

# OPERATING MANUAL

## HD48 / HD49 series

Humidity and  
temperature  
transmitters



EN  
V1.0



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## 1 Introduction

**HD48...** and **HD49...** series transmitters measure, depending on model, temperature, relative humidity and dew point.

The probe is available in different versions:

- Fixed vertical probe for wall mounting (HD48/HD49...**TV**)
- Fixed duct horizontal probe (HD48/HD49...**TOx**)
- Probe with M16 connector and cable (HD48/HD49...**TCx.x** and **TFP.x**)

Available outputs, depending on the model:

- RS485 Modbus-RTU digital output (HD48**Sxx**...)
- 0...10 V voltage analog output (HD48**Vxx**...)
- 4...20 mA active current analog output (HD48**xx**...)
- 2-wire (current loop) 4...20 mA analog output (H49**xx**...)

Versions with 4-digit LCD display (option L) are available, which allow the measured parameters to be displayed.

The instruments are factory calibrated and ready for use.

### Models

|  |  |
|--|--|
| <p><b>Display</b><br/>           "" = without LCD<br/> <b>L</b> = with LCD</p> <p><b>Cable length</b> (only ...<b>TC</b> and ...<b>TFP</b> models)<br/> <b>2</b> = 2 m (option not available for ...<b>TFP</b> models)<br/> <b>5</b> = 5 m<br/> <b>10</b> = 10 m</p> <p><b>Type of probe</b><br/> <b>TC1</b> = probe with cable, stem 135 mm<br/> <b>TC2</b> = probe with cable, stem 335 mm<br/> <b>TO1</b> = horizontal fixed probe, stem 135 mm<br/> <b>TO2</b> = horizontal fixed probe, stem 335 mm<br/> <b>TV</b> = vertical fixed probe<br/> <b>TFP</b> = contact probe for solar panel</p> <p><b>Temperature range</b><br/>           "" = -20...+80 °C (...<b>TV</b>, ...<b>TC</b> and ...<b>TO</b> models) / -40...+85 °C (...<b>TFP</b> models)<br/> <b>E</b> = -40...+150 °C (only ...<b>TC</b> and ...<b>TO</b> models, except HD48x77/HD4977)</p> <p><b>Measured quantities</b><br/> <b>01</b> = relative humidity<br/> <b>07</b> = temperature (mandatory option for ...<b>TFP</b> models)<br/> <b>17</b> = relative humidity and temperature<br/> <b>77</b> = dew point and temperature</p> <p><b>Type of output</b><br/> <b>HD48</b> = active 4...20 mA analog output<br/> <b>HD48V</b> = 0...10 V analog output<br/> <b>HD48S</b> = RS485 Modbus-RTU digital output<br/> <b>HD49</b> = 2-wire (current loop) 4...20 mA analog output</p> |  |
|--|--|

## 2 Technical specifications

|                                 |             |   |
|---------------------------------|-------------|---|
| Sensor                          | RH          | Capacitive  |
|                                 | Temperature | NTC (...TV models and ...TC/...TO models without option "E")<br>Pt100 (...TFP models and ...TC/...TO models with option "E")  |
|                                 | Dew Point   | Quantity calculated from relative humidity and temperature  |
| Measuring range                 | RH          | 0...100%  |
|                                 | Temperature | -20...+80 °C (...TV models and ...TC/...TO models without option "E")<br>-40...+85 °C (...TFP models)<br>-40...+150 °C (...TC/...TO models with option "E")                             |
|                                 | Dew Point   | -20...+80 °C  |
| Resolution                      | RH          | 0.1%  |
|                                 | Temperature | 0.1 °C  |
|                                 | Dew Point   | 0.1 °C  |
| Accuracy                        | RH          | ±1.5% (0...90%) / ±2% (90...100%) @ T=15...35 °C<br>(1.5 + 1.5% of measured value)% @ T=remaining range   |
|                                 | Temperature | ±0.3 °C @ T=0...70 °C / ±0.4 °C @ T=remaining range (NTC sensor)<br>±0.3 °C (Pt100 sensor)  |
|                                 | Dew Point   | See the table below   |
| Repeatability                   | RH          | 0.4%  |
|                                 | Temperature | 0.1 °C  |
|                                 | Dew Point   | 0.5 °C  |
| Output                          |             | <b>HD48...</b> : active 4...20 mA<br><b>HD48V...</b> : 0...10 Vdc<br><b>HD48S...</b> : RS485 Modbus-RTU<br><b>HD49...</b> : 2-wire 4...20 mA  |
| Power supply                    |             | <b>HD48...</b> : 24 Vac ± 10% or 18...40 Vdc<br><b>HD48V...</b> : 24 Vac ± 10% or 18...40 Vdc<br><b>HD48S...</b> : 12...30 Vdc<br><b>HD49...</b> : 12...40 Vdc                          |
| Power consumption               |             | <b>HD48...</b> : 20 mA @ 24 Vdc and I <sub>out</sub> =12 mA<br><b>HD48V...</b> : 4 mA @ 24 Vdc<br><b>HD48S...</b> : 2 mA @ 24 Vdc<br><b>HD49...</b> : equal to output signal            |
| Electrical connections          |             | Screw terminal block, max 1.5 mm <sup>2</sup> , PG9 cable gland   |
| Connection to PC                |             | RS232 serial port (except HD48S...)<br>RS485 serial port (only HD48S...)<br>Can be connected to a USB port by using the optional CP27 (except HD48S...) or RS48 (only HD48S...) adapter |
| RH sensor operating conditions  |             | -20...+80 °C (...TV models and ...TC/...TO models without option "E")<br>-40...+150 °C (...TC/...TO models with option "E")   |
| Instrument operating conditions |             | -20...+60 °C / 0...95 %RH   |
| Storage temperature             |             | -20...+80 °C  |

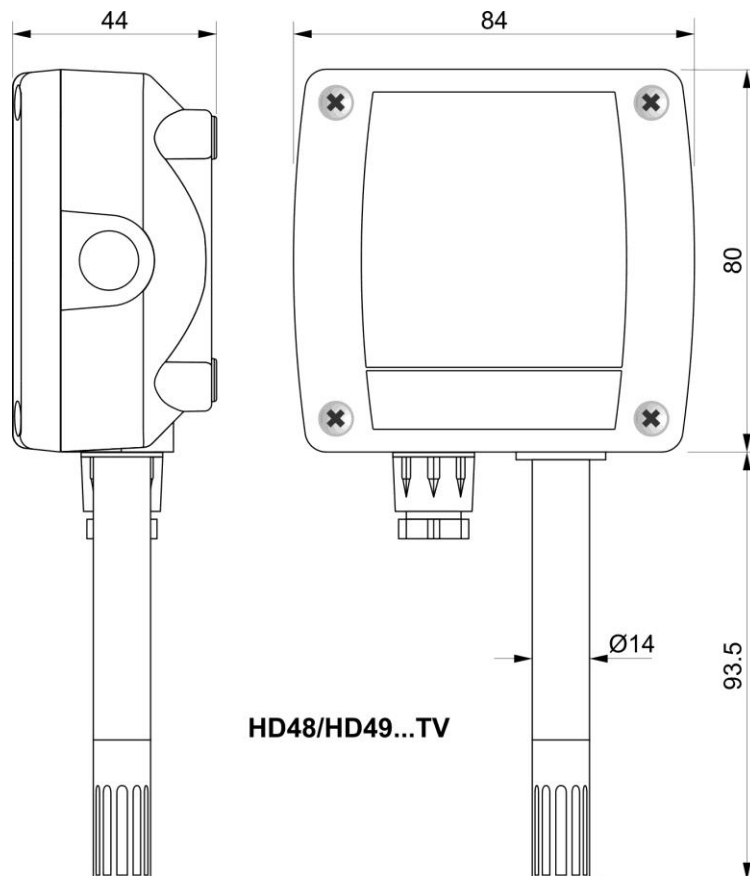
|                   |   |
|-------------------|---|
| Materials         | Housing: ABS<br>Probe stem: PBT (...TV models) or Inox (...TC/...TO models)<br>Probe filter: PBT and 10 µm stainless steel grid (...TV models and ...TC/...TO models without option "E") or 20 µm PTFE (...TC/...TO models with option "E") |
| Weight            | From 120 g approx. (...TV models) to 900 g approx. (...TC2.10 models)   |
| Protection degree | IP65  |

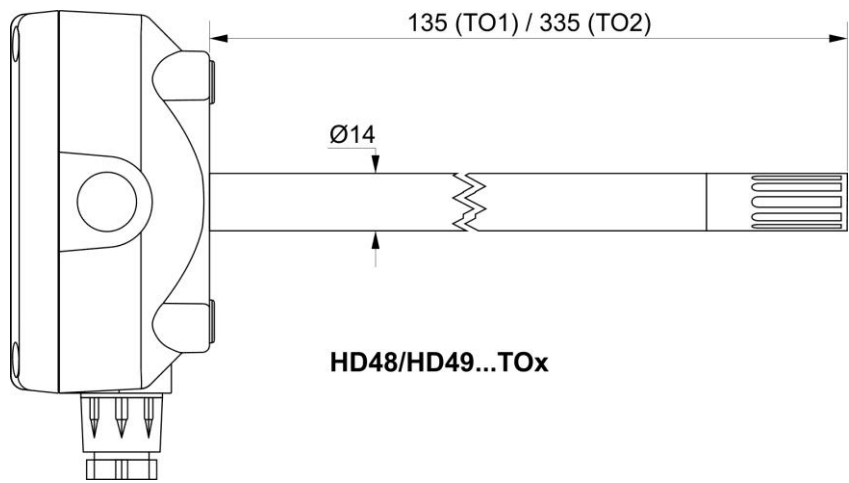
**Accuracy of Dew Point (Td) measurement:**

|                |     | Td °C                |                 |   |     |     |     |    |    |    |     |       |     |     |     |  |
|----------------|-----|----------------------|-----------------|---|-----|-----|-----|----|----|----|-----|-------|-----|-----|-----|--|
|                |     | -20                  | -10             | 0 | 10  | 20  | 30  | 40 | 60 | 80 |     |       |     |     |     |  |
| Temperature °C | -20 | ≤±1                  | <b>Td LIMIT</b> |   |     |     |     |    |    |    |     |       |     |     |     |  |
|                | -10 | ≤±1                  |                 |   |     |     |     |    |    |    | ≤±1 |       |     |     |     |  |
|                | 0   | ≤±1                  |                 |   |     |     |     |    |    |    | ≤±1 | ≤±1   |     |     |     |  |
|                | 10  | ≤±3                  |                 |   |     |     |     |    |    |    | ≤±1 | ≤±1   | ≤±1 |     |     |  |
|                | 20  | ≤±4                  |                 |   |     |     |     |    |    |    | ≤±2 | ≤±1   | ≤±1 | ≤±1 |     |  |
|                | 30  | <b>NOT SPECIFIED</b> |                 |   |     |     |     |    |    |    | ≤±3 | ≤±1.5 | ≤±1 | ≤±1 | ≤±1 |  |
|                | 40  |                      |                 |   |     |     |     |    |    |    | ≤±2 | ≤±1   | ≤±1 | ≤±1 | ≤±1 |  |
|                | 60  | <b>NOT SPECIFIED</b> |                 |   |     |     |     |    |    |    | ≤±5 | ≤±2.5 | ≤±2 | ≤±1 | ≤±1 |  |
| 80             | ≤±4 |                      |                 |   | ≤±2 | ≤±1 | ≤±1 |    |    |    |     |       |     |     |     |  |

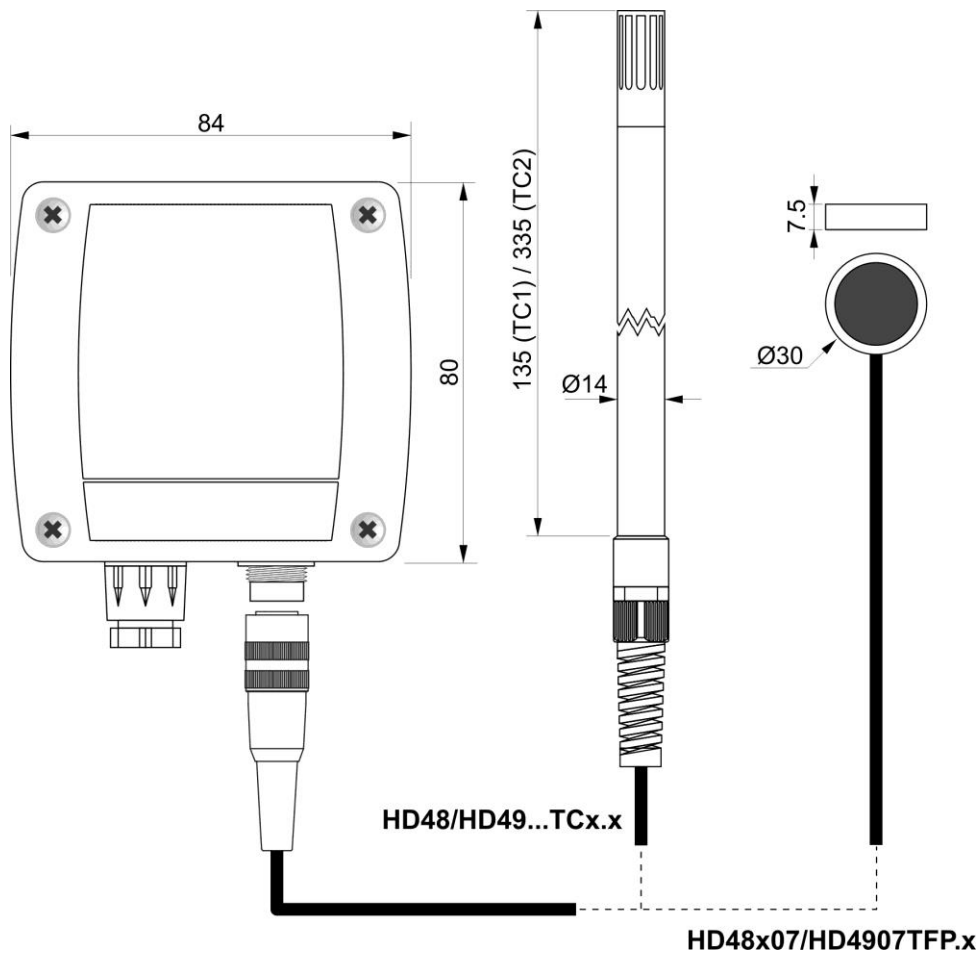
For example, at 20 °C environmental temperature, the Dew Point value of 0 °C is measured with an accuracy better than 1 °C.

**Dimensions (mm)**





HD48/HD49...TOx

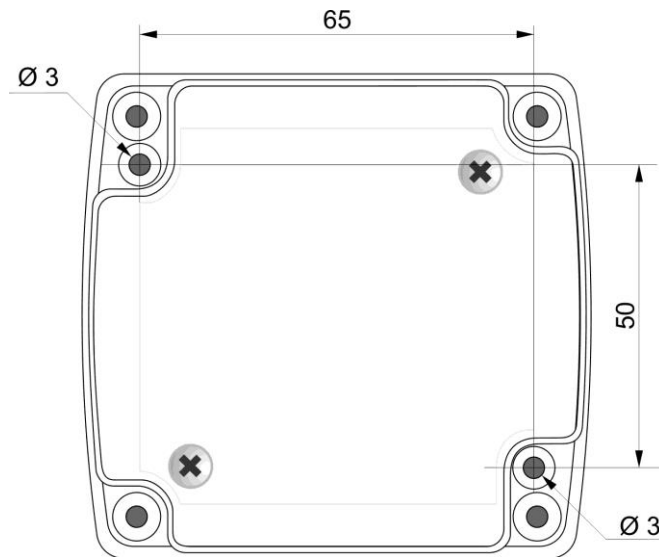


HD48/HD49...TCx.x

HD48x07/HD4907TFP.x

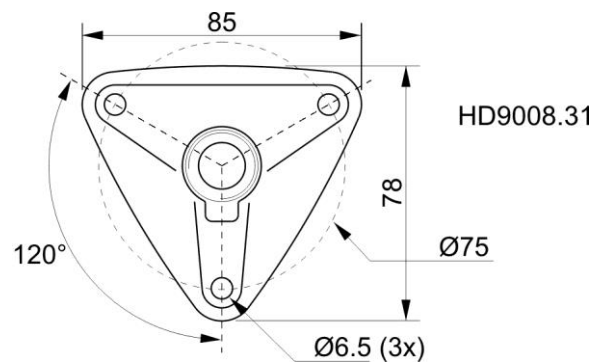
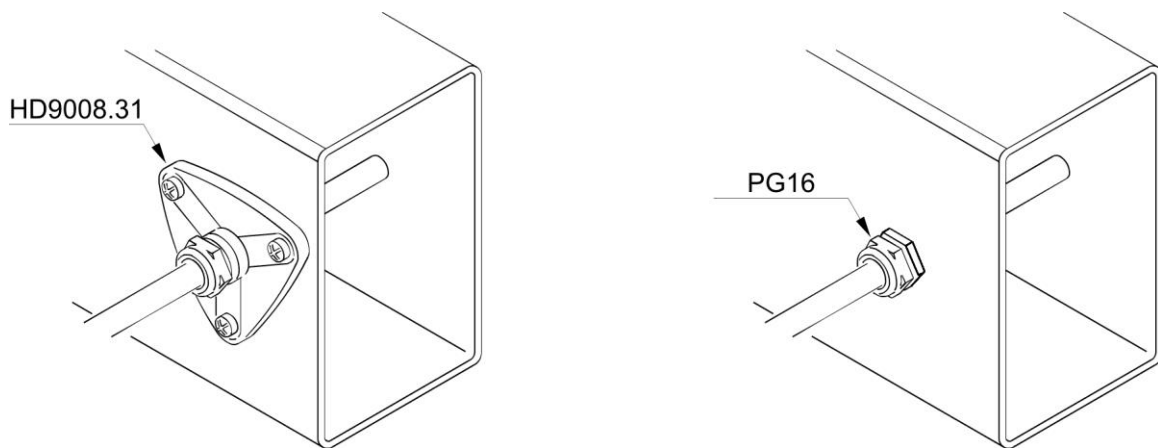
### 3 Installation

The transmitter is wall mounted using the two  $\varnothing 3$  mm holes on the back (open the cover to access the holes and the terminal header for electrical connections).



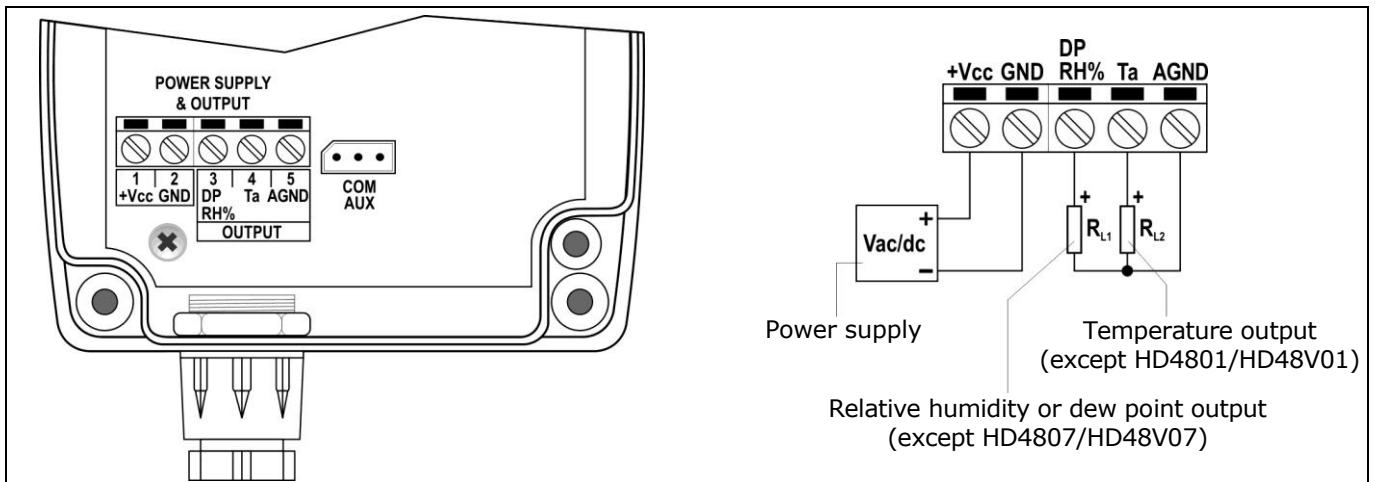
The probe can be fixed to a duct by using the **HD9008.31** flange or the **PG16** metal cable gland.

PG16 has G  $\frac{1}{2}$ " , L=8 mm thread on duct side.

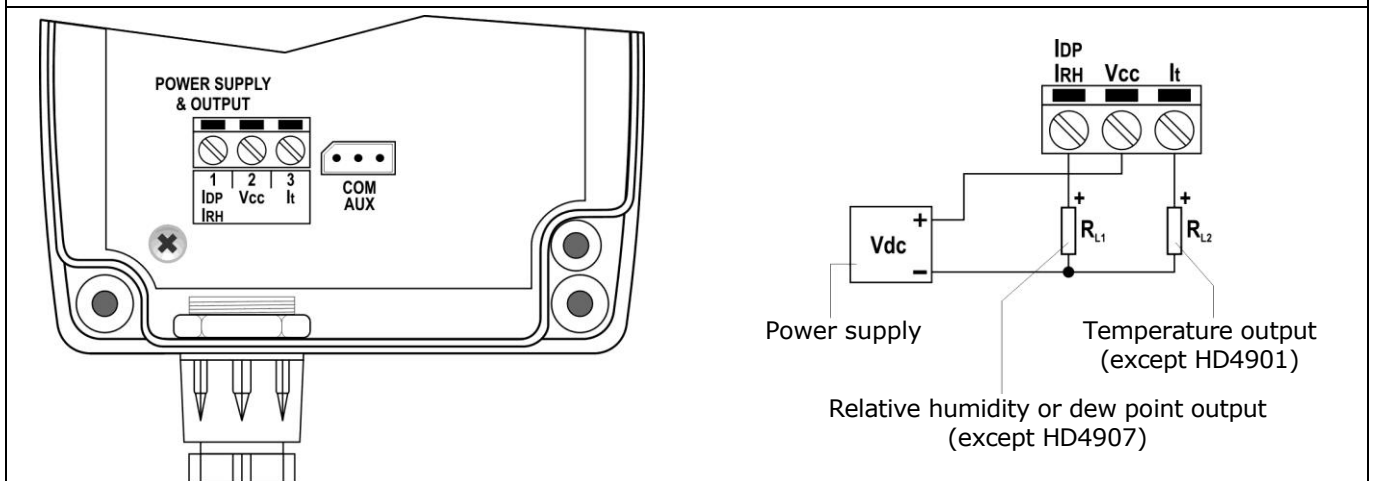


### 3.1 Electrical connections

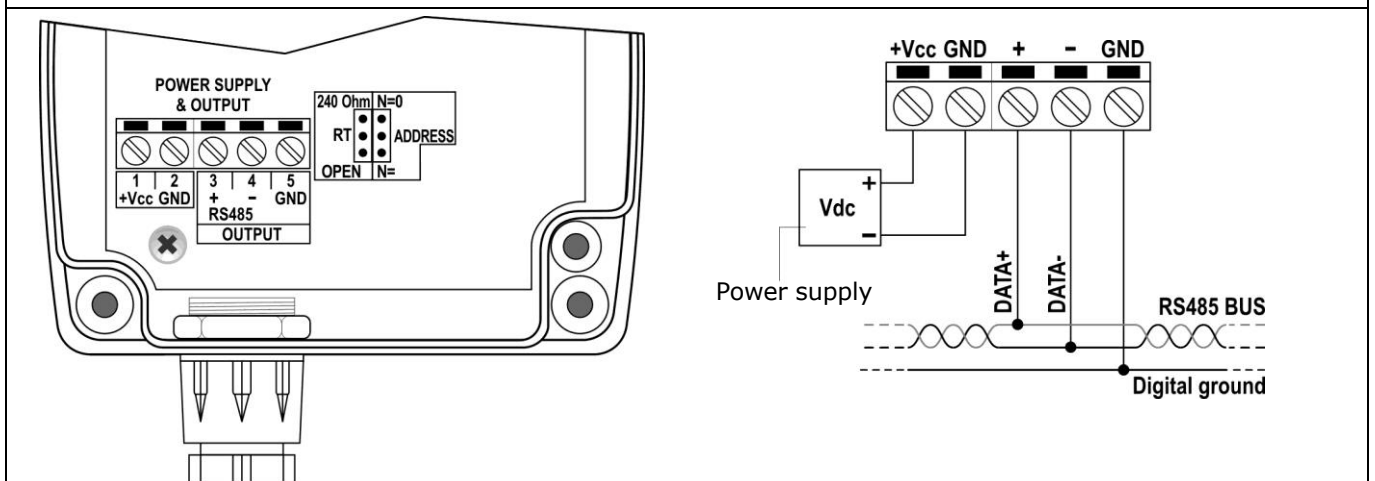
Internally there are the terminal header for connecting the power supply and the output and the RS232 serial connector (COM AUX, except HD48S...).



**Models with 0...10 V or active 4...20 mA analog output  
(HD4801, HD4807, HD4817, HD4877, HD48V01, HD48V07, HD48V17 and HD48V77)**



**Models with 2-wire current output  
(HD4901, HD4907, HD4917 and HD4977)**



**Models with digital RS485 output  
(HD48S01, HD48S07, HD48S17 e HD48S77)**



**Analog outputs:**

The load resistance  $R_L$  varies according to the type of analog output:

| Analog output                   | Load resistance  |
|---------------------------------|--|
| 0...10 V                        | > 10 k $\Omega$  |
| 4...20 mA active                | < 500 $\Omega$   |
| 4...20 mA 2-wire (current loop) | < $(V_{dc} - 12) / 0.022$<br>Vdc is in V, the result in $\Omega$ |

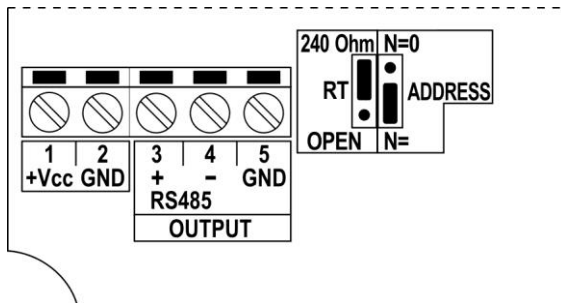
In the event of an anomaly in the measurement (detected measurement outside the measuring range), the output goes to a value 10% higher than the full scale: 11 V if the output is 0...10 V, 22 mA if the output is 4...20 mA.

**RS485 output:**

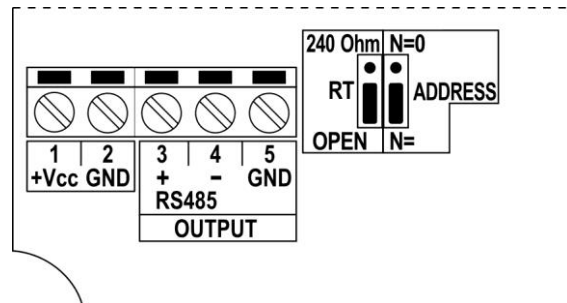
The output is not isolated.

Before connecting the transmitter to the RS485 network, set the address and the communication parameters, if different from the factory preset (see "Configuration" chapter).

The instrument has a built-in line termination that can be connected or removed through the **RT** short jumper placed next to the terminal header. If the instrument is the last or the first device of a network group, connect the termination by placing the short jumper on the "240 Ohm" side. If the instrument is not at the end of a network group, disconnect the termination by placing the short jumper on the "OPEN" side.



**Termination connected**



**Termination disconnected**

For normal operation with the Modbus-RTU protocol, the **ADDRESS** short jumper must be placed on the "N=" side (not "N=0").

## 4 Configuration

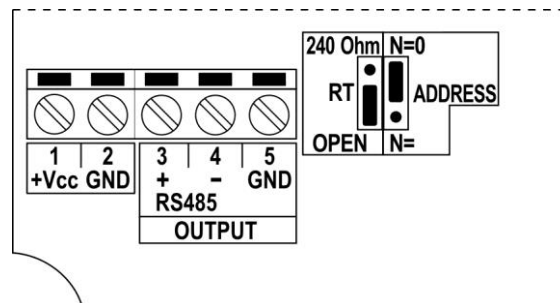
The configuration can be changed by connecting the transmitter to the PC:

- In models with analog output, connect the **COM AUX** port to the PC via the **CP27** cable.
- In models with RS485 output, connect the RS485 output to the PC via the **RS48** cable.

To use the CP27 and RS48 cables, the related USB drivers must be installed in the PC.

Configuration changes are made via the **HD4817CAL** software or, only for setting serial communication parameters in models with RS485 output, a standard serial communication software.

In models with RS485 output, for communication with HD4817CAL software or a standard serial communication software, it is necessary to place the **ADDRESS** short jumper on the "N=0" side.



Via the HD4817CAL software, downloadable from the website, the following can be set:

- In models with analog output, a temperature or dew point measuring range corresponding to the analog output reduced from the whole measuring range (by default, the analog output corresponds to the whole measuring range). For example, in a model with 4...20 mA output and -20...+80 °C measuring range, 4 mA=0 °C and 20 mA=+60 °C can be set.
- In models with RS485 output, the serial communication parameters (Modbus address, Baud Rate, parity/stop bit).
- In dual-parameter models (T/RH or T/Td) with LCD, the mode of displaying measurements: one fixed parameter or both parameters alternately.
- The temperature unit of measurement (°C or °F).
- The RH calibration in 1 or 2 points (33% and 75%).

For operation of the HD4817CAL software, see the on-line help of the software.

For setting serial communication parameters in models with RS485 output by using a standard serial communication software, set in the serial communication program the Baud Rate 115200, the parameters 8N2 and the COM port number to which the transmitter is connected; then, send the commands described in the table below.

By default, the transmitter has Modbus address **1** and communication parameters 19200, 8E1.

**Serial commands:**

| <b>Command</b> | <b>Description</b>   |
|----------------|--|
| MA n           | Sets the Modbus-RTU address (1...247) to n. Default=1  |
| L1             | Reads the Modbus-RTU address.  |
| MB n           | Sets the Baud Rate: <ul style="list-style-type: none"> <li>▪ 9600 if n=0</li> <li>▪ 19200 if n=1 (<i>default</i>)</li> </ul>   |
| L2             | Reads Baud Rate setting.   |
| MP n           | Sets parity and stop bits (data bits = 8 fixed): <ul style="list-style-type: none"> <li>▪ 8N1 if n=0</li> <li>▪ 8E1 if n=2 (<i>default</i>)</li> <li>▪ 8O1 if n=4</li> <li>▪ 8N2 se n=1</li> <li>▪ 8E2 se n=3</li> <li>▪ 8O2 se n=5</li> </ul>                               |
| L3             | Reads the setting of parity and stop bits.   |
| MW n           | Sets waiting time after transmission with Modbus-RTU protocol: <ul style="list-style-type: none"> <li>▪ Immediate reception if n=0 (violates protocol)</li> <li>▪ Waiting 3.5 characters if n=1 (respects protocol)</li> </ul> <i>Default</i> : Waiting 3.5 characters (n=1) |
| L4             | Reads the setting of waiting time after transmission with Modbus-RTU protocol.   |

The following commands allow reading the transmitter general information.

| <b>Command</b> | <b>Description</b>                      |
|----------------|---|
| G0             | Reads the transmitter model.            |
| G2             | Reads the transmitter serial number.    |
| G3             | Reads the transmitter firmware version. |
| G4             | Reads the transmitter firmware date.    |
| P0             | Ping.                                   |

## 5 Modbus-RTU protocol (HD48S...)

For communication with Modbus-RTU protocol, the **ADDRESS** short jumper on the circuit board must be placed on the "N=" side (not "N=0").

Below is the list of registers.

### Input Registers:

| Address | Description   | Format         |
|---------|---|----------------|
| 0       | Temperature in °C (x10)   | 16-bit Integer |
| 1       | Temperature in °F (x10)   | 16-bit Integer |
| 2       | Relative humidity in % (x10)  | 16-bit Integer |
| 3       | Dew Point in °C (x10)   | 16-bit Integer |
| 4       | Dew Point in °F (x10)   | 16-bit Integer |
| 5       | Status register:<br>bit0=1 ⇒ temperature measurement error<br>bit1=1 ⇒ relative humidity measurement error<br>bit2=1 ⇒ dew point measurement error<br>bit3=1 ⇒ configuration data error | 16-bit Integer |

## 6 Maintenance

In order to grant measurements high accuracy, it is necessary to clean the filter periodically (except ...TFP models).

To clean the filter, unscrew it from the probe body and wash it under running water with the help of a brush. Dry the filter and screw it back to the probe body.

**Warning: after removing the filter, be careful not to touch the RH sensor with your hands, so as not to damage it irreparably.**

If the filter is too dirty to be able to clean, it can be replaced with a new one.

Do not use aggressive cleaning agents or incompatible with the materials indicated in the technical specifications. For cleaning the housing, use a soft dry cloth or slightly dampened with clean water.

## 7 Safety instructions

The transmitter proper operation and operating safety can be ensured only in the climatic conditions specified in this manual and if all standard safety measures as well as the specific measures described in this manual are followed.

Do not use the instrument in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

### User obligations

The transmitter operator shall follow the directives and regulations below that refer to the treatment of dangerous materials:

- EU directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

## 8 Accessories ordering codes

**PC connecting cable and fixing accessories must be ordered separately.**

### Fixing accessories

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**HD9008.31** Wall flange with cable gland to fix Ø 14 mm probes.

**PG16** AISI304 cable gland to fix Ø 14 mm probes. G ½", L=8 mm thread.

### PC connecting cables

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**CP27** PC connecting cable for the configuration of the transmitter. With built-in RS232/USB converter. 3-pole connector on transmitter side and A-type USB connector on PC side. **For versions with analog output.**

**RS48** PC connecting cable for the configuration of the transmitter. With built-in RS485/USB converter. 3 open wires on transmitter side and A-type USB connector on PC side. **For versions with RS485 output.**

### Saturated solutions

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**HD75** Saturated solution for checking the Relative Humidity sensor at 75% RH. Includes screw adaptor for Ø14 mm probes.

**HD33** Saturated solution for checking the Relative Humidity sensor at 33% RH. Includes screw adaptor for Ø14 mm probes.

**HD11** Saturated solution for checking the Relative Humidity sensor at 11% RH. Includes screw adaptor for Ø14 mm probes.

### Spare parts

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**P7** 20 µm PTFE filter.  
*Standard filter in ...TC and ...TO models with option "E".*

**P8** Filter in PBT with 10 µm stainless steel grid.  
*Standard filter in ...TV, ...TC and ...TO models without option "E".*

## **WARRANTY**

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.

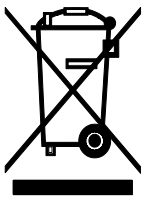
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

## **TECHNICAL INFORMATION**

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.

We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

## **DISPOSAL INFORMATION**



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.



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