User Manual

EE99-1

Humidity / Temperature Module for OEM Applications

YOUR PARTNER IN SENSOR TECHNOLOGY

E+E ELEKTRONIK® Ges.m.b.H.

EMC note USA (FCC):

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC note Canada (ICES-003):

CAN ICES-3 (A) / NMB-3 (A)

CONTENT

1 General

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. The user manual may not be used for the purposes of competition without the written consent of E+E Elektronik® and may not be forwarded to third parties. Copies may be made for internal purposes. All information, technical data and diagrams included in these instructions are based on the information available at the time of writing.

Please find this document and further product information on our website at www.epluse.com/ee99-1.

Disclaimer
The manufacturer or his authorised agent can be only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the specified operating conditions. Consequential damages are excluded from the liability.

1.1 Explanation of Symbols

This symbol indicates safety information.
It is essential that all safety information is strictly observed. Failure to comply with this information can lead to personal injuries or damage to property. E+E Elektronik® assumes no liability if this happens.

This symbol indicates instructions.
The instructions shall be observed in order to reach optimal performance of the device.

1.2 Safety Instructions

1.2.1 General Safety Instructions

- The device and mainly the filter cap shall not be exposed to unnecessary mechanical stress.
- When replacing the filter cap make sure not to touch the sensing elements.
- The device must be operated with the filter cap on at all times.
- For sensor cleaning and filter cap replacement please see “Cleaning instructions” at www.epluse.com
- Installation, electrical connection, maintenance and commissioning shall be performed by qualified personnel only.
- Use the EE99-1 only as intended and observe all technical specifications.
- Do not use EE99-1 in explosive atmosphere or for measurement of aggressive gases.
- The sensor is an electrostatic discharge sensitive component (ESD). When touching the sensing element, ESD protective measures should be followed.
- This device is not appropriate for safety, emergency stop or other critical applications where device malfunction or failure could cause injury to human beings.

1.2.2 Intended Use

The EE99-1 humidity and temperature module is optimised for the measurement of relative humidity (RH) and temperature (T) in climate chambers and other OEM applications. The use of the EE99-1 other than described in this manual is not allowed. The manufacturer cannot be held responsible for damages as a result of incorrect handling, installation and maintenance of the device. Unauthorised modifications of the product lead to loss of all warranty claims. The device may only be powered with separated extra-low voltage (SELV).

Short-term temperature up to 200 °C (392 °F):
For short time cycles, the EE99-1 is capable of withstanding temperatures of up to 200 °C (392 °F). Please note that this is only allowed for a period of <30 minutes per cycle and <100 hours for the total product lifetime.

The stress on the sensing elements at these high temperatures must be taken into account with a shorter calibration interval.

In order to avoid damage to the instrument or health hazards, the measuring equipment must never be

manipulated with tools that are not specifically described in this manual.

The sensor may only be utilised in accordance with the conditions defined in the technical data. Otherwise, measurement inaccuracies will occur and equipment failures cannot be ruled out.

The steps recommended by the manufacturer for installation, inspections and maintenance work must be observed and carried out for the safety of the user and for the functionality of the equipment.

Unauthorised product modification leads to loss of all warranty claims. This may be accomplished only with an explicit permission of E+E Elektronik!

1.2.3 Mounting, Start-up and Operation

The EE99-1 humidity and temperature module has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a manner that does not have a negative effect on its safe use. The user is responsible for observing all applicable safety guidelines, local and international, with respect to safe installation and operation on the device. This user manual contains information and warnings that must be observed by the user in order to ensure safe operation.

- Mounting, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorised by the operator of the facility to carry out the mentioned activities.
- The qualified staff must have read and understood this user manual and must follow the instructions contained within.
- All process and electrical connections shall be thoroughly checked by authorised staff before putting the device into operation.
- Do not install or start-up a device supposed to be faulty. Make sure that such devices are not accidentally used by marking them clearly as faulty.
- A faulty device may only be investigated and possibly repaired by qualified, trained and authorised staff. If the fault cannot be fixed, the device shall be removed from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer.

1.3 Environmental Aspects

Products from E+E Elektronik® are developed and manufactured in compliance with all relevant environmental protection requirements. Please observe local regulations for the device disposal.

For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

1.4 ESD Protection

The sensing elements and the electronics board are ESD (electrostatic discharge) sensitive components of the device and must be handled as such. The failure to do so may damage the device by electrostatic discharges when touching exposed sensitive components.

2 Scope of Supply

- EE99-1 – Humidity / Temperature Module for OEM Applications
- Test report according to DIN EN 10204-2.2
- User manual

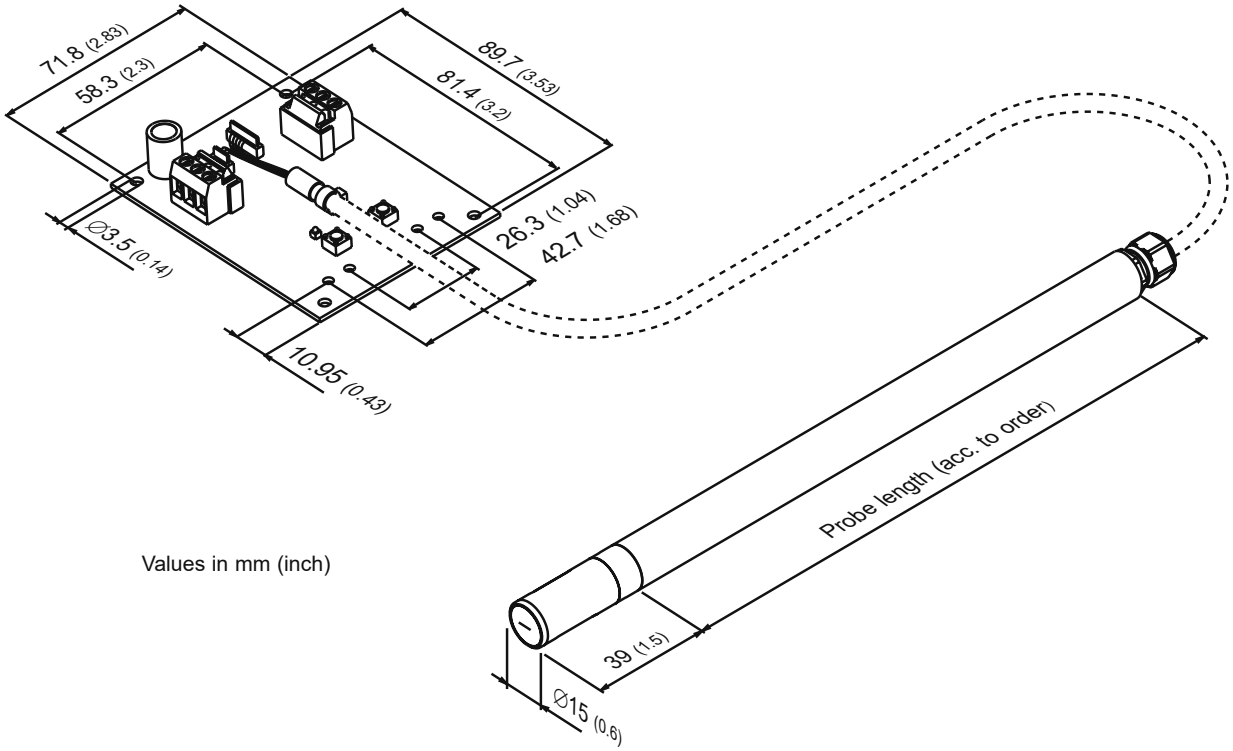
3 Product Description

3.1 General

The measured RH data is available on an analogue current output (4 - 20 mA / 3-wire). The passive T values can be read out using 3-wire connection. The EE99-1 features a 15 mm (0.6") plastic (PPS) sensing probe which can be employed over the entire T range according to the technical data. The sensing elements are protected by E+E proprietary coating and a stainless steel grid filter cap.

The sensing probe and the electronics of the EE99-1 undergo the factory adjustment together and may not be separated from each other. Do not cut, shorten or extend the probe cable.

3.2 Dimensions



Values in mm (inch)

3.3 Installation

ESD handling regulations must be strictly observed.

3.3.1 Electronics Board

Hold the electronics boards only by the edges. Do not touch the components or their contacting.

3.3.2 Sensing Probe

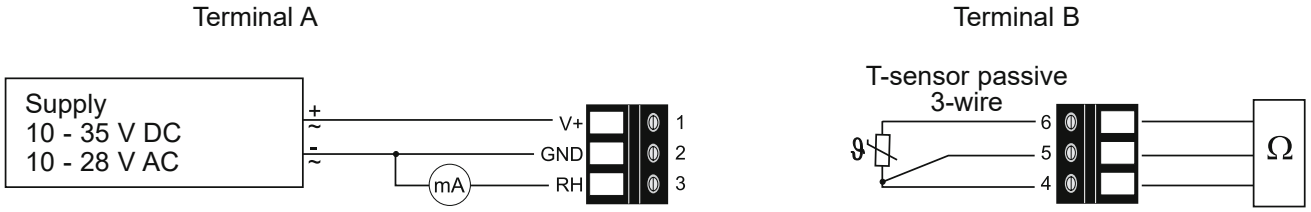
Avoid touching the sensing head. The probe must be operated with the filter cap on at all times.

A clogged filter cap causes longer response time. For replacing the filter cap and cleaning the sensing head please see the “Cleaning Instructions” at www.epluse.com.

Do not touch the sensing elements!

For accurate measurement results it is of paramount importance to avoid temperature gradients along the sensing probe. Whenever possible, install the entire probe in the environment to monitor. If the probe is installed into a partition wall, the probe‘s backend shall be isolated thermally.

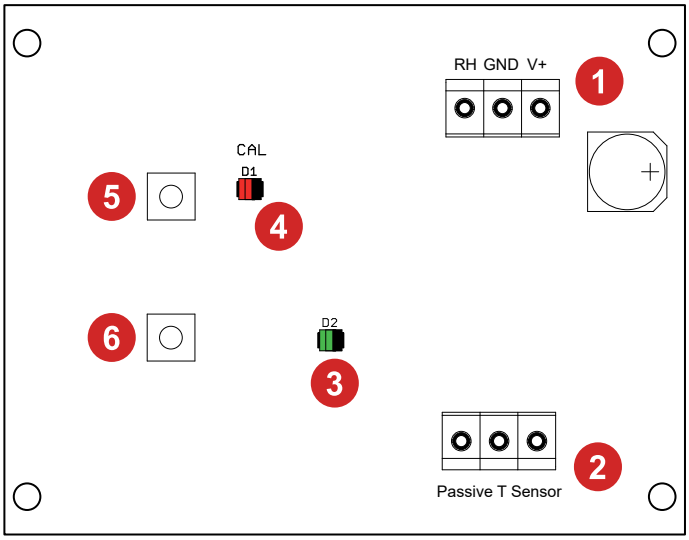
3.4 Electrical Connection



Use only power supply units according to EN 61140, protection class III (EU) and protection class II (North America).

Important note:
The manufacturer cannot be held responsible for personal injuries or damage to property as a result of incorrect handling, installation, wiring, power supply and maintenance of the device.

3.5 Setup and Configuration



1 Terminal A for supply and output signal
2 Terminal B T-passive
3 Status LED (green): - flashing = supply voltage applied / microprocessor is active
- constantly = RH sensing element error
4 Calibration LED (red): - lit up permanently during the adjustment mode
- lit up shortly when reset to factory adjustment is performed
5 Pushbutton S2: - for 1 point RH adjustment (humidity <50 %RH)
- for 2 point RH adjustment (low adjustment point)
- to exit the adjustment mode settings
6 Pushbutton S1: - for 1 point RH adjustment (humidity >50 %RH)
- for 2 point RH adjustment (high adjustment point)
- to store the adjustment settings

4 Calibration / Adjustment

4.1 Definition of Terms

Calibration
The calibration documents the accuracy of a measurement device. The device under test (specimen) is compared with the reference and the deviations are documented in a calibration certificate. During the calibration, the specimen is not changed or improved in any way.

Adjustment
The adjustment improves the measurement accuracy of a device. The specimen is compared with the reference and brought in line with it. An adjustment can be followed by a calibration which documents the accuracy of the adjusted specimen.

4.2 Calibration and Adjustment at E+E Elektronik

Calibration and/or adjustment can be performed in the E+E Elektronik calibration laboratory. For information on the E+E capabilities in ISO or accredited calibration please see www.eplusecal.com.

4.3 Calibration and Adjustment by the User

The RH adjustment of EE99-1 can be performed using the pushbuttons S1 and S2 on the electronics board.

The following adjustments are possible:

1-point humidity adjustment: quick and simple adjustment at a defined humidity point (working point)

2-point humidity adjustment: for accurate measuring results over the entire humidity working range.

- To reach a temperature balance it is recommended to keep the transmitter and the reference chamber (e.g. Humor 20,...) for minimum 4 hours in the same room.
- Depending on the level of accuracy required, the humidity reference can be:
  – Humidity calibrator (e.g. Humor 20), please see www.epluse.com/humor20.
  – Handheld device (e.g. Omniport 30), please see www.epluse.com/omniport30.
  – Humidity standards (e.g. Humidity Calibration Kit), please see www.epluse.com/ee99-1.
- During stabilisation period and calibration/adjustment procedure it is important to keep the temperature constant in the reference climate chamber.
- For calibrating/adjusting the humidity sensor must be stabilised at least 30 minutes into the reference chamber.
- Replace a used dirty filter cap before calibration and/or adjustment.

4.3.1 1-point Humidity Adjustment

When the working range is limited to a certain more narrow range, a adjustment at one humidity point is absolutely sufficient.

This adjustment is implemented as an offset correction and may cause an extra inaccuracy for the rest of the working range.

Procedure for 1-point humidity adjustment:

1. Insert the sensor probe into the reference chamber (humidity adjustment point) and stabilise for minimum 30 min.

S1

2. PUSHBUTTON S1 (adjustment point >50 %RH.): Pressing the button for 3 seconds starts the procedure for the high adjustment point. The adjustment mode is indicated by the lit red LED “Calib”.

Calib

or

S2

PUSHBUTTON S2 (adjustment point <50 %RH): Pressing the button for 3 seconds starts the procedure for the low adjustment point. The adjustment mode is indicated by the lit red LED “Calib”.

S1 S2

3. PUSHBUTTON S1 (up) und **S2 (down)**: Pressing the two buttons will adjust the measuring value in steps of 0.1 % up or down to the reference value. The actual measuring value can be measured with the analogue output.

S1

4. PUSHBUTTON S1: Pressing the button for 3 seconds saves the adjustment value and ends the procedure. Exiting the adjustment mode is indicated by deactivation of the red LED “Calib”.

Calib

or

S2

PUSHBUTTON S2: Pressing the button for 3 seconds ends the adjustment procedure without storing the adjustment values. Exiting the adjustment mode is indicated by deactivation of the red LED “Calib”.

4.3.2 2-point Humidity Adjustment

For accurate adjustment over the whole working range or in case of sensor exchanges a two point adjustment is recommended.

- Start adjustment at the low humidity adjustment point!
- The humidity difference between the two points should be >30 %RH

Procedure for 2-point humidity adjustment (start at low adjustment point)**:**

Low adjustment point:

1. Insert the sensor probe into the reference chamber (low humidity adjustment point) and stabilise for minimum 30 min.

S2 Calib

2. PUSHBUTTON S2: Pressing the button for 3 seconds starts the procedure for the low adjustment point. The adjustment mode is indicated by the lit red LED “Calib”.

S1 S2

3. PUSHBUTTON S1 (up) and **S2 (down)**: Pressing the two buttons will adjust the measuring value in steps of 0.1% up or down to the reference value. The actual measuring value can be measured with the analogue output.

S1

4. PUSHBUTTON S1: Pressing the button for 3 seconds saves the adjustment values and ends the procedure. Exiting the adjustment mode is indicated by deactivation of the red LED “Calib”.

Calib

S2

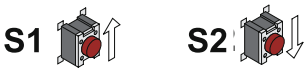
or PUSHBUTTON S2: Pressing the button for 3 seconds ends the adjustment procedure without storing the adjustment values. Exiting the adjustment mode is indicated by deactivation of the red LED “Calib”.

High adjustment point:

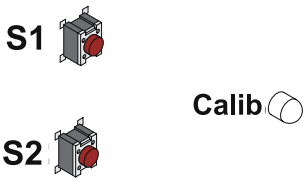
5. Insert the sensor probe into the reference chamber 2 (high humidity adjustment point) and stabilise for minimum 30 min.

S1 Calib

6. PUSHBUTTON S1: Pressing the button for 3 seconds starts the procedure for the high adjustment point. The adjustment mode is indicated by the lit red LED „Calib“.



7. PUSHBUTTON S1 (up) and **S2 (down)**: Pressing the two buttons will adjust the measuring value in steps of 0.1% up or down to the reference value. The actual measuring value can be measured with the analogue output.



8. PUSHBUTTON S1: Pressing the button for 3 seconds stores the adjustment value and the procedure is ended. Exiting the adjustment mode is indicated by deactivation of the red LED „Calib“.

or PUSHBUTTON S2: Pressing the button for 3 seconds ends the adjustment procedure without storing the adjustment values. Exiting the adjustment mode is indicated by deactivation of the red LED „Calib“.

4.3.3 Reset to Factory Adjustment:

PUSHBUTTON S1 and S2: In neutral mode pressing both buttons simultaneously for 5 seconds customer adjustment settings are reset to factory adjustment.
A short flash of the red LED „Calib“ indicates the reset.

5 Maintenance and Service

EE99-1 does not require any special maintenance, nevertheless for high accurate measurements especially over wide RH and T ranges it is recommended to calibrate/adjust the sensor every 12 months. If needed, the sensing element of the humidity sensor can be cleaned by the user (see the E+E cleaning instructions).

5.1 Filter Replacement

Depending on the application it might be necessary to replace the filter cap, once in a while. In most of the cases, a clogged filter shows visible contamination or dirt. Longer response time of the humidity measurement also indicates a clogged filter cap. In such cases, replace the filter cap by a new, original one, see chapter 5.3.

Procedure

- Turn the filter cap counter-clockwise for removing it.
- Install the new filter cap finger tight by turning it clockwise.
- While replacing the filter cap take very good care to not touch or rub the sensing element.

5.2 Repairs

Repairs may be carried out by the manufacturer only. The attempt of unauthorised repair excludes any warranty claims.

5.3 Spare Parts

Stainless steel grid filter **HA010108**

5.4 Self Diagnosis and Error Messages

Feedback Module	Meaning	Required Action
Green LED flashing	Supply voltage applied / Microprocessor is active	-
Green LED constantly lit	Humidity sensor element damaged	Contact the E+E representative
Green LED off	No supply voltage	Check wiring and supply voltage
Long response time	Clogged filter	Replace filter
High humidity values	Dew (condensation) in sensor probe head	Dry probe head and check the mounting of the probe

6 Technical Data

Measurands

Relative humidity

Measuring range		0…100 %RH	
Accuracy[1] *(including hysteresis, non-linearity and repeatability)*			
-15...40 °C (5...104 °F)	≤90 %RH	± (1.3 + 0.003*mv) %RH	mv = measured value
	>90 %RH	± 2.3 %RH	
-25...70 °C (-13...158 °F)		± (1.4 + 0.01*mv) %RH	
-50...180 °C (-40...356 °F)		± (1.5 + 0.015*mv) %RH	
Response time t_{90}, typ. at 20 °C (68°F)		<15 s	

Temperature

Measuring range		-50...180 °C (-58...356 °F)	

Output

Analogue		RH: 4 - 20 mA (3-wire)	Load resistance ≤350 Ω
Temperature passive[2]		Pt100, Pt1000 DIN A (DIN EN 60751) see ordering guide, 3-wire connection	

General

Power supply class III [3]		10 - 28 V AC 10 - 35 V DC	
Current consumption, typ.			
	24 V AC	<60 mA	
	24 V DC	<32 mA_{rms}	
Probe material		Plastic PPS-GF40	
Electrical connection		Pluggable screw terminals max. 1.5 mm^2 (AWG 16)	
Electromagnetic compatibility		Component for OEM equipment tested according to EN 61000-4-3 EN 61000-4-6 Industrial environment	
Working range			
	Electronics	-40...60 °C (- 40...140 °F), 0...90 %RH non-condensing	
	Probe	-50...180 °C (- 58...356 °F)/short time up to 200 °C (392 °F) possible, 0...100 %RH	
Storage conditions		-40…60 °C (-40...140 °F), 0...90 %RH non-condensing	
Adjustment		RH: field adjustable via push buttons on the PCB	

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) Max. power dissipation 1 mW
3) USA & Canada: class 2 supply required, max. supply voltage 30 V DC.

HEADQUARTERS

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