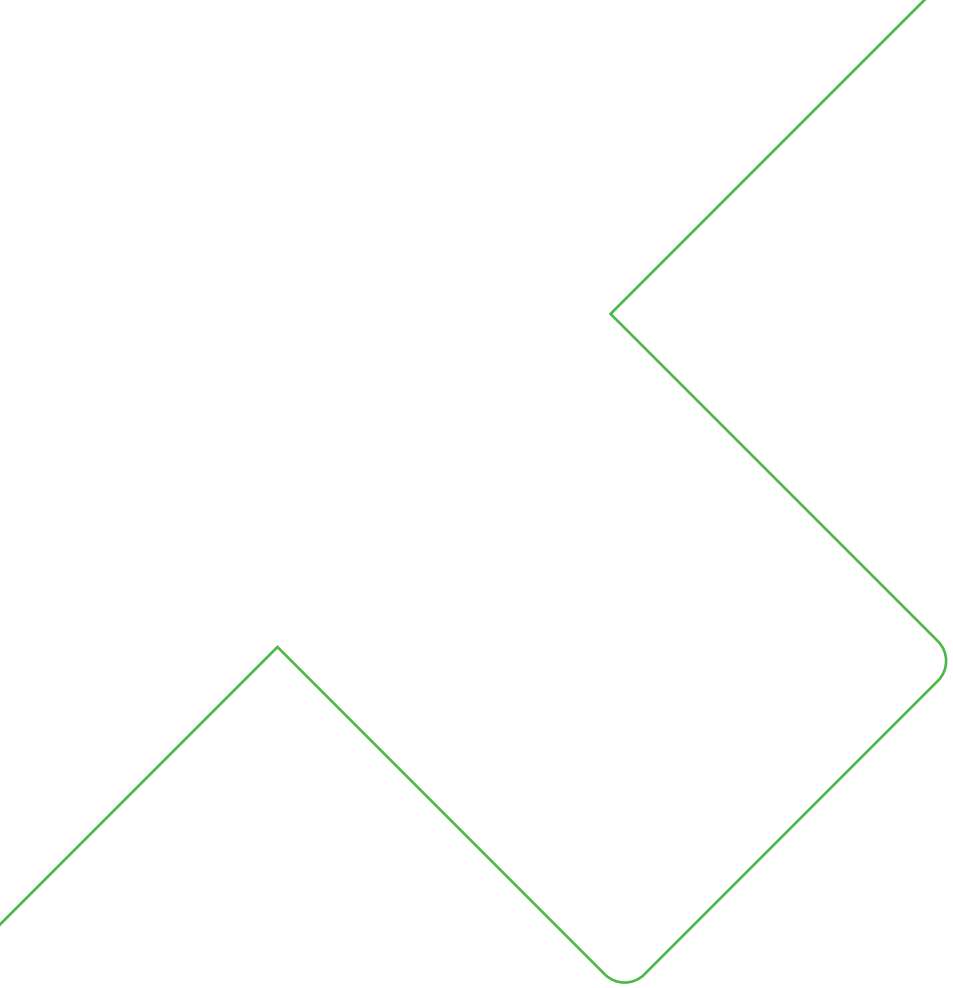
EE33-M1T28F11K2J3C1GA3

| Feature | Code | Description |
|----------------------------|----------------|---|
| Model | M1 | RH & T |
| Type | T28 | Two remote probes for meteorological applications |
| Enclosure material | No code | PC (Polycarbonate) |
| Filter | F11 | PTFE (Polytetrafluoroethylene) membrane, stainless steel body |
| Probe cable length | K2 | 2 m (6.6") |
| Electrical connection | No code | Standard (2 x M16 cable glands) |
| Digital interface | J3 | RS485 |
| Sensing element protection | C1 | With E+E proprietary coating |
| Output signal | GA3 | 0 - 10 V |
| Output 1 measurand | No code | Relative humidity RH [%] |
| Output 1 scaling low | No code | 0 |
| Output 1 scaling high | No code | 100 |
| Output 2 measurand | No code | Temperature T [°C] |
| Output 2 scaling low | No code | -40 |
| Output 2 scaling high | No code | 60 |

Accessories

For further information see datasheet [Accessories](#).

| Description | Code |
|--|---|
| E+E Product Configuration Software (free download from www.epluse.com/configurator) | 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 |
| RS485 kit for network | HA010605 |



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Version v1.5 | 05-2023
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