



User Manual

# **EE1950**

## **DEW POINT MODULE FOR HIGH HUMIDITY APPLICATIONS**

YOUR PARTNER IN SENSOR TECHNOLOGY



**ELEKTRONIK®**  
Ges.m.b.H.

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**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)

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# 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.

## 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



- Avoid any unnecessary mechanical stress and inappropriate use.
- When replacing the filter cap make sure not to touch the sensing elements.
- For sensor cleaning and filter cap replacement please see “Cleaning instructions” at [www.epluse.com](http://www.epluse.com).
- Installation, electrical connection, maintenance and commissioning shall be performed by qualified personnel only.

### 1.2.2 Mounting, Start-up and Operation

The device has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory 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 authorized by the plant operator 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 authorized staff before putting the system 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 authorized staff. If the fault cannot be fixed, the device shall be removed from the system.
- Service operations other than described in this operating manual may only be performed by the manufacturer.

### 1.2.3 Intended Use

The EE1950 is intended for the measurement of dew point temperature (Td) in applications with continuous high humidity and condensing conditions. The use of the EE1950 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.

Unauthorized modifications of the product lead to loss of all warranty claims. The device may only be powered with separated extra-low voltage (SELV).

#### Disclaimer

The manufacturer or his authorized agent can 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 operating conditions. Consequential damages are excluded from the liability.

## 1.3 Environmental Aspects



Products from E+E Elektronik® are developed and manufactured observing of all relevant requirements with respect to environment protection. 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.

## 1.5 Scope of Supply

- EE1950 according to ordering guide
- Inspection certificate according to DIN EN 10204-3.1

# 2 Product Description

## 2.1 General



The sensing probe and the electronics of the EE1950 undergo the factory adjustment together and may not be separated from each other. Do not cut, shorten or extend the probe cable.

The analogue output of EE1950 can be set to voltage or current with a slide switch on the electronics board (see chapter 4.1).

### 2.1.1 Sensing Probes

The EE1950 features a plastic (PPS) probe according to the order which can be employed over the entire T range according to the technical data.

### 2.1.2 Filter Caps

The right choice of filter cap is very important for optimal performance under certain environment conditions. Please see details in the data sheet “Accessories” at [www.epluse.com/EE1950](http://www.epluse.com/EE1950) or contact the manufacturer’s representative for advice.

## 2.2 Dimensions

All values are given in mm / inch.

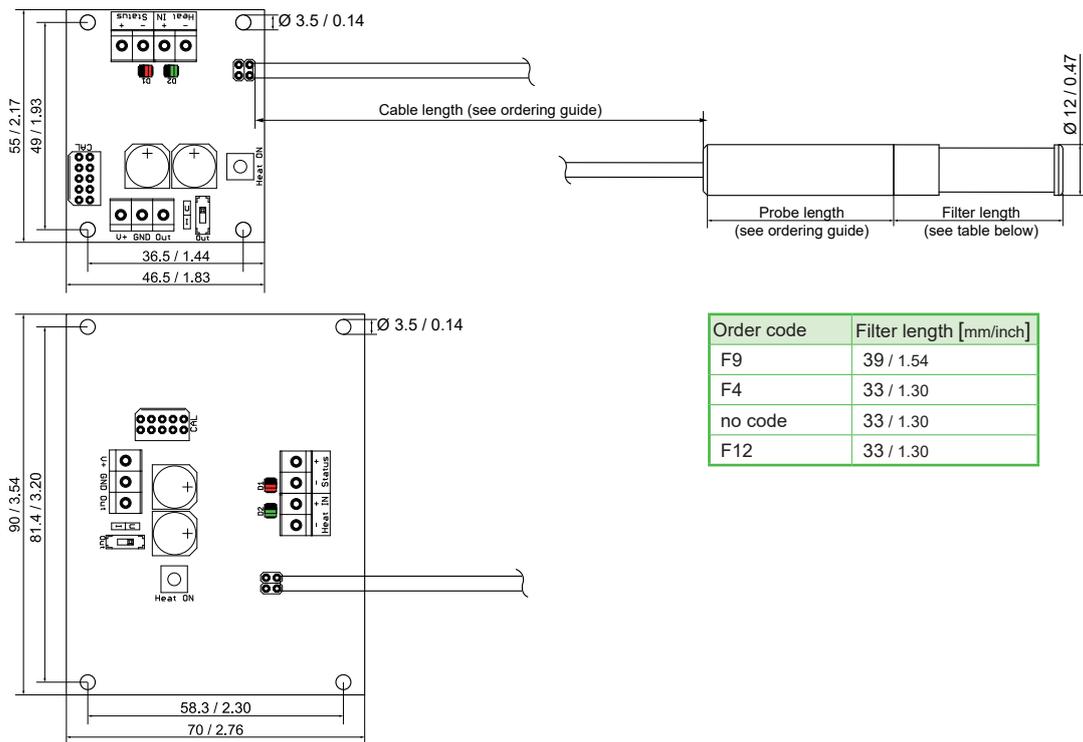


Fig. 1 Dimensions of EE1950

## 2.3 Installation



ESD handling regulations must be strictly observed.

### 2.3.1 Electronics Board

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

### 2.3.2 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 “Cleaning Instructions” at [www.epluse.com/ee1950](http://www.epluse.com/ee1950).



**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 Electrical Connection

#### Supply

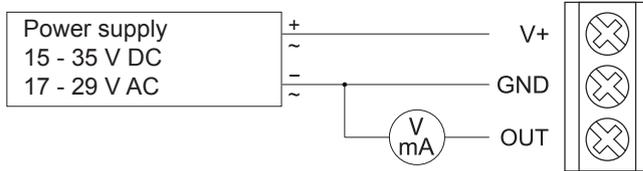


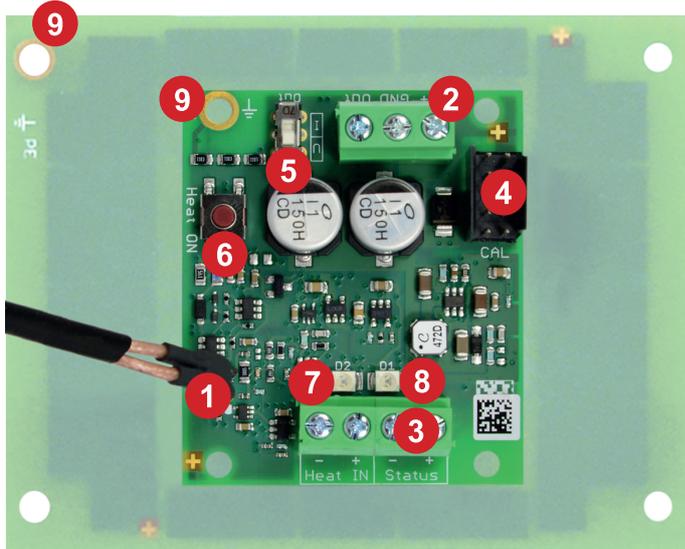
Fig. 2 Connection supply and outputs

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



For performance according to the specifications, the electronics board must be properly grounded, see chapter 4 (No. 9 "Grounding" - Fig. 3).

### 4 Setup and Configuration



1. Probe connection
2. Terminals for supply and output signal
3. Terminals for ARC external triggering (Heat IN) and status information (Status)
4. Configuration interface
5. Slide switch for output signal selection (voltage / current)
6. Manual trigger for ARC
7. Status LED (green)
8. Error indication LED (red)
9. Grounding

Fig. 3 Electronics board

## 4.1 Selection of the Output Signal

Use the slide switch (No. 5 - Fig. 3) to select between current and voltage output.

- When switching from original voltage output to current output, the output becomes 0 - 20 mA = -20...+80°C Td (-4...176 °F) and error indication according NAMUR (see 4.3) is disabled.
- When switching from original current output to voltage output, the output becomes 0 - 10 V = -20... +80°C Td (-4...176 °F) and error indication according NAMUR (see 4.3) is disabled.

After switching the output between voltage and current with the slide switch, the scaling of the output can be set using the E+E Product Configuration Software (see chapter 4.2).



### Important:

- After changing the factory setup (output signal and/or output scale) the packaging label loses its validity; it does not match any longer the device setup.
- The factory setup restore function of EE-PCS reestablishes the original adjustment/calibration of the device, but does not affect the user setup for output signal and output scale.

## 4.2 Selection of the Measurand - Output Scale

The selection between Td and Tf (frost point temperature) as well as the scaling of the output can be performed via the configuration interface with the EE-PCS Product Configuration Software, free download from [www.epluse.com/configurator](http://www.epluse.com/configurator). Use the optional configuration cable HA011017 to connect the EE1950 at the USB port of the PC.

## 4.3 Error Indication on the Analogue Output (NAMUR)

The EE1950 features an error indication on the analogue output according to NAMUR recommendations. A device failure is indicated by 11 V in case of voltage output and by 21 mA in case of current output.



### Important:

Upon delivery the NAMUR error indication is disabled. It can be enabled with the free EE-PCS Product Configuration Software.

## 4.4 Calculation of the Relative Humidity (RH)

For calculating the RH it is necessary to employ an additional sensor which measures the T in the application. Thus the RH can be calculated out of the Td reading from EE1950 and the T reading from the additional T sensor, using the following formula:

$$\text{RH in \%} = U_w = \frac{e^{\left(\frac{17.08005 \cdot T_d}{234.175 + T_d}\right)}}{e^{\left(\frac{17.08005 \cdot T}{234.175 + T}\right)}} \cdot 100$$

- Td = dew point temperature reading from EE1950 in °C
- T = temperature reading from the additional sensor in °C

Please see also the E+E Humidity Calculator available free of charge at [www.humidity-calculator-online.com](http://www.humidity-calculator-online.com). It is also available free of charge as App for Android and iOS.

## 5 Automatic Sensor ReCoverY (ARC)

Certain chemical pollution may lead to drift of the sensing element. Using the sensor recovery function, the contamination is removed by a controlled heating of the sensor. After the heating process, the sensor quickly returns to normal measuring conditions (Fig. 5).

### Start:

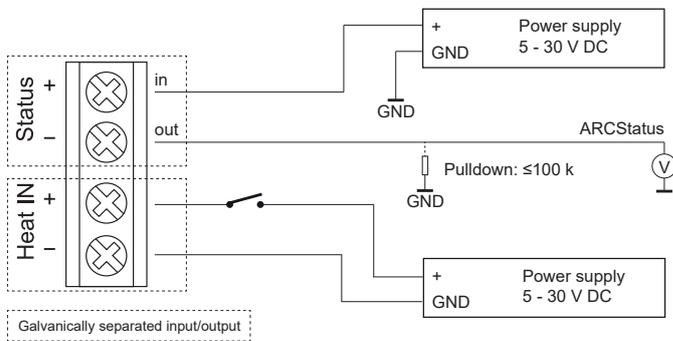
The ARC can be started either manually by pressing the “Sensor Recovery” button (No. 6 - Fig. 3) for min. 3 seconds or automatically by applying a voltage of 5 - 30 V DC to the potential free input (No. 3 “Heat IN” - Fig. 3) for at least 3 seconds.

### Abortion:

To cancel the ARC process, the same procedure is valid as to starting it: pressing the “Sensor Recovery” button (No. 6 - Fig. 3) or a voltage of 5 - 30 V DC at the “Heat IN” interface for min. 3 seconds.

### Duration:

A sensor recovery cycle takes around 23 minutes, of which 20 minutes heat-up time, followed by 3 minutes cooling time. The cooling time is necessary also in case the ARC process is cancelled.



### Current consumption in ARC mode

Supply	Consumption
15 V DC	~120 mA (max.)
24 V DC	~80 mA (max.)
35 V DC	~55 mA (max.)
17 V AC	~210 mA <sub>rms</sub> (max.)
24 V AC	~160 mA <sub>rms</sub> (max.)
29 V AC	~140 mA <sub>rms</sub> (max.)

Fig. 4 ARC trigger and status connection



### Important:

ARC can only be started if  $T_d$  is minimum  $3^\circ\text{C}$  below  $T_{\text{ambient}}$ .

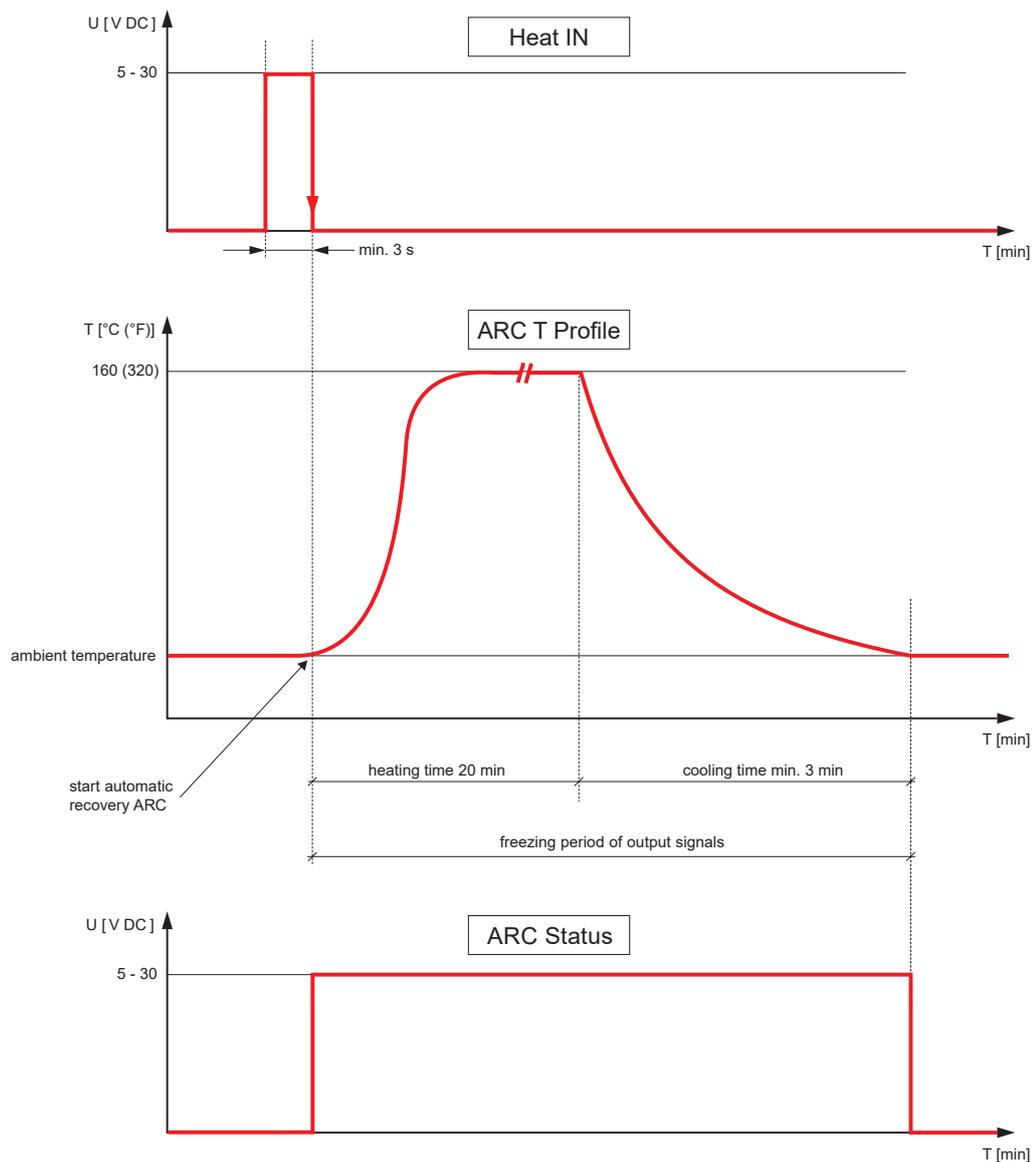


Fig. 5 ARC Chart

During the sensor recovery process, the output is frozen at the last measured value before triggering the sensor recovery.

The ARC mode is indicated by the closed contact at the optocoupler output (No. 3 "Status" - Fig. 3) and by the red LED flashing very quickly. The optocoupler output thus indicates whether the data on the analogue output is up-to-date (during normal measurement) or frozen (during the sensor recovery process).

An efficient sensor recovery requires a certain sensor temperature. In case of strong air flow at the sensing head (for instance more than 6 m/s with the stainless steel grid filter), the required sensor temperature might not be reached. In such a case, the heating process is automatically interrupted after 2 minutes.

# 6 Calibration / Adjustment

## 6.1 Definitions

### 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.

## 6.2 Important Prerequisite



For accurate calibration and adjustment results it is paramount to avoid temperature gradients along the sensing probe. Whenever possible, place the entire probe in the reference environment. Otherwise, thermally isolate the parts of the probe which are not in the reference environment.

## 6.3 Calibration

The calibration of the EE1950 against a Td reference can be performed either by using the analogue output signal or by connecting the EE1950 to a PC with the HA011017 adapter cable and the EE-PCS Product Configuration Software. Allow for stabilisation time minimum 30 minutes per calibration point.

## 6.4 Adjustment Procedure

The adjustment of EE1950 can be performed using the HA011017 and the EE-PCS , free download from [www.epluse.com/configurator](http://www.epluse.com/configurator).

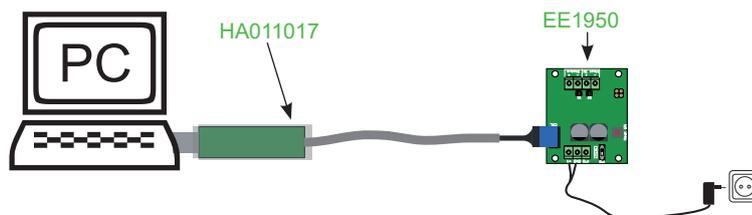


Fig. 6 EE1950 Adjustment and Configuration

After connecting EE1950 to the PC and starting EE-PCS, press the “Ready” software button for switching EE1950 to adjustment mode. During the adjustment the EE-PCS shows the RH reading of the EE1950 and requires a RH reference value for adjustment.



For an accurate adjustment it is utmost important to allow for stabilisation time as suggested by the EE-PCS. The adjustment of the EE1950 shall be performed against an appropriate RH reference. See “Calibration Kit - User Guide” at [www.epluse.com/ee1950](http://www.epluse.com/ee1950)

## 7 Self Diagnosis and Error Messages

Feedback module	Meaning	Action
<b>Green and red LED on for about 1 sec.</b>	Acknowledgment for ARC start / stop	The ARC mode is either started or stopped. If the sensor is in the ARC mode the red LED flashes very fast.
<b>Green LED flashing / Red LED off</b>	Normal measuring mode	-
<b>Red LED on</b>	Electronics failure	Contact the E+E representative.
<b>Red LED flashes (1Hz)</b>	Probe is not properly connected or damaged.	Contact the E+E representative.
<b>Red LED flashes very fast (5 Hz)</b>	ARC mode is active.	Wait until the ARC cycle is finished, or interrupt the ARC cycle.
<b>Optocoupler closed</b>	Humidity output is frozen / ARC active	Wait until the ARC cycle ist finished. Check the red LED.
<b>Optocoupler open</b>	Normal measuring mode / ARC inactive	-
<b>Namur (Disabled by default)</b>		
<b>21 mA / 11 V</b>	An error has occurred.	Contact the E+E representative.

## 8 Replacement Parts / Accessories

see data sheet "Accessories" at [www.epluse.com/EE1950](http://www.epluse.com/EE1950)

Description	Order code
- Filter caps	HA0101xx
- Stainless steel grid	HA010109
- Stainless steel sintered	HA010117
- PTFE	HA010105
- H <sub>2</sub> O <sub>2</sub>	HA010115
- Mounting flange stainless steel	HA010201
- Mounting flange plastic	HA010202
- Wall mounting clip stainless steel	HA010225
- Wall mounting clip plastic -35 °C...105 °C (-31 °C...221 °C)	HA010211
- Configuration cable with USB adapter	HA011017
- Humidity calibration kit	see data sheet "Humidity calibration kit"
- Protection cap for Ø12 mm (0.47") probe	HA010783

# 9 Technical Data

Sensing element HMC01

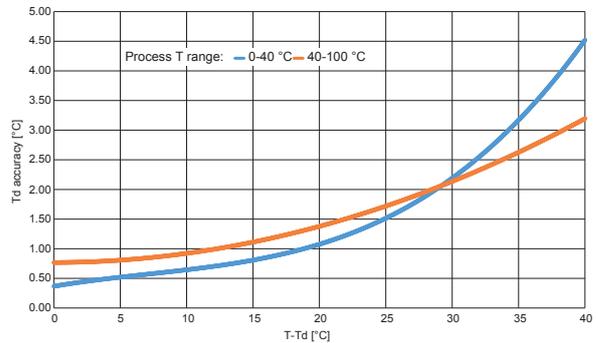
## Measurands

### Dew point (Td)

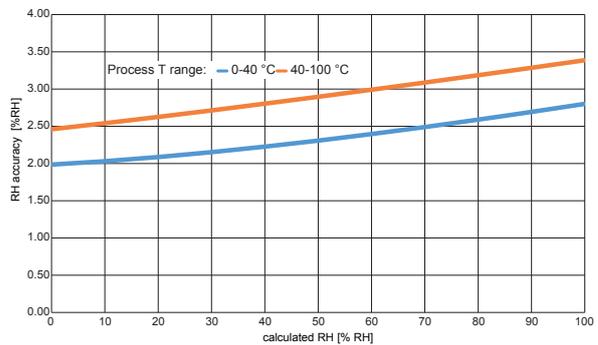
Working range

-20...100 °C (-4...212 °F Td)

Accuracy<sup>1)</sup> for Td < 90 °C



Accuracy of the **calculated relative humidity (RH)** out of the measured Td and the reading of an additional T sensor with ±0.2 °C (3.6 °F) uncertainty.



## General

Response time RH  $t_{10/90}$  at 20 °C (68 °F), typ.

15 s with stainless steel grid filter<sup>2)</sup>

Output signal

0 - 1 / 5 / 10 V     -1 mA <  $I_L$  < 1 mA  
0 / 4 - 20 mA (3 wire)  $R_L$  < 500 Ω

Supply voltage

15 - 35 V DC and 17 - 29 V AC

Current consumption at 20 °C (68 °F)

Supply	24 V DC	24 V AC
Measuring mode	< 35 mA	< 70 mA <sub>rms</sub>
ARC mode	max. 80 mA	max. 160 mA <sub>rms</sub>

ARC status signal

Optocoupler, open/closed

Working range electronics

-40...60 °C (-40...140 °F) / 0...90 % RH non-condensing

Working range probe

-70...180 °C (-94...356 °F) / 0...100 % RH

Storage conditions

-40...60 °C (-40...140 °F) / 0...90 % RH non-condensing

Electrical connection

Screw terminals max. 1.5 mm<sup>2</sup> (AWG 16)

Electromagnetic compatibility

EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6  
Industrial Environment and EN 55011

1) 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) Other filters see data sheet "Accessories".



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