



## HUMIDITY MEASUREMENT



## Humidity

- **HANDHELD - READ ONLY**  
- HD2301.0 pag. 6
- **HANDHELD - COMMUNICATION / DATA LOGGING**  
- HD2101.1, HD2101.2 pag. 7
- **PROBES - COMBINED TEMPERATURE AND RH** pag. 9
- **RH CALIBRATION - SALT SATURATED SOLUTION** pag. 10
- **PROBES - T, RH/DEW POINT MEASUREMENT IN PIPES**  
-HP480  
-HP481 pag. 12
- **PROBES - Pt100 TEMPERATURE** pag. 14
- **TRANSMITTERS - RELATIVE HUMIDITY, DEW POINT AND TEMPERATURE**  
-HD48..., HD49... SERIES - basic passive / active pag. 20  
-HD2717T...SERIES - advanced / interchangeable probe pag. 24  
-HD2817T... SERIES - advanced / interchangeable probe pag. 27  
-HD9817T... SERIES - integrated pag. 30
- **TRANSMITTERS - ABSOLUTE HUMIDITY AND TEMPERATURE**  
-HD3817T..., HD38V17T... SERIES pag. 33
- **DATALOGGER - MONITORING TEMPERATURE, RELATIVE HUMIDITY AND DEW POINT**  
-HD208 pag. 36
- **HUMIDITY MEASUREMENT - REALATED PRODUCTS** pag. 40

The qualitative level of our instruments is the result of a continuous evolving of the product itself. This may bring to slight differences between what written in the following manual and the instrument you bought. We cannot completely exclude the presence of errors inside the manual, which we apologise for. Data, images and descriptions included in this manual cannot be enforced legally. We reserve the right to perform modifications and corrections at any time without notice.

# Handheld - Overview

	HD2301.0	HD2101.1	HD2101.2
Humidity measurement range	0...100%RH		
Pt100 / Pt1000 measurement range	-200...+650 °C		
Unit of measurement	°C - °F - %RH – g/m <sup>3</sup> – hPa	°C - °F - %RH – g/kg – g/m <sup>3</sup> – hPa – J/g	
Calculated parameters	Absolute humidity Dew Point Partial steam pressure	Absolute humidity Dew Point Partial steam pressure Wet bulb temperature Mixing ratio Enthalpy Comfort indices	
Max - Min - Avg function	✓	✓	✓
Data Logging			✓
Measured data storage			38000 samples (2000 pages of 19 samples each)
RS232C serial interface		✓	✓
USB interface			✓
Resolution	0.1%RH – 0.1°C		
Accuracy	±0.1%RH - ± 0.1°C		
Drift after to one year	0.1%RH – 0.1°C		



## Overview - Transmitters

	HD48	HD49	HD2717	HD2817	HD9817T1R, HD9817T2R, HD9817T3R, HD9817TVS	HD3817T / HD38V17T
<b>Measured parameters</b>	Temperature Relative Humidity		Temperature (°C / °F) Relative Humidity		Temperature Relative Humidity	Temperature Relative Humidity*
<b>Calculated parameters</b>	Dew Point		Absolut Humidity Dew Point Mixing Ratio Wet Bulb Temperature			Absolute Humidity
<b>RH measuring range</b>	0...100%RH					0...130 g/m <sup>3</sup> (0...100%RH@60 °C and 1013hPa)
<b>Temperature measuring range</b>	-20...+80 °C -40...+150 °C (extended range)		-50...+150 °C (-58...+392 °F)		-40...+60 °C	0...+200 °C
<b>Temperature sensor</b>	Pt100 / NTC 10KΩ		Pt100		Pt100	Pt100 4-wires
<b>Minimum Temperature Range</b>	25°C		25°C			
<b>Output</b>	4...20 mA (or 20...4 mA) 0...10 Vdc (or 10...0 Vdc) RS485 MODBUS- RTU	4...20 mA (or 20...4 Vdc)	4...20 mA; 0...20 mA 0...10 Vdc; 2...10 Vdc		-Voltage output -RS232C -USB -MODBUS-RTU (depending on models)	4...20 mA 0...10 Vdc
<b>Display</b>	✓ (optional)	✓ (optional)	✓ (optional)	✓		
<b>Data logging</b>			✓	✓		
<b>Power supply</b>	18...40 Vdc or 24 Vac ±10%	12...40 Vdc	24Vac/dc or 90/240Vac	24Vac/dc or 90/240Vac	5...35Vdc	24Vac ±10% (on demand 115Vac or 230Vac ±10%)
<b>Installation</b>	Duct (with horizontal probe) Wall mounting (with vertical probe) Wall mounting (probe con- nected by cable)		Duct (with horizontal probe) Wall mounting (with vertical probe) Wall mounting (probe con- nected by cable) INTERCHANGEABLE PROBE		Duct	Ventilation channel Duct Drying machines

\*Only for the calculation of absolute humidity

# HD2301.0



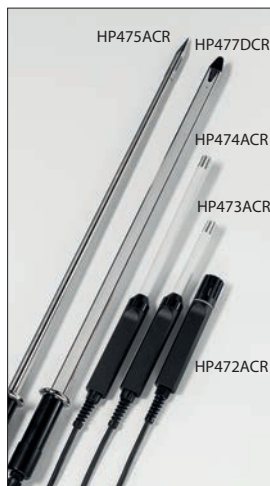
## HD2301.0 HYGRO- THERMOMETER HANDHELD - READ ONLY

HD2301.0 is a portable instrument with LCD display. It measures relative humidity and temperature using combined probes. Temperature only is measured by Pt100 or Pt1000 immersion, penetration, air or contact probes. When the humidity/temperature combined probe is connected, the instrument calculates and displays the absolute humidity, the dew point, the partial vapour pressure. The probes are fitted with an automatic detection module, with the factory calibration data already stored inside.

The Max, Min and Avg function calculate the maximum, minimum or average values.

Other functions include: the relative measurement REL, the HOLD function, and the automatic turning off (excludable)

The instruments have IP67 protection degree.



Technical specifications	
<b>Measurement of relative humidity</b>	
Measurement range	0...100%RH
Resolution	0.1%RH
Accuracy	±0.1%RH
Drift after 1 year	0.1%RH/year
<b>Measurement of temperature</b>	
Pt100 measurement range	-200...+650 °C
Pt1000 measurement range	-200...+650 °C
Resolution	0.1°C
Accuracy	±0.1°C
Drift after 1 year	0.1°C/year
Measuring unit	°C - °F - %RH - g/m <sup>3</sup> - hPa
<b>Power</b>	
Batteries	3 1.5V type AA batteries
Autonomy	200 hours with 1800 mAh alkaline batteries
Power absorbed with instrument off	< 20µA
<b>Connections</b>	
Input module for the probes	8-pole male DIN45326 connector
<b>Operating conditions</b>	
Operating temperature	-5...50 °C
Storage temperature	-25...65°C
Working relative humidity	0...90%RH without condensation
<b>Protection degree</b>	IP67
<b>General characteristics</b>	
Dimensions (Length x Width x Height)	140x88x38mm
Weight	160g (complete with batteries)
Materials	ABS
Display	2 rows 4½ digits plus symbols Visible area: 52x42mm

### ORDERING CODES

**HD2301.0:** The kit is composed of the instrument HD2301.0, 3 1.5V alkaline batteries, operating manual, case. Probes must be ordered separately.

For all suitable probes, see from pag.9 onwards

### Accessories

**HD75:** Saturated solution at 75.4%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

**HD33:** Saturated solution at 33.0%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

**HD11:** Saturated solution at 11.0%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

### Protection for humidity probes Ø 26, thread M24x1,5

**P1:** Technopolymer and 34µm stainless steel grid protection. Operating temperature: -40...80 °C.

**P2:** Technopolymer and 20µm sintered PE protection Operating temperature: -40...80 °C.

**P3:** 20µm sintered bronze protection Operating temperature: -40...150 °C.

**P4:** 20µm sintered PE protection. Operating temperature: -40...80 °C.

### Protection for humidity probes Ø 14, thread M12x1

**P6:** 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.

**P7:** 20µm PTFE protection. Operating temperature: -40...150 °C.

**P8:** PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.

## HD2101.1, HD2101.2



### HD2101.1, HD2101.2 HYGRO-THERMOMETER HANDHELD - COMMUNICATION / DATA LOGGING

HD2101.1 and HD2101.2 are portable instruments with LCD display. They measure relative humidity and temperature with combined probes. Temperature only is measured by Pt100 or Pt1000 immersion, penetration air or contact probes.

When the humidity/temperature combined probe is connected, the instrument calculates and displays the absolute humidity, the dew point, the partial vapour pressure, the wet bulb temperature, the mixing ratio, the enthalpy and the comfort indices.

The probes are fitted with an automatic detection module, with the factory calibration data already stored inside.

The instrument HD2101.2 is a **data logger**. It stores up to 38,000 samples which can be transferred into a PC connected to the serial ports RS232C and USB 2.0 or into a portable printer.

The storing interval, printing, and baud rate can be configured using the menu.

The Max, Min and Avg function calculate the maximum, minimum or average values.

Other functions include: the relative measurement REL, the HOLD function and the automatic turning off (excludable).

The instruments have IP66 protection degree.

Technical specifications	
<b>Measurement of relative humidity</b>	
Measurement range	0...100%RH
Resolution	0.1%RH
Accuracy	±0.1%RH
Drift after 1 year	0.1%RH/year
<b>Measurement of temperature</b>	
Pt100 measurement range	-200...+650 °C
Pt1000 measurement range	-200...+650 °C
Resolution	0.1°C
Accuracy	±0.1°C
Drift after 1 year	0.1°C/year
Measuring unit	°C - °F - %RH - g/kg - g/m <sup>3</sup> - hPa - J/g
<b>Measured values storage - model HD2101.2</b>	
Type	2000 pages containing 19 samples each
Quantity	Total of 38000 samples
Storage interval	1,5,10,15,30 s; 1,2,5,10,15,20,30 min; 1 hour
Security of stored data	Unlimited, independent of battery charge conditions
<b>Power</b>	
Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800 mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains	12Vdc / 1000 mA output mains adapter
<b>Serial interface RS232C</b>	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Print interval	Immediate or selectable among 1,5,10,15,30 s; 1,2,5,10,15,20,30 min; 1 hour
<b>USB interface - model HD2101.2</b>	
Type	1.1 - 2.0 electrically isolated

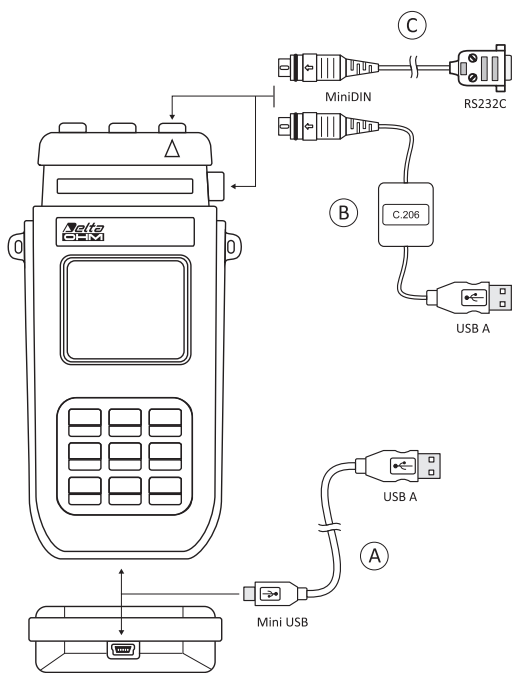


HD2101.2



CP23

Connections	
Input module for the probes	8-pole male DIN45326 connector
Serial interface	8-pole Mini-Din connector
USB Interface	Mini USB type B
Mains adapter	2-pole connector (positive at centre)
Operating conditions	
Operating temperature	-5...50 °C
Storage temperature	-25...65°C
Working relative humidity	0...90%RH without condensation
Protection degree	IP66
Instrument Technical Characteristics	
Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2 rows 4½ digits plus symbols Visible area: 52x42mm
Time	
Date and time	In real time
Accuracy	1min/month max drift



A The portable data loggers HD2101.2 are equipped with HID (Human Interface Device) type USB port with mini USB connector.

For the connection to a PC with the CP23 cable it is not necessary to load USB drivers.

B For the connection of the models HD2101.1 to the USB port of a PC, the C.206 USB/serial converter is necessary. The converter is supplied with its own drivers which must be installed before the connection of the converter to the PC.

C The port with the Mini-DIN connector is a serial port type RS232C. The serial port RS232C of a PC or the printer HD40.1 can be connected by the cable HD2110CSNM.

## ORDERING CODES

**HD2101.1:** The kit is composed of the instrument HD2101.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software downloadable from Delta OHM website. Probes and cable must be ordered separately.

**HD2101.2:** The kit is composed of the HD2101.2 **datalogger**, 4 1.5V alkaline batteries, operating manual, case, USB cable CP23 and DeltaLog9 software downloadable from Delta OHM website. The probes and cable must be ordered separately.

**HD2110CSNM:** 8-pole connection cable Mini-Din - Sub D 9-pole female for RS232C.

**C.206:** Cable for instruments series HD21..1 to connect directly to the USB Input of a PC.

**SWD10:** Stabilized 230Vac/12Vdc-1000 mA mains adapter.

**HD40.1:** Portable, serial input, 24 column thermal printer, 58mm paper width. It uses the cable HD2110 CSNM (optional).

**For all suitable probes, see from pag.9 onwards**

## Accessories

**HD75:** Saturated solution at 75.4%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

**HD33:** Saturated solution at 33.0%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

**HD11:** Saturated solution at 11.0%RH@20 °C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

## Protection for humidity probes Ø 26, thread M24x1,5

**P1:** Technopolymer and 34µm stainless steel grid protection. Operating temperature: -40...80 °C.

**P2:** Technopolymer and 20µm sintered PE protection. Operating temperature: -40...80 °C.

**P3:** 20µm sintered bronze protection. Operating temperature: -40...150 °C.

**P4:** 20µm sintered PE protection. Operating temperature: -40...80 °C.

## Protection for humidity probes Ø 14, thread M12x1

**P6:** 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.

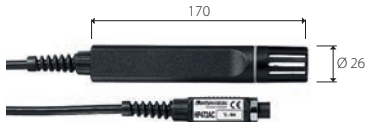
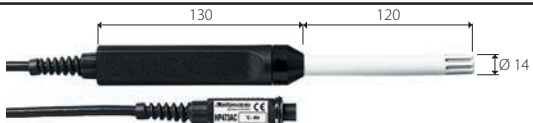

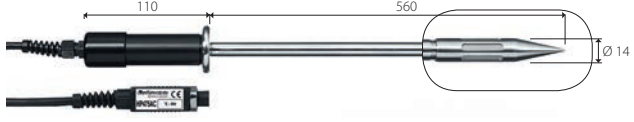



**P7:** 20µm PTFE protection. Operating temperature: -40...150 °C.

**P8:** PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.












**COMBINED DEW POINT AND TEMPERATURE PROBES WITH SICRAM MDODULE**

CODE	SENSORS	RANGE RH - TEMP	DIMENSIONS
HP472ACR	RH Pt100	0...100% RH -20 °C...+80 °C	
HP473ACR			
HP474ACR		0...100% RH -40 °C...+150 °C	
HP475ACR			
HP475AC1R		0...100% RH -40 °C...+180 °C	
HP477DCR		0...100% RH -40 °C...+100 °C	
HP478ACR		0...100% RH -40 °C...+150 °C	
HP480 / HP481		Pt100	0...100%RH -40...+60 °C

**PROBES COMMON CHARACTERISTICS**

<b>Relative humidity</b>	
Sensor	Capacitive
Temperature drift @ 20 °C	Max 0.02%RH/°C
Response time %RH at constant temperature	10 sec (10÷80%RH; air speed=2m/s) at constant temperature
<b>Temperature with sensor Pt100</b>	
Temperature drift @20 °C	0.003%/°C
<b>Accuracy</b>	
%RH	±1.5% RH (0...90%RH) ±2.0% RH (90...100%) @ T=15...35°C ±(1.5 + 1.5% of the displayed value)% RH in the remaining temperature range
Temperature	± 0.3°C

**PROBES PROTECTION**

	P1	P2	P3	P4	P6	P7	P8
Operating Temperature	-40...80 °C	-40...80 °C	-40...150 °C.	-40...80 °C	-40...180 °C	-40...150 °C	-40...120 °C
Material	Technopolymer and 34µm stainless steel grid protection	Technopolymer and 20µm sintered PE protection	20µm sintered bronze protection	20µm sintered PE protection	10µm sintered stainless steel protection	20µm PTFE protection	PBT and 10µm stainless steel grid protection
View							
Technical Spec.	suitable for probes Ø 26 - thread M 24x1,5				suitable for probes Ø 14 - thread M 12x1		

**HD75, HD33, HD11**



**HD75, HD33, HD11  
RH CALIBRATION - SALT SATURATED SOLUTION**

For checking, setting up or calibrating instruments with relative humidity sensors

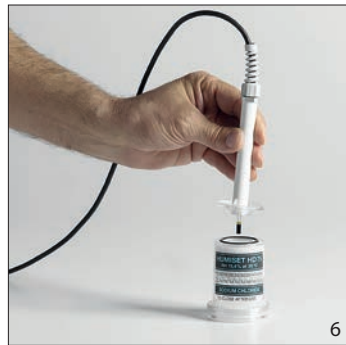
**Before starting**

1. Make sure that inside the chamber containing the saturated salt solutions there are at the same time:
  - solid salt
  - liquid solution or wet salt
2. The instrument and the saturated solutions to be used are to be kept in an environment at stable temperature while checking or calibrating them.
3. Wait for at least a couple of hours at stable temperature so that the instrument and the salt solutions reach thermal equilibrium with the environment.
4. Unscrew the cap of the first saturated salt solution to be used for checking or calibrating the instrument. Use:
  - for probes with thread M24X1,5, the bottle threaded hole M24X1,5 directly;
  - for probes with thread M12X1, the supplied adapter M24X1,5 / M12X1.
5. If there is any liquid inside the measurement chamber, dry it with clean absorbent paper. The uncertainty of the solution or measurement is not influenced by any liquid left inside the measurement chamber.
6. Screw the probe to the bottom of the thread; do not touch the sensitive element with your hands or any other object or liquid.
7. The temperature of the salt solution and that of the sensor must be the same or very close. Once the sensor is inserted, wait for at least 30 minutes.
8. Connect the probe to the instrument or transmitter. Power or turn them on as per instructions.
9. After 30 minutes, start the calibration procedure for the first calibration point according to the instruction manual of the specific instrument.
10. Once you have checked, set up or calibrated the first point, take the probe out of the bottle and put the cap back on the bottle. Make sure you do not mix it up with that of other saturated solutions.
11. Repeat points 1, 2, 3 and 4 to perform the second calibration point with the second saturated solution.

**Notes and warnings:**

- I. Keep salt solutions in the dark at a temperature of about 20 °C.
- II. Salt solutions are effective and can be used as long as there is salt to be melted as well as liquid inside them. As a rule, in 33% RH solution make sure that there is some solid salt left, while in 75%RH solution make sure that there is some liquid left or salt is wet.
- III. For better results, the temperature of the probe and that of the saturated solution must be as close as possible. Do not forget that plastic materials are bad conductors of heat. Any difference of tenths of degree between the sensor and the saturated salt solution leads to errors of RH points.
- IV. Do not touch the sensitive element with your hands or other objects. Scratches and dirt alter the instrument measurement and may damage the sensor.
- V. The measurement chamber must be closed, otherwise the equilibrium cannot be reached.  
Thoroughly screw the probe to the bottle.
- VI. The check or calibration sequence for Delta OHM instruments or transmitters is always as follows:  
first solution: 75% RH  
second solution: 33%RH  
third solution: 11% RH (if any)  
No sequence is compulsory for checking the sensor.
- VII. To calibrate or set up the instrument, follow the instruction manual of the instrument that you are using.
- VIII. If you check, set up or calibrate the instrument at a temperature of other than 20 °C, see the following table to find out the equilibrium relative humidity reference value of the salt solution corresponding to the working temperature. In this table, you will find the saturated salt relative humidity variation when temperature changes.

Equilibrium relative humidity of selected saturated salt solutions from 0 to 100 °C			
Temp. °C	Lithium Chloride	Magnesium Chloride	Sodium Chloride
0	11.23 ± 0.54	33.66 ± 0.33	75.51 ± 0.34
5	11.26 ± 0.47	33.60 ± 0.28	75.65 ± 0.27
10	11.29 ± 0.41	33.47 ± 0.24	75.67 ± 0.22
15	11.30 ± 0.35	33.30 ± 0.21	75.61 ± 0.18
20	11.31 ± 0.31	33.07 ± 0.18	75.47 ± 0.14
25	11.30 ± 0.27	32.78 ± 0.16	75.29 ± 0.12
30	11.28 ± 0.24	32.44 ± 0.14	75.09 ± 0.11
35	11.25 ± 0.22	32.05 ± 0.13	74.87 ± 0.12
40	11.21 ± 0.21	31.60 ± 0.13	74.68 ± 0.13
45	11.16 ± 0.21	31.10 ± 0.13	74.52 ± 0.16
50	11.10 ± 0.22	30.54 ± 0.14	74.43 ± 0.19
55	11.03 ± 0.23	29.93 ± 0.16	74.41 ± 0.24
60	10.95 ± 0.26	29.26 ± 0.18	74.50 ± 0.30
65	10.86 ± 0.29	28.54 ± 0.21	74.71 ± 0.37
70	10.75 ± 0.33	27.77 ± 0.25	75.06 ± 0.45
75	10.64 ± 0.38	26.94 ± 0.29	75.58 ± 0.55
80	10.51 ± 0.44	26.05 ± 0.34	76.29 ± 0.65
85	10.38 ± 0.51	25.11 ± 0.39	
90	10.23 ± 0.59	24.12 ± 0.46	
95	10.07 ± 0.67	23.07 ± 0.52	
100	9.90 ± 0.77	21.97 ± 0.60	



**HP480, HP481**



**HP480, HP481 - PROBES FOR TEMPERATURE, RELATIVE HUMIDITY AND DEW POINT MEASUREMENT IN PIPES.**

Compressed air is used for several purposes, many of which require compressed air with a low humidity level, and so comes the need to know the dew point (DP) of water vapour in the compressed air that circulates in the system. The **HP480** and **HP481** probes are designed specifically for this purpose.

The use of dew point measurement in order to limit moisture in compressed air distribution systems has many advantages:

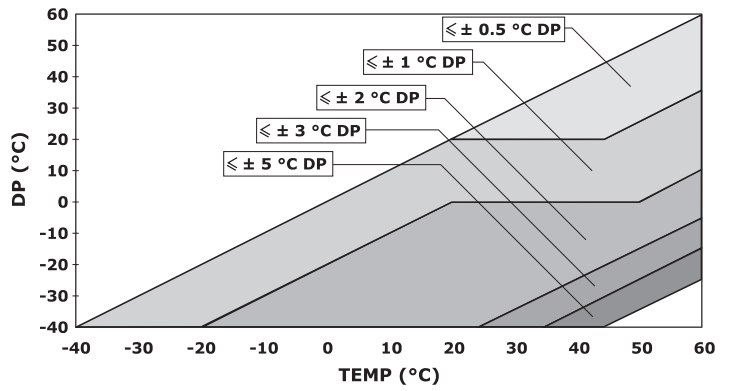
- prevents corrosion of metal pipes;
- in cold areas, prevents the formation of ice inside the pipes leading to obstruction of the pipes themselves;
- prevents bacterial growth in plants for medical use
- reduces maintenance costs of pneumatic drives, maintaining the proper lubrication of moving parts;
- improves the quality of products coming into contact with air, for example in the drying process of granulates.

**Typical installation HP480**

The probe can be installed in any position. The connection to the compressed air can be achieved with a threaded connection or with a quick connection.

The connection allows for quick installation and removal of the probe without stopping the system. There are 3 different couplings supplied: 1/4" Italian, German and American standard.

The probe is equipped with a filter made of sintered steel, stainless steel measuring chamber and control valve of the air flow. Suitable for measurement of compressed air with dew point up to class 3 according to standard ISO8573-1.



Graph 1: accuracy of the dew point measurement (DP)

**Typical installation HP481**

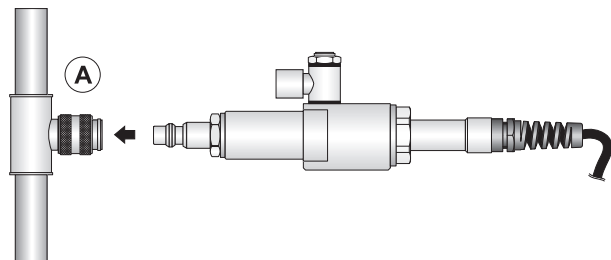
**HP481** is a combined relative humidity and temperature probe suitable for in-line installation. The probe can be used in pressurized pipes, or in which vacuum is required. It is equipped with a G 1/2" threading for the connection to the system and can be installed in any position. The probe is equipped with a sintered steel filter.

**Connections**

The probes can be connected to the pipe in three ways:

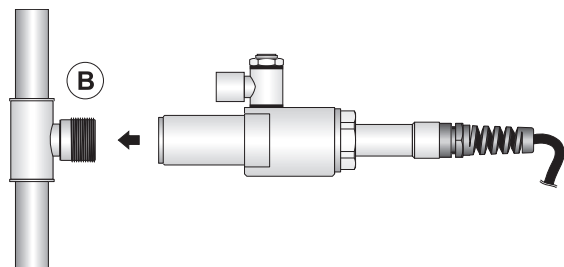
- by using the measuring chamber with a quick coupling (only HP480);
- by using the measuring chamber with a threaded G 1/4" connection (only HP480);
- directly (without measuring chamber) with a threaded G 1/2" connection.

**Connection with measuring chamber and quick coupling:**



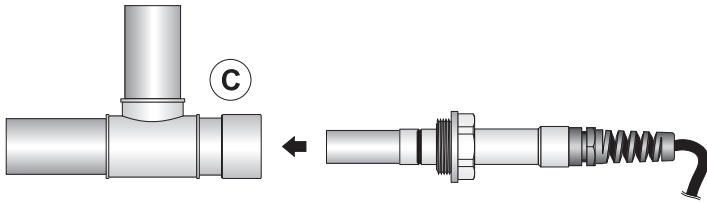
To connect with quick coupling, you can use one of the standard 1/4" couplings provided. Other couplings than those supplied can be used, provided that they have a G 1/4" thread on the side that fits into the probe.

**Connection with measuring chamber and threaded connection:**



For the connection by threaded coupling, the connection must have an external G 1/4" thread on the side which will be placed in the probe. The connection must be airtight. When installing or removing the probe, it is necessary to depressurize the system.

Direct connection (without measuring chamber) only for HP481 and threaded connection:



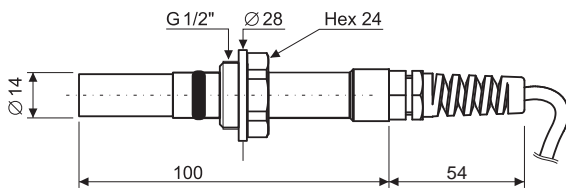
For direct connection of the probe, use a fitting with internal G 1/2" thread on the side which will be placed in the probe. The connection must be airtight. When installing or removing the model HP480, it is necessary to depressurize the system. Ensure that the probe does not obstruct the normal flow of air through the distribution line.

In all modes of installation, it is recommended that you place in the plant, upstream of the sensor, a safety valve to be closed manually in case of maintenance of the probe.

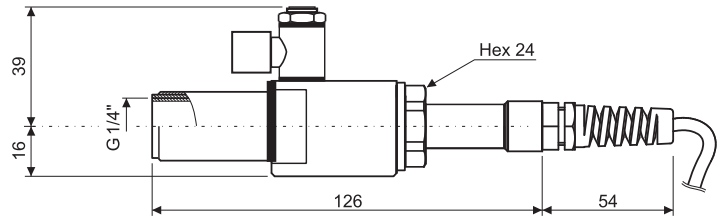
Periodically check the cleanliness of the sintered filter of the probe, in order to maintain optimum response characteristics of the probe. The filter can be washed with a detergent that leaves no traces.

## DIMENSIONS

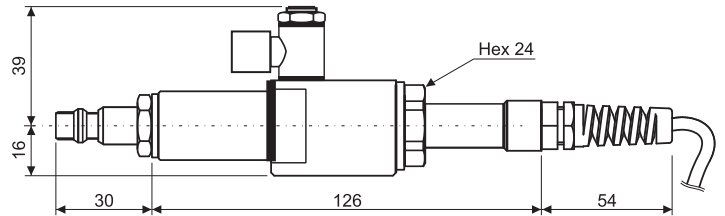
Dimensions (mm) of the probe without measuring chamber:



Dimensions (mm) of the probe with measuring chamber, without quick coupling (only HP480):



Dimensions (mm) of the probe with measuring chamber and quick coupling (only HP480):



## ORDERING CODES

**HP480:** Interchangeable temperature and relative humidity probe, complete with SICRAM module. Connection cable 2m. Equipped with 15µ sintered AISI 316 stainless steel filter, measuring chamber, air flow regulation valve, and three 1/4" quick couplings (standard Italian, German, and American).

**HP481:** Interchangeable temperature and relative humidity combined probe, complete with SICRAM module. Connection cable 2 m. Equipped with 15µ sintered AISI 316 stainless steel filter, G 1/2" threading.

Technical specifications	HP480	HP481
<b>Relative humidity</b>		
Sensor		capacitive
Measuring range		0...100%RH
Accuracy (@ T = 15...35 °C)	± 1,5%RH (0..90%RH), ± 2%RH (remaining field)	
Accuracy (@ T = -40...+60 °C)	± (1,5 + 1,5% of the measured value)%RH	
Long term stability	< 1%RH/year	
<b>Temperature</b>		
Sensor	Pt100	
Measuring range	-40...+60 °C	
Accuracy	± 0,25 °C	
<b>Dew point</b>		
Sensor	Parameter calculated from the measurement of temperature and relative humidity	
Measuring range	-40...+60 °C DP	
Accuracy (@ T = 20 °C)	± 2 °C DP (-40...0 °C DP) ± 1 °C DP (0...+20 °C DP)	
Accuracy (@ T = -40...+60 °C)	see graph 1	
<b>General features</b>		
Connection	G 1/2" or G 1/4" or quick coupling	G 1/2"
Regulation of the air flow	From 0,2 to 3 l/min	
Cable length	2m	2m (other lengths on request)
Filter	Sintered 15µ AISI 316 steel	
Material of the measuring chamber	AISI 304 stainless steel	
Operating temperature of the probe	-40...+80 °C	
Operating pressure of the probe	0...16 bar	-1...16 bar
Protection degree	IP65	
Compatibility with ethylene oxide (C2H4O)	The maximum allowed concentration in continuous operation which causes a deviation within 2% is 3 ppm	

## TEMPERATURE PROBES – RESISTANCE THERMOMETERS

Delta OHM offers a wide choice of Platinum resistance thermometers with resistance equal to 100 Ω at 0 °C and temperature coefficient α as defined by the IEC 60751 standard: Pt100, R<sub>0</sub>=100 Ω, α= 3.851·10<sup>-3</sup> °C<sup>-1</sup>.

For particular applications, probes with Pt1000 sensor or with a thermistor sensor are available. The response time τ<sub>0.63</sub> indicated for each probe is the response time of the sensor to a temperature variation, with a variation of the measured signal corresponding to the 63% of the total variation. The response times are referred:

- in water at 100 °C for immersion probes;
- to the contact with a metal surface at 200 °C for surface probes;
- to an air temperature of 100 °C for air probes.

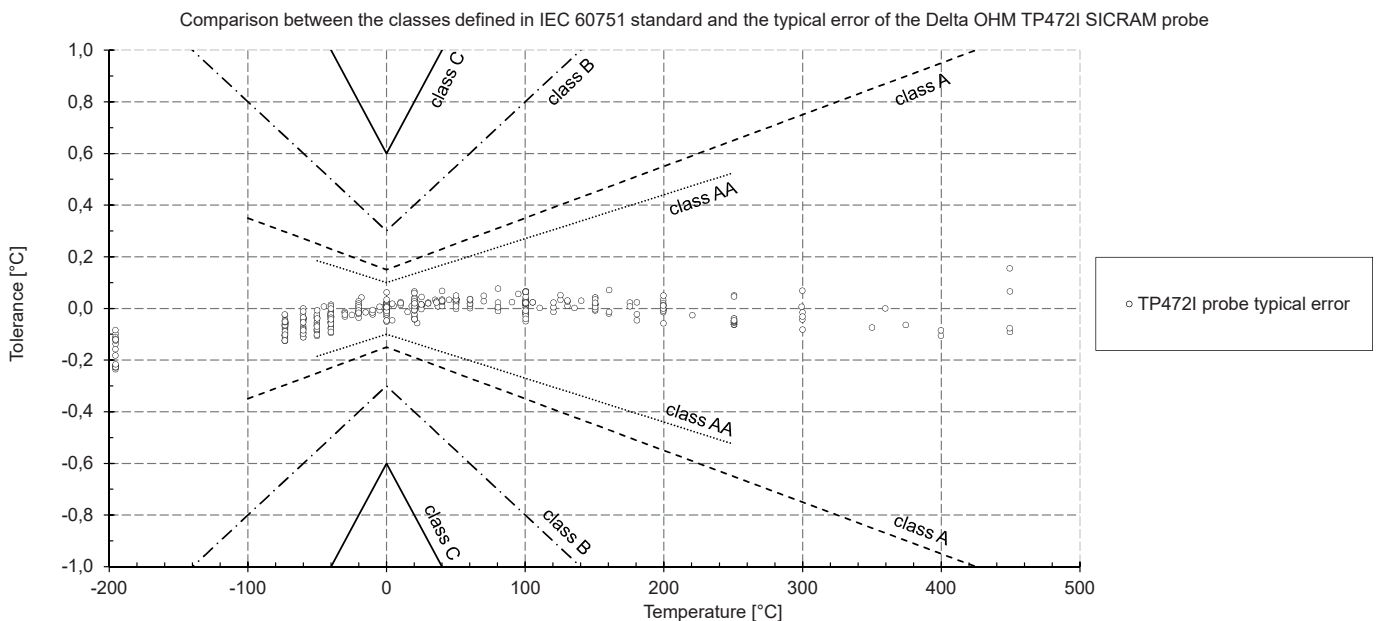
The IEC 60751:2008 standard defines the tolerance classes of the resistance thermometers as summarized in the following table:

Tolerance class	Temperature Range		Tolerance [°C]
	WIRE WOUND sensor	THIN FILM sensor	
classe AA (1/3 DIN)	from -50 °C to 250 °C	from 0 °C to 150 °C	±(0.1+0.0017· t )
classe A	from -100 °C to 450 °C	from -30 °C to 300 °C	±(0.15+0.002· t )
classe B	from -196 °C to 600 °C	from -50 °C to 500 °C	±(0.3+0.005· t )
classe C	from -196 °C to 600 °C	from -50 °C to 600 °C	±(0.6+0.01· t )

On request, the probes can be assembled with a compatible connector chosen from TP471 and TP47.

The TP471 connector developed by Delta OHM contains an electronic module (SICRAM) that allows the probe error to be adjusted. During the Quality Control, the probes provided with this module are individually checked in our laboratories, linearizing the characteristic and allowing more stringent accuracy over the entire working range.

The following graph shows the Delta OHM SICRAM module probe TP472I typical error values obtained from the calibrations performed in our ISO17025 calibration laboratory. The graph highlights the effectiveness of the linearization performed on the probes.



Tolerance as a function of temperature. The temperature range refers to the platinum wire wound probes.

Tolerance [°C]	Temperature [°C]										
	-196	-100	-50	0	100	250	300	350	450	500	600
class AA	---	± 0.27	± 0.19	± 0.10	± 0.27	± 0.53	± 0.61	± 0.70	---	---	---
class A	---	± 0.35	± 0.25	± 0.15	± 0.35	± 0.65	± 0.75	± 0.85	± 1.05	---	---
class B	± 1.28	± 0.80	± 0.55	± 0.30	± 0.80	± 1.55	± 1.80	± 2.05	± 2.55	± 2.80	± 3.30
class C	± 2.56	± 1.60	± 1.10	± 0.60	± 1.60	± 3.10	± 3.60	± 4.10	± 5.10	± 5.60	± 6.60
accuracy TP472I	± 0.30	± 0.30	± 0.20	± 0.10	± 0.20	± 0.20	± 0.30	± 0.30	± 0.30	± 0.30	---

By means of the calibration, the purchased instrument can be metrologically characterized, determining the systematic error of the thermometer and ensuring at the same time the traceability to international standards. Delta OHM Laboratories are able to provide this service by issuing calibration reports according to ISO 9001 or ACCREDIA LAT certificates in compliance with ISO/IEC 17025 standard, recognized internationally through ILAC MRA agreements.



LAT N° 124

Temperature - Humidity - Pressure - Air speed  
Photometry/Radiometry - Acoustics

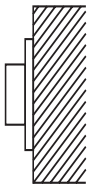
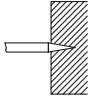
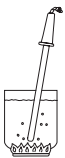




Pt100 PROBES WITH TP471 SICRAM MODULE

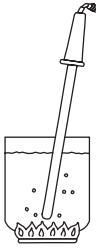
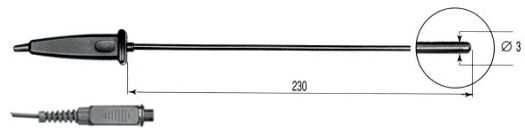
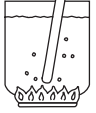
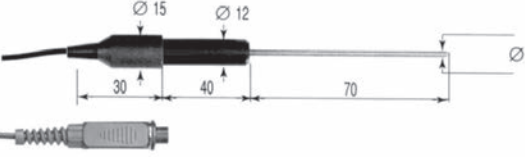
CODE	T (°C)	ACCURACY	USE	$\tau_{0.63}$	DIMENSIONS
TP472I	-196 +500	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3s	
TP472I.O	-50 +300	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3s	
TP473P.I	-50 +400	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		5s	
TP473P.O	-50 +300	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)			
TP474C.O	-50 +300	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		5s	
TP475A.O	-50 +250	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		12s	
TP472I.5	-50 +400	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3s	
TP472I.10	-50 +400	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3s	
TP49A.I	-70 +250	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3,5s	
TP49AC.I	-70 +250	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		5,5s	
TP49AP.I	-70 +250	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		4s	
TP87.O	-50 +200	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		3s	




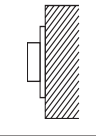

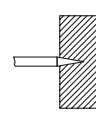
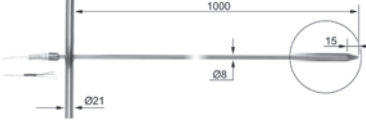
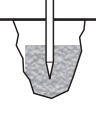
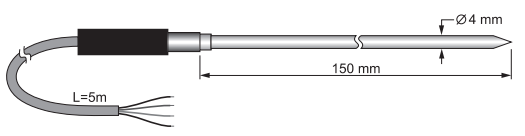
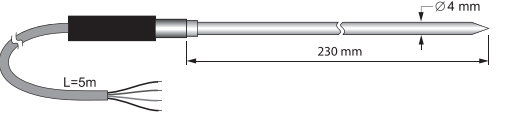
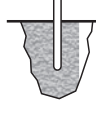
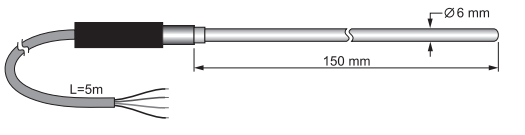
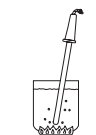
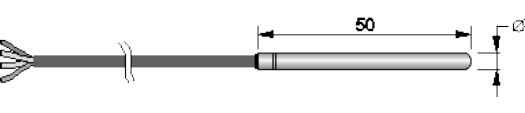
Pt100 PROBES WITH TP471 SICRAM MODULE

CODE	T (°C)	ACCURACY	USE	$\tau_{0.63}$	DIMENSIONS
TP878.O	-40 +85	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		60s	Contact probe for solar panels, with SICRAM module. Cable L = 2 m
TP878.1.O	-40 +85	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)			Contact probe for solar panels, with SICRAM module. Cable L = 5 m
TP879.O	-20 +120	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		60s	Penetration probe for compost, with SICRAM module. Cable L = 5 m
TP880/300.I	-50 +450	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		60s	Mignon head, cable length = 2m
TP880/600.I	-50 +450	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)			Mignon head, cable length = 2m
TP35.5AF.5S	-110 +180	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3$ °C (t < -50 °C; t > 250 °C)		3s	 Cable L = 5 m. Shield in Inox + PTFE
TP875.I	-30 +120	$\pm 0.1$ °C (@ 0 °C) $\pm 0.2$ °C (-50 °C $\leq$ t $\leq$ 250 °C)		15'	Globe-thermometer probe for measurement of radiant heat with $\varnothing 150$ mm. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m. Supplied with SICRAM module.
TP876.I					Globe-thermometer probe for measurement of radiant heat with $\varnothing 50$ mm. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m. Supplied with SICRAM module.


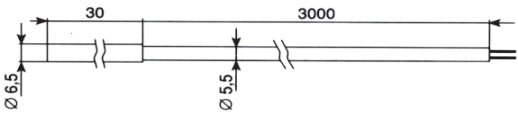
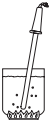
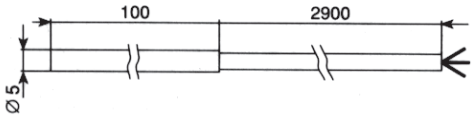
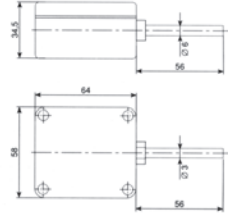
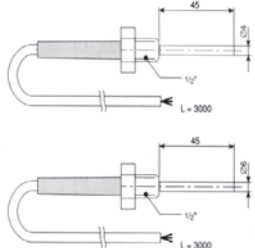
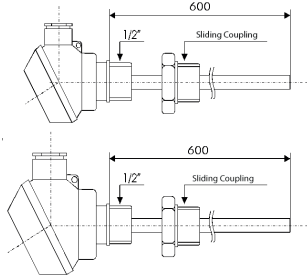
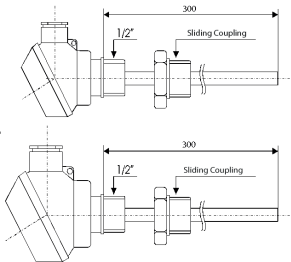
**Pt100/Pt1000 PROBES WITH TP47 CONNECTOR WITHOUT SICRAM MODULE**

CODE	T (°C)	CLASS	USE	$\tau_{0.63}$	DIMENSIONS
TP47.100.O (Pt100)	-50 +250	Class A		3s	
TP47.1000.O (Pt1000)					
TP87.100.O (Pt100)	-50 +200	Class A		3s	
TP87.1000.O (Pt1000)					



**Pt100 PROBES ENDING WITH FREE WIRES**

TP875.1.I	-30 +120	Class A		15s	Globe-thermometer probe for measurement of radiant heat with $\varnothing 150$ mm. Accuracy according to ISO 7243 ISO 7726. Pt100 sensor, 4-wire cable L=2 m .
TP876.1.I					Globe-thermometer probe for measurement of radiant heat with $\varnothing 50$ mm. Accuracy according to ISO 7243 - ISO 7726. Pt100 sensor, 4-wire cable L=2 m.
TP878.1SS.O	-40 +85	Class A		60s	Contact probe for solar panels 4-wire cable L = 5 m 
TP879.1.O	-20 +120	Class A		60s	Penetration probe for compost 4-wire cable L = 5 m 
TP32MT.1P.I	-40 +100	Class A		40s	
TP32MT.1P.2	-50 +250	Class A		40s	
TP32MT.2.I	-40 +100	Class A		60s	
TP35.5AF.5	-110 +180	Class A		3s	 Cable L = 5 m. Shield in Inox + PTFE

**TEMPERATURE PROBES FOR INDUSTRIAL USE**

CODE	T (°C)	CLASS	USE	$\tau_{0.63}$	DIMENSIONS
HD882/EK (KTY81)	-40 +150	Not applicable		5s	
HD882/ E/100 (Pt100)	-50 +300	Class A		5s	
HD882/GK (KTY81)	-50 +100	Not applicable	Environmental	5s	
HD882/G100 (Pt100)	-50 +100	Class A	Environmental	5s	
HD882/L104 (Pt100)	0 +250	Class A	Process Thread	7s	
HD882/L106 (Pt100)	0 +250	Class A	Process Thread	15s	
HD882M100/600 (Pt100)	-50 +450	Class A	Process Thread - Miniature Head	15s	
HD882DM100/600 (Pt100)	-50 +450	Class A	Process Thread - DIN B Head	15s	
HD882M100/300 (Pt100)	-40 +100	Class A	Process Thread - Miniature Head	15s	
HD882DM100/300 (Pt100)	-50 +250	Class A	Process Thread - DIN B Head	15s	

**CONNECTORS**

TP47	Connector without SICRAM module. It can be connected to 4-wire Pt100 probes (and 3-wire with some instruments) or 2-wire Pt1000 probes.	
TP471	Connector with SICRAM electronic module for the connection of resistance thermometers and the correction of the characteristic of the sensor. It can be connected to 3-wire or 4-wire Pt100Ω platinum temperature probes. assembling and calibration only in Delta OHM	

## HD48... SERIES, HD 49... SERIES



### HD48...SERIES, HD49...SERIES PASSIVE OR ACTIVE TEMPERATURE, RELATIVE HUMIDITY, RELATIVE HUMIDITY AND TEMPERATURE, TEMPERATURE AND DEW POINT TRANSMITTERS

HD48... and HD49... series of transmitters measure temperature, relative humidity and the dew point temperature.

Versions with only standard analog output or with only RS485 output with MODBUS- RTU protocol are available. The models with analog output provide a signal suitable for transmission to a remote display, recorder or PLC. The models with RS485 output are suitable for connection to a PC or PLC.

The models of the HD48.. series are active transmitters and accept both direct and 24Vac alternating power supply; they have standard current (4...20 mA) or voltage (0...10V) outputs, or a serial RS485 output, depending on the model. The models of the HD49.. series are passive transmitters and thus suitable to be inserted in a 4...20 mA current loop. The HD48.. and HD49.. series of transmitters are designed for temperature and humidity control in conditioning and ventilation applications (HVAC/BEMS) in the following sectors: pharmacy, museums, clean rooms, ventilation ducts, industrial and civil sectors, crowded places, canteens, auditoria, gyms, high-density farms, greenhouses, etc.

The HD48.. and HD49.. transmitters measure relative humidity with a well proven temperature compensated capacitive sensor that assures precise and reliable measurements in the course of time. The transmitters of the HD48.. and HD49.. series are available in two probe temperature ranges: standard -20...+80 °C and extended -40...+150 °C for the most critical applications. A stainless steel 10µm filter protects the sensors against dust and particles (other filters are available for different applications).

The transmitters are factory calibrated and no further adjustments are required.

Each series is available in different versions: with horizontal probe for duct mounting (HD48...TO..., HD49...TO...), with vertical probe for wall mounting (HD48...TV..., HD49... TV...) or with remote probe connected to the transmitter by means of a cable (HD48...TC..., HD49...TC...), cable lengths available are 2, 5 and 10m, for the measure of compressed air in pipelines (HD48...T480, HD49...T480) or for in-line installation (HD48...T481, HD49...T481) The probes can be supplied in two different lengths (135mm or 335mm).

Various accessories are available for the installation: for example to fix the probe to the duct, it can be used the HD9008.31 flange, a 3/8" universal biconical connection or a PG16 metal cable gland (Ø10...14mm). A 4-digit optional display ("L" model) allows to display the measured parameters in a continuous or sequential mode.

Technical specifications		
	STANDARD RANGE	EXTENDED RANGE
<b>Relative Humidity</b>		
Sensor	Capacitive	
Measuring range	0...100%RH	
Accuracy @T=15...35°C	±1.5% RH (0..90%RH), ±2.0% RH (90...100%RH)	
Accuracy @ rest of T range	±(1.5+1.5% of the measure) %RH	
Repeatability	0.4%RH	
Sensor working temperature	-20...+80 °C	-40...+150 °C
<b>Temperature</b>		
Measuring range	-20...+80 °C -40...+60 °C (for T480/T481)	-40...+150 °C
Sensor	NTC 10kΩ	Pt100 class A
Accuracy	±0.3 °C (0..+70 °C) ±0.4°C (-20.0 °C, +70..+80 °C)	±0.3°C
Repeatability	0.05°C	0.05°C
<b>Dew Point</b>		
Sensor	Parameter calculated from relative humidity and temperature	
Measuring range	-20...+80 °C DP	
Accuracy	See table 1	
Repeatability	0.5°C DP	
<b>Type of output (according to the model)</b>		
Models HD4807T..	Temperature	4...20 mA (-20..+80 °C), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD4807ET..	Temperature	4...20 mA (-40..+150 °C), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD48V07T..	Temperature	0...10 Vdc (-20..+80 °C), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48V07ET..	Temperature	0...10 Vdc (-40..+150 °C), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48S07T.. HD48S07ET..	Temperature	Only RS485 with MODBUS-RTU protocol
Models HD4907T..	Temperature	4...20 mA (-20..+80 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
Models HD4907ET..	Temperature	4...20 mA (-40..+150 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
Models HD4801T.. HD4801ET	Relative Humidity	4...20 mA (0...100%RH), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD48V01T.. HD48V01ET..	Relative Humidity	0...10 Vdc (0...100%RH), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48S01T.. HD48S01ET..	Relative Humidity	Only RS485 with MODBUS-RTU protocol
Models HD4901T.. HD4901ET..	Relative Humidity	4...20 mA (0...100%RH), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
Models HD4817T..	Relative Humidity	4...20 mA (0...100%RH), $R_L < 500\Omega$ 22 mA outside the measuring range
	Temperature	4...20 mA (-20..+80 °C), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD4817ET..	Relative Humidity	4...20 mA (0...100%RH), $R_L < 500\Omega$ 22 mA outside the measuring range
	Temperature	4...20 mA (-40..+150 °C), $R_L < 500\Omega$ 22 mA outside the measuring range

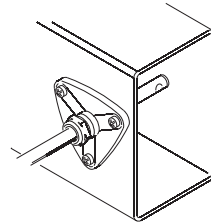
Models HD48V17T..	Relative Humidity	0...10 Vdc (0...100%RH), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
	Temperature	0...10 Vdc (-20...+80 °C), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48V17ET..	Relative Humidity	0...10 Vdc (0...100%RH), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
	Temperature	0...10 Vdc (-40...+150 °C), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48S17T.. HD48S17ET	Relative Humidity	Only RS485 with MODBUS-RTU protocol
	Temperature	
Models HD4917T..	Relative Humidity	4...20 mA (0...100%RH), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
	Temperature	4...20 mA (-20...+80 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
Models HD4917ET..	Relative Humidity	4...20 mA (0...100%RH), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
	Temperature	4...20 mA (-40...+150 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
Models HD4877T..	Dew Point	4...20 mA (-20...+80 °C DP), $R_L < 500\Omega$ 22 mA outside the measuring range
	Temperature	4...20 mA (-20...+80 °C), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD48V77T..	Dew Point	0...10 Vdc (-20...+80 °C TD), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
	Temperature	0...10 Vdc (-20...+80 °C), $R_L > 10k\Omega$ 11V dc outside the measuring range
Models HD48S77T..	Dew Point	Only RS485 with MODBUS-RTU protocol
	Temperature	
Models HD4977T..	Dew Point	4...20 mA (-20...+80 °C DP), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
	Temperature	4...20 mA (-20...+80 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22mA outside the measuring range
Models HD4877T480 HD4877T481	Dew Point	4...20 mA (-40...+60 °C DP), $R_L < 500\Omega$ 22 mA outside the measuring range
	Temperature	4...20 mA (-40...+60 °C), $R_L < 500\Omega$ 22 mA outside the measuring range
Models HD48V77T480 HD48V77T481	Dew Point	0...10 Vdc (-40...+60 °C DP), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
	Temperature	0...10 Vdc (-40...+60 °C DP), $R_L > 10k\Omega$ 11 Vdc outside the measuring range
Models HD48S77T480 HD48S77T481	Dew Point	Only RS485 with MODBUS-RTU protocol
	Temperature	
Models HD4977T480 HD4977T481	Dew Point	4...20 mA (-40...+60 °C DP), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range
	Temperature	4...20 mA (-40...+60 °C), $R_{Lmax} = (Vdc-12)/0.022$ 22 mA outside the measuring range

Table 1 -Accuracy of dew point measurement:

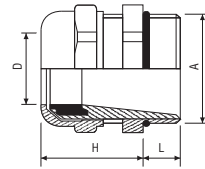
		TD °C								
		-20	-10	0	10	20	30	40	60	80
Temperature °C	-20	≤±1								
	-10	≤±1	≤±1							
	0	≤±1	≤±1	≤±1						
	10	≤±3	≤±1	≤±1	≤±1					
	20	≤±4	≤±2	≤±1	≤±1	≤±1				
	30		≤±3	≤±1,5	≤±1	≤±1	≤±1			
	40				≤±2	≤±1	≤±1	≤±1		
	60				≤±5	≤±2,5	≤±2	≤±1	≤±1	
	80						≤±4	≤±2	≤±1	≤±1

Installation notes

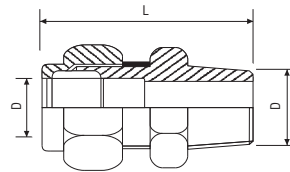
To fix the probe inside a ventilation duct, a pipe, etc., use for example the HD9008.31 flange, a PG16 metal cable gland (Ø10...14mm) or a 3/8" universal biconical connection.



HD9008.31 Flange



PG16 metal cable gland  
D = 10...14mm  
L = 6.5mm  
H = 23mm  
A = PG16



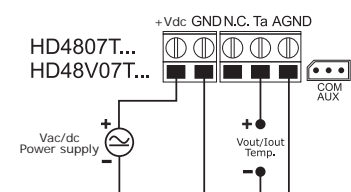
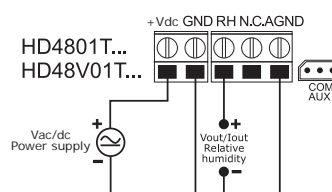
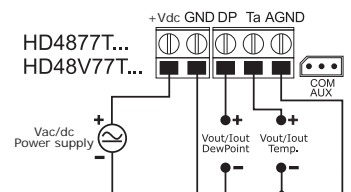
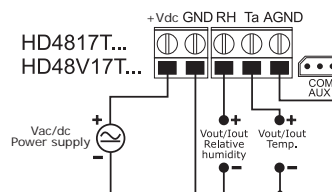
Universal biconical connector  
L = 35mm  
D = 14mm  
A = 3/8"

Electrical connections

HD48.. series with analog output

Power the instrument as shown in the below connection schemes, the power supply terminals are marked as +Vcc and GND. Depending on the model, the output signal is available between:

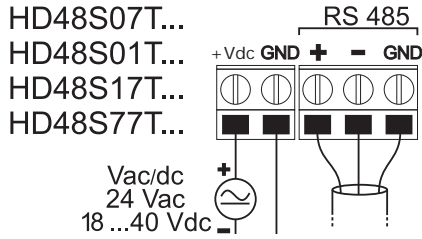
- Ta and AGND terminals for the transmitters of the HD4807T..and HD48V07T... series.
- RH% and AGND terminals for the transmitters of the HD4801T.. and HD48V01T... series.
- RH% and AGND, Ta and AGND terminals for the transmitters of the HD4817T.. and HD48V17T.. series.
- DP and AGND, Ta and AGND terminals for the transmitters of the HD4877T.. and HD48V77T... series.



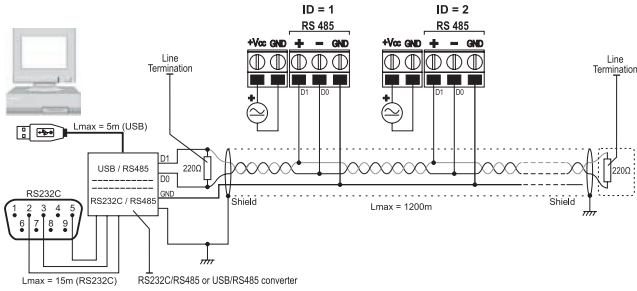
Power supply and electrical connections		
	HD48...	HD49...
Power supply	18...40 Vdc or 24 Vac ±10%	12...40 Vdc
Consumption	- 4 mA@24V (models with voltage output) - 4 mA@24V with open output, 20 mA@24V with 12 mA output (models with current output) - 2 mA@24V models with serial RS485 output	
Electrical connections	Screw type terminal block, max 1,5mm <sup>2</sup> , M16 cable gland for input cable	
General characteristics		
TV probe working temperature	-20...+80 °C	
...TO...TC Probes working temperature	STANDARD RANGE -20...+80 °C	EXTENDED RANGE -40...+150 °C
T480/T481 probes working temperature	-40...+80 °C	
Electronics working temperature	-20...+60 °C	
Storage temperature	-20...+80 °C	
Electronics protection class	IP66	
Case dimensions (length x width x height)	80x84x44	

## HD48...series with RS485 output

Connect the instrument as shown in the below connection schemes, the power supply terminals are marked as +Vcc and GND.



Thanks to RS485 output, several instruments can be connected to form a network. The instruments are connected in a sequence through a shielded cable with twisted pair for signals and a third wire for the ground.

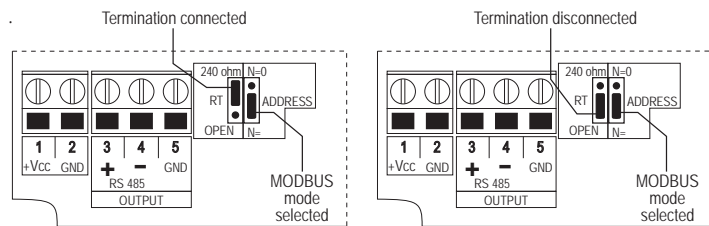


Line termination must be set at the two network ends. To polarize the line during nontransmission periods, resistor are connected between signal and power supply lines. The maximum number of devices that can be connected to the (Bus) line RS485 depends on the load characteristics of the devices to be connected.

The standard RS485 requires that the total load does not exceed 32 Unit Loads. The load of a HD48S.. transmitter is equal to 1/4 of the unit load.

If the total load is more than 32 unit loads, divide the net in segments and insert a signal repeater between one segment and the next one. At the beginning and at the end of each segment a line termination must be connected.

The instrument has a built in line termination that can be connected or removed through a short jumper placed next to the terminal block. If the instrument is the last or the first device of a network group, connect the termination placing the short jumper between the "RT" and "240 ohm" indications. If the instrument is not at the end of a network group, remove the termination placing the short jumper between the "RT" and "OPEN" indications



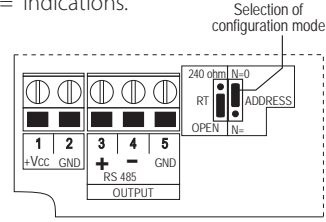
The cable shield must be connected to both line ends. The cable should have the following features:

- Characteristic impedance: 120 ohm
- Capacity: less than 50pF/m
- Resistance: less than 100 ohm/km
- gauge: 0,22 mm<sup>2</sup> (AWG24) at least.

The cable maximum length depends on baud rate and cable characteristics. Typically, the maximum length is 1200m. The data line must be kept separated from any power lines in order to prevent interferences on the transmitted signal. For connection to a PC, a RS232/RS485 or a USB/RS485 converter must be used. To operate with the MODBUS-RTU protocol be sure that the ADDRESS short jumper is between "ADDRESS" and "N=" indications.

Each transmitter of the network is univocally identified by an address. The address must be between 1 and 247. There must not be any other transmitters connected with the same address. The address must be configured before connecting the instrument to the network. To set the instrument address use

the HD48STCAL kit. The kit includes the RS48 cable with built in USB/RS485 adapter. To configure the instrument it is necessary to move the ADDRESS short jumper between the "ADDRESS" and "N=0" indications to select the setup mode. After the configuration, move the short jumper back between the "ADDRESS" and "N=" indications.



In MODBUS mode it is possible to read the measured values by the instrument through the 04h functioning code (Read Input Registers). Table 2 represents the available quantities with its relative register address.

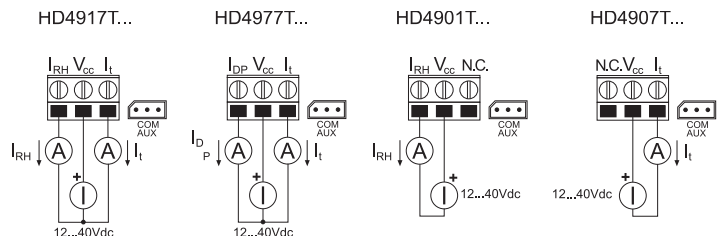
Table 2 – MODBUS Registers

Address	Quantities	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	State register Bit 0 = 1 => temperature measure in error Bit 1 = 1 => relative humidity measure in error Bit 2 = 1 => dew point temperature calculation in error Bit 3 = 1 => error in data configuration	16-bit integer

## HD49.. series

Follow the connection schemes shown below, the maximum load resistance that can be connected to each 4...20 mA output depends on the power supply Vcc applied, according to the relation:

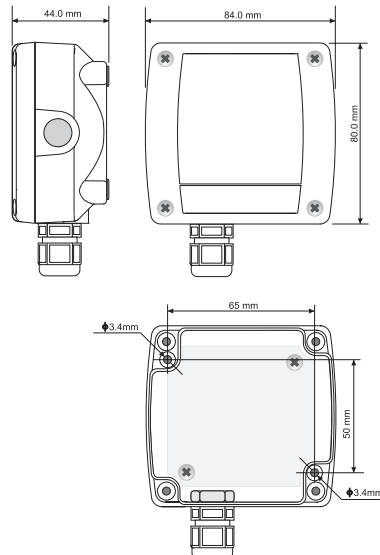
$$R_{L_{max}} = (V_{dc}-12)/0.022, \text{ e.g. if } V_{dc}=24V_{dc} \text{ the max load is } R_{L_{max}}=545 \text{ ohm.}$$



## Relative humidity probe calibration

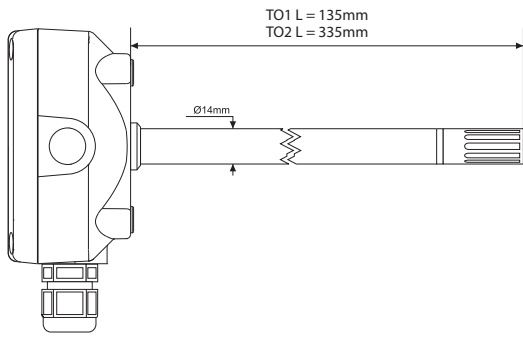
The HD48.. and HD49.. transmitters are supplied factory calibrated and ready to use. If necessary, it is possible to calibrate the relative humidity sensor using the saturated salt solutions HD75 (75%RH saturated salt solution) and HD33 (33%RH saturated salt solution) by connecting the instrument to the PC and using the HD48TCAL software.

## Case dimension

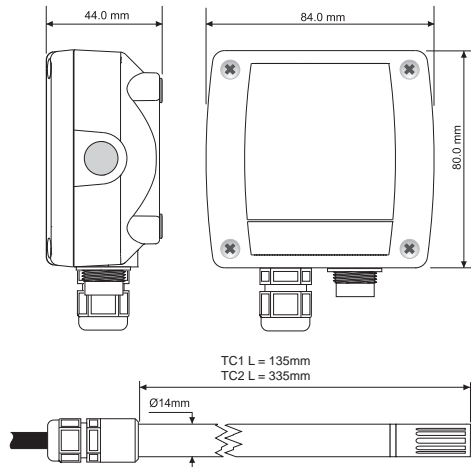


## Probe dimensions

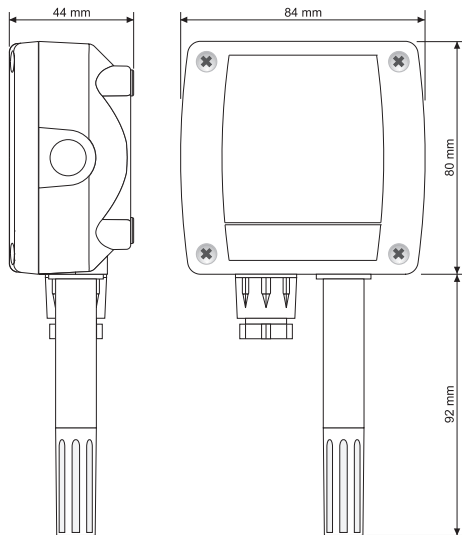
### TO series



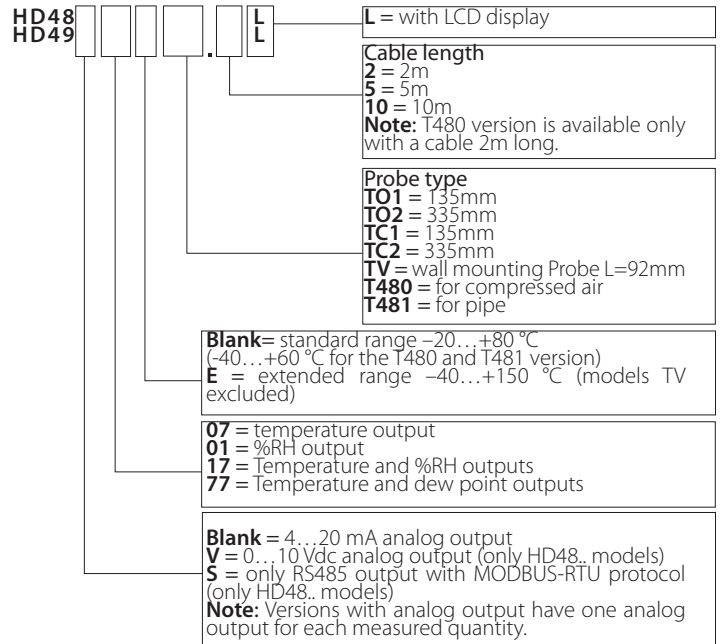
### TC series



### TV series



## ORDERING CODES:



## EXAMPLES OF ORDERING CODES

- HD4801TV:** Wall mounting digital active relative humidity transmitter. Relative humidity range 0...100%RH. Analog output: 4...20 mA (0...100%RH). Probe working range -20...+80 °C. Power supply 18...40 Vdc or 24Vac.
- HD4917TO1:** Digital passive (current loop) temperature and relative humidity transmitter for duct mounting. AISI304 steel probe, diameter 14mm and stem length 135mm, Relative humidity range 0...100%RH, temperature range -20...+80 °C. Analog outputs: 4...20 mA (0...100%RH) for RH and 4...20 mA (-20...+80 °C) for temperature. Probe working range -20...+80 °C. Power supply 12...40 Vdc.
- HD4817TC25L:** Digital active temperature and relative humidity transmitter with LCD display. AISI304 steel probe, diameter 14mm and stem length 335mm, with 5m cable. Relative humidity range 0...100%RH, temperature range -20...+80 °C. Analog outputs: 4...20 mA (0...100%RH) for RH and 4...20 mA (-20...+80 °C) for temperature. Probe working range -20...+80 °C. Power supply 18...40 Vdc or 24Vac.
- HD48V17ETC25:** Digital active temperature and relative humidity transmitter, extended range. AISI304 steel probe, diameter 14mm and stem length 335mm, with 5m cable. Relative humidity range 0...100%RH, temperature range -40...+150 °C. Analog outputs: 0...10V (0...100%RH) for RH and 0...10V (-40...+150 °C) for temperature. Probe working range -40...+150 °C. Power supply 18...40 Vdc or 24Vac.
- HD48S17TC25L:** Digital active temperature and relative humidity transmitter with LCD display. AISI304 steel probe, diameter 14mm and stem length 335mm, with 5m cable. Relative humidity range 0...100%RH, temperature range -20...+80 °C. Only RS485 output with MODBUS-RTU protocol. Probe temperature working range -20...+80 °C. Power supply 18...40 Vdc or 24Vac.

## Accessories

- RS48:** Cable for RS485 serial connection with built-in USB/RS485 converter.
- CP27:** Connection/converter cable from COM AUX serial port to USB.
- HD75:** 75%RH saturated solution for the verification of the relative humidity sensor, complete of screw adaptors for probes with Ø 14mm and Ø 26mm.
- HD33:** 33%RH saturated solution for the verification of the relative humidity sensor, complete of screw adaptors with Ø 14mm and Ø 26mm.
- HD9008.31:** Wall flange with cable gland to fix Ø 14mm probes.

## Protection for humidity probes Ø 14, thread M12x1

- P6:** 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.
- P7:** 20µm PTFE protection. Operating temperature: -40...150 °C.
- P8:** PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.

## HD2717T... SERIES



### HD2717T...SERIES TRANSMITTER, INDICATOR, ON/OFF REGULATOR, TEMPERATURE AND HUMIDITY DATA LOGGER WITH INTERCHANGEABLE PROBE

The instruments of the HD2717T... series are transmitters, indicators, and ON/OFF regulators with data logging functions; they measure temperature and humidity.

The main feature of these instruments is their **interchangeable probe**. The probe can be replaced by the user without process interruption. Thus, the probe can be calibrated or repaired at a later time.

The instrument is available in different versions: with horizontal probe (S.TO), vertical probe (S.TV) or with remote probe (S.TC), having the probe connected to the electronics by means of a cable of various lengths. The S.TO and S.TV probes are made of stainless steel AISI304, the S.TC probes can be of stainless steel AISI304 or Technopolymer PBT (plastic material).

For the measurement of temperature and humidity/dew point in pipes (in particular for compressed air systems) to the HD2717T you can connect the probes S.TC2.480.2 and S.481.2.



Horizontal Probe S.TO2



The probes are factory calibrated and ready to use, they are provided with a SICRAM2 module which stores the calibration data of the probes, allowing their interchangeability.

The instruments measure:

- Temperature in Celsius or Fahrenheit scales
  - Relative humidity
- and calculate:
- Absolute humidity
  - Mixing Ratio
  - Dew point
  - Wet bulb temperature

All models have both current and voltage outputs.

Some models are fitted with two control relays and one alarm relay, configurable by the user.

All models are fitted with a multistandard RS232/RS485 serial port and an auxiliary RS232C standard serial output. The RS485 serial output allows the management of more than one device in a network.

The models HD2717T... can be with or without LCD. The display shows on the first line the relative humidity or a derived parameter and on the second line the temperature in degrees Celsius or Fahrenheit.

The data logger function allows to store the measures with a selectable storage interval.

The instrument setup remains permanently stored, while the real time clock is protected by an apposite Lithium battery against temporary mains voltage interruptions.

The power supply can be chosen, at the time of placing the order, between 24Vac/dc or universal 90...240Vac.

#### Instrument versions and available probes

Display	
HD2717Tx.0x	Absent
HD2717Tx.Dx	Custom LCD

Relay	
HD2717Tx.x0	Absent
HD2717Tx.xR	2 control relays with change-over contact. 1 alarm relay with normally open contact.

Type of probe	
HD2717T.xx	Instrument with vertical probe S.TV or probe with cable S.TC.
HD2717TO.xx	Instrument with horizontal probe S.TO.

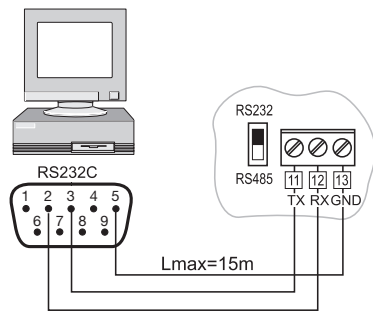
Probes complete with SICRAM2 module for instruments HD2717T.xx	
S.TV	Vertical probe L=130mm. AISI304. The material of the S.TC...probes can be chosen between stainless steel AISI304 or Technopolymer PBT.
S.TC1.2	Probe L=135mm with cable 2m. AISI304.
S.TC1.2P	Probe L=135mm with cable 2m (PBT probe)
S.TC1.5	Probe L=135mm with cable 5m. AISI304.
S.TC1.5P	Probe L=135mm with cable 5m (PBT probe)
S.TC1.10	Probe L=135mm with cable 10m. AISI304.
S.TC1.10P	Probe L=135mm with cable 10m (PBT probe)
S.TC2.2	Probe L=335mm with cable 2m. AISI304.
S.TC2.2P	Probe L=335mm with cable 2m ( PBT probe)
S.TC2.5	Probe L=335mm with cable 5m. AISI304.
S.TC2.5P	Probe L=335mm with cable 5m (PBT probe)
S.TC2.10	Probe L=335mm with cable 10m AISI304.
S.TC2.10P	Probe L=335mm with cable 10m (PBT probe)

#### Probes with cable for the measurement of humidity and dew point in compressed air systems or pipes:

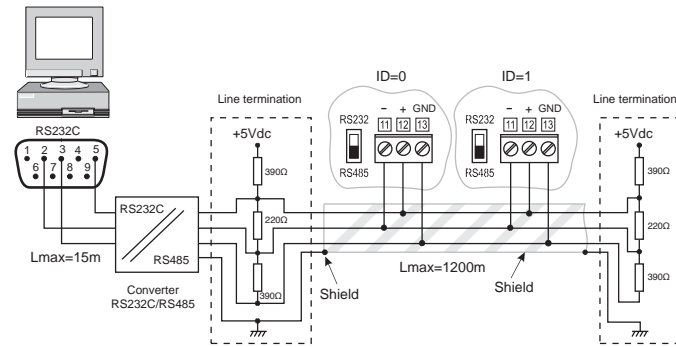
S.TC2.480.2	Length of the cable 2m. Measuring range: -40...+60 °C, -40...+60 °C DP ¼" italian standard quick coupling. Working pressure 0 - 16 bar. Measuring chamber made of AISI304.
S.481.2	Length of the cable 2m Measuring range: -40...+60 °C, -40...+60 °C DP Connection G ½" Working pressure from -1 > 16 bar

Probes complete with SICRAM2 module for instruments HD2717TO.xx. AISI	
S.TO1	horizontal probe L= 135mm
S.TO2	horizontal probe L= 335mm





PC: connection instrument with serial communication protocol RS232C.



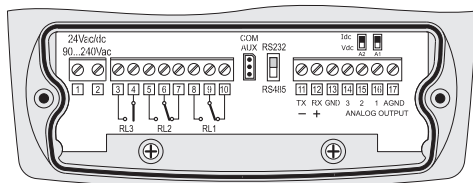
PC connection: instrument with the RS485 communication protocol for distances up to 1200 m using the RS232C/RS485 converter.

On both ends of the network, line termination have to be used. To polarize the line during periods of non transmission, resistors connected between the signal line and power line are used. If you need to connect over 32 instruments, insert a signal repeater between a group and the next one. At the beginning and at the end of each segment you should apply the line terminator. The data line should be kept separate from any power line in order to avoid interferences on the transmitted signal. The cable shield should be connected at both ends of the line. The cable should have the following characteristics:

- Impedance 120 Ohm
- Capacity <50pF/m
- Resistance <100 Ohm/km
- Section > 0.22mm<sup>2</sup>, (AVG24)

The maximum cable length depends on the data transmission velocity and on the characteristics of the cable. Typically, the maximum length is 1200m. The data line should be kept separate from any power line in order to avoid interferences on the transmitted signal.

### Terminal board



Technical specifications (@ 24Vac and 20 °C)		
Inputs		
Temperature	Sensor	Pt100 class 1/3 DIN
	Working range of the sensor	-50 ... +200 °C (-58 ...+392°F)
Humidity	Relative humidity %RH	0 ... 100%RH
	Working range of the sensor in temperature	-50 ... +150 °C (Special configurations up to 180 °C available on request)
	Dew point TD	-50 ... +100 °C
	Absolute humidity	0 ... 600g/m <sup>3</sup>
	Mixing ratio	0 ... 2000g/kg of dry air
Accuracy of the measured physical quantities	Wet bulb temperature	-50 ... +100 °C
	Relative humidity %RH	±0.25°C ±1.5%RH (0...90%RH) ±2.0%RH (elsewhere) for T=15...35°C ±(1.5+1.5% of the measured value)%RH in the remaining temperature range

Accuracy of the calculated physical quantities	See tables in the following chapter	Accuracy of the Dew point @ T = 20 °C ± 2°C DP (-40...-20 °C DP) ± 1,5°C DP (-20...0 °C DP) ± 1°C DP (0...+20 °C DP)
Response time		3min with grid protection (at 20 °C and 0.5m/s)

Same specifications reported above apply for S.TC2.480.2 and S.481.2 probes (for measuring humidity of the air in pipes), with the following exceptions:

S.TC2.480.2 / S.481.2		
Temperature	Measuring range	-40...+60 °C
	Measuring range	-40...+60 °C DP
Dew Point	Accuracy @ T = 20 °C	± 2 °C DP (-40...0 °C DP) ± 1 °C DP (0...+20 °C DP)
	Working Temperature	-40...+80 °C
Environmental Conditions	Working Pressure	0...16 bar (S.TC2.480.2) -1...16 bar (S.481.2)

Outputs		
Communications	Type	RS232C and RS485 Multidrop
	Baud Rate	9600 baud 57600 baud non-permanent
Physical quantities	Measured	Temperature, relative humidity
	Calculated	Dew point, absolute humidity, mixing ratio, wet bulb temperature
Analog outputs	Number	2
	Output types	4...20 mA; 0...20 mA 0...10 Vdc; 2...10 Vdc
	Load resistance	Current output: 500Ω max Voltage output: 100kΩ min
	Resolution	16bit
	Accuracy analog outputs	±0.05% f.s. @20 °C
	In case of measuring error (exceeding of the operating limits, faulty or not connected probe,...)	Idc = 22mA Vdc = 11V
Relay	Working relay	2 x 3A/250Vac Load resistance, 1 change-over contact
	Alarm relay	1 x 3A/250Vac Load resistance, 1 with normally open contact

Instrument		
Power supply	Versions	24Vdc / 24Vac 50...60Hz, ±10%
	Average consumption	90 ... 240Vac, 50...60Hz 3W
Data logger	Storage capacity	9000 samples in max. 256 sessions
	Storage type	Circular memory
	Stored parameters	Temperature, relative humidity, dew point, absolute humidity, mixing ratio, wet bulb temperature, analog outputs 1 and 2, relay status 1, 2, 3.
	Storage interval	1, 2, 5, 10, 20, 60 s 2 and 4 min
Real time clock	Type	Real time with Lithium buffer battery
	Accuracy	±1min/month
Software		DeltaLog12 for Windows operative systems, from Windows* 98
Display	LCD	Custom segment LCD
Ambient working conditions of the electronics	Operating temperature	-20...+60 °C
	Relative humidity	0...90%RH - No condensate
	Static working pressure of the sensors	12 bar max.
Housing	Storage temperature	-30...+80 °C
	Lenght x Width x Height	144x154x61
	Weight	600g
	Material	ABS
Degree of protection		Electronics IP65

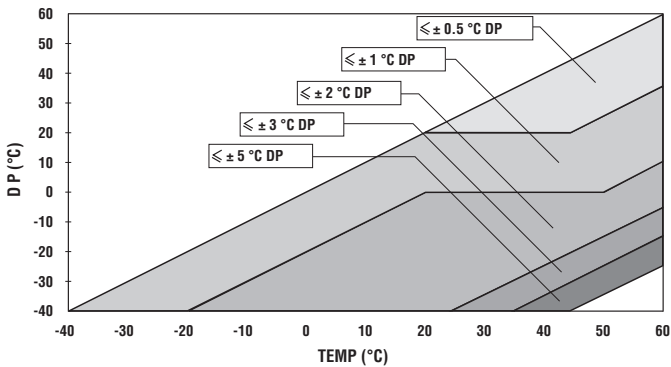
## Accuracy of the calculated physical quantities

The accuracy of the calculated physical quantities depends on the accuracy of the relative humidity and temperature calibration.

## Accuracy of the dew point measurement (DP) as a function of RH

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.92	0.49	0.30	0.22	--	--
	0	1.05	0.56	0.35	0.25	0.20	0.18
	20	1.18	0.75	0.45	0.34	0.27	0.23
	50	1.27	0.88	0.56	0.42	0.33	0.30
	100	1.30	1.17	0.76	0.58	0.47	0.42

## Accuracy of the Dew Point Td (°C) in S.TC2.480.2 and in S.481.2



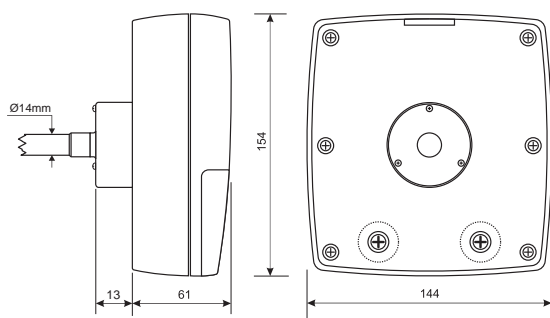
## Accuracy of the absolute humidity (g/m<sup>3</sup>)

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.015	0.020	0.025	0.030	---	---
	0	0.08	0.10	0.11	0.13	0.14	0.15
	20	0.28	0.33	0.40	0.44	0.50	0.55
	50	1.36	1.56	1.74	1.92	2.13	2.19
	100	9.37	10.2	11.3	12.3	13.2	13.5

## Accuracy of the mixing ratio (g/kg)

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.014	0.017	0.020	0.024	---	---
	0	0.06	0.08	0.09	0.10	0.12	0.13
	20	0.24	0.29	0.34	0.39	0.44	0.45
	50	1.28	1.54	1.85	2.20	2.53	2.66
	100	12.5	23.2	46.2	136.0	---	---

## Dimensions

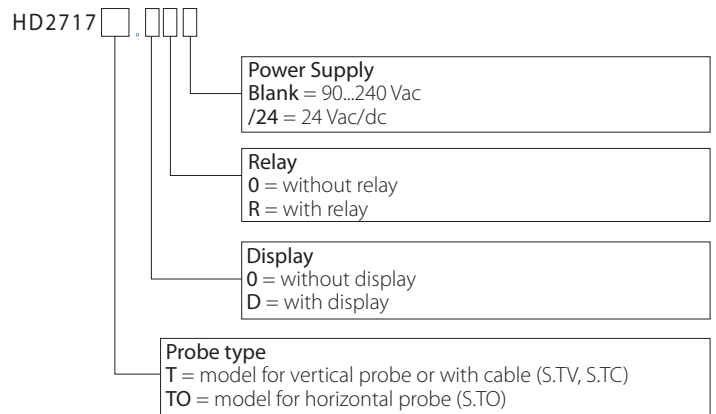


## Version HD2717TO... for horizontal probes

## ORDERING CODES

HD2717T...: Transmitter, indicator and ON/OFF regulator for temperature and humidity, with data logging functions. Fitted with 2 analogue current outputs (0÷20 mA and 4÷20 mA) or voltage outputs (0÷10 Vdc and 2÷10 Vdc). RS232/RS485 serial outputs for PC connection. It uses interchangeable SICRAM2 probes with microprocessor for the storage of the probe's calibration data. 24Vac/dc or universal 90...240Vac power supply. It includes DeltaLog12 software downloadable from Delta OHM website and instruction manual. RS27 cable is included only for transmitters without display.

Power supply, type of probe and accessories have to be specified when placing the order.



## Interchangeable temperature and humidity probes with SICRAM 2 module, vertical version S.TV or with cable S.TC

S.TV: Vertical probe. Length of stem 130mm. Aisi 304.

## Probes with cable:

- S.TC1.2: Stem length 135 mm, cable length 2 m. AISI 304
- S.TC1.2P: Stem length 135 mm, cable length 2 m. PBT technopolymer
- S.TC1.5: Stem length 135 mm, cable length 5 m. AISI 304
- S.TC1.5P: Stem length 135 mm, cable length 5 m. PBT technopolymer
- S.TC1.10: Stem length 135 mm, cable length 10 m. AISI 304
- S.TC1.10P: Stem length 135 mm, cable length 10 m. PBT technopolymer
- S.TC2.2: Stem length 335 mm, cable length 2 m. AISI 304
- S.TC2.2P: Stem length 335 mm, cable length 2 m. PBT technopolymer
- S.TC2.5: Stem length 335 mm, cable length 5 m. AISI 304
- S.TC2.5P: Stem length 335 mm, cable length 5 m. PBT technopolymer
- S.TC2.10: Stem length 335 mm, cable length 10 m. AISI 304
- S.TC2.10P: Stem length 335 mm, cable length 10 m. PBT technopolymer.
- S.TC2.480.2: Probe for pipes. Cable length 2m. ¼" quick coupling Italian standard. AISI 304 measuring chamber.
- S.481.2: Probe for pipes. G ½" threading. Cable 2 m. 15µ sintered AISI 316 stainless steel filter.

## S.TO horizontal interchangeable temperature and humidity probes with SICRAM 2 module

- S.TO1: Horizontal probe for instrument HD2717TO.xx. Stem length 135 mm
- S.TO2: Horizontal probe for instrument HD2717TO.00. Stem length 335 mm

## Accessories:

- CP27: USB to COM AUX serial converter.
- HD75: 75%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm
- HD33: 33%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm.
- HD11: 11%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm.
- HD9008.21.1: Flange with support, hole Ø 26mm for installation of S.TC probes in vertical position, distance from the wall 250mm. The adapter HD9008.26/14 from Ø 26mm to Ø 14mm is requested for S.TC series probes.
- HD9008.21.2: Flange with support, hole Ø 26mm for installation of S.TC probes in vertical position, distance from the wall 125mm. The adapter HD9008.26/14 from Ø 26mm to Ø 14mm is requested for S.TC series probes.
- HD9008.26/14: Adapter from Ø 26mm to Ø 14mm for supports HD9008.21.1 and HD9008.21.2 for S.TC series probes.
- HD9008.31: Wall flange with cable gland to fix the probes Ø 14mm.
- PG16: Cable gland made of AISI 304 PG16 for probes Ø 14mm.

## Protection for humidity probes Ø 14, thread M12x1

- P6: 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.
- P7: 20µm PTFE protection. Operating temperature: -40...150 °C.
- P8: PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.

## HD2817T...SERIES



### HD2817T...SERIES TRANSMITTER, INDICATOR, ON/OFF REGULATOR, TEMPERATURE AND HUMIDITY DATA LOGGER WITH INTERCHANGEABLE PROBE

The instruments of the HD2817T... series are transmitters, indicators, and ON/OFF regulators with data logging functions; they measure temperature and humidity. They are fitted with a graphic 128x64 backlit display.

The main feature of these instruments is their **interchangeable probe**. The probe can be replaced by the user without process interruption. Thus, the probe can be calibrated or repaired at a later time.

The instrument is available in different versions: with horizontal probe (S.TO), vertical probe (S.TV) or with remote probe (S.TC), having the probe connected to the electronics by means of a cable of various lengths. The S.TO and S.TV probes are made of stainless steel AISI304, the S.TC probes can be of stainless steel AISI304 or Technopolymer PBT.

For the measurement of temperature and humidity/dew point in pipes (in particular for compressed air systems) to the HD2817T you can connect the probes S.TC2.480.2 and S.481.2.

Wall flange with  
grommet for probe  
Ø 14 mm



HD2817TO.Dx



Horizontal probe S.TO2

The probes are factory calibrated and ready to use, they are provided with a **SICRAM2 module** which stores the calibration data of the probes, allowing their interchangeability.

The instruments measure:

- Temperature in Celsius or Fahrenheit scales
  - Relative humidity
- and calculate:
- Dew point
  - Absolute humidity
  - Mixing Ratio
  - Wet bulb temperature

All models have both current and voltage outputs.

Some models are fitted with two control relays and one alarm relay, configurable by the user.

All models are fitted with a multistandard RS232/RS485 serial port and an auxiliary RS232C standard serial output. The RS485 serial output allows the management of more than one device in a network.

The models HD2817T... are fitted with a graphic backlit LCD. The display shows contemporaneously three measured physical quantities (or the real time graphic) of one of the measured quantities.

The data logger function allows to store the measures with a selectable storage interval.

The instrument setup remains permanently stored, while the real time clock is protected by an apposite Lithium battery against temporary mains voltage interruptions.

The power supply can be chosen, at the time of placing the order, between 24Vac/dc or universal 90...240Vac.

#### Instrument versions and available probes

Relay	
HD2817Tx.D0	Absent
HD2817Tx.DR	2 control relays with change-over contact, 1 alarm relay with normally open contact.

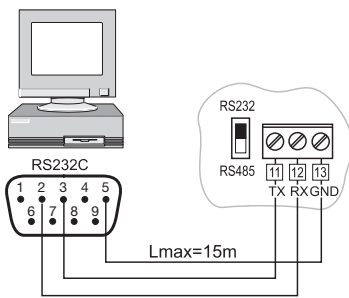
Type of probe	
HD2817Tx.Dx	Instrument with vertical probe S.TV or probe with cable S.TC.
HD2817TO.Dx	Instrument with horizontal probe S.TO.

Probes complete with SICRAM2 module for instruments HD2817Tx.Dx	
S.TV	Vertical probe L= 130mm AISI 304.
The material of the S.TC...probes can be chosen between stainless steel AISI 304 or Technopolymer PBT.	
S.TC1.2	Probe L=135mm with cable 2m. AISI304.
S.TC1.2P	Probe L=135mm with cable 2m (PBT probe)
S.TC1.5	Probe L=135mm with cable 5m. AISI304.
S.TC1.5P	Probe L=135mm with cable 5m (PBT probe)
S.TC1.10	Probe L=135mm with cable 10m. AISI304.
S.TC1.10P	Probe L=135mm with cable 10m (PBT probe)
S.TC2.2	Probe L=335mm with cable 2m. AISI304.
S.TC2.2P	Probe L=335mm with cable 2m (PBT probe)
S.TC2.5	Probe L=335mm with cable 5m. AISI304.
S.TC2.5P	Probe L=335mm with cable 5m (PBT probe)
S.TC2.10	Probe L=335mm with cable 10m. AISI304.
S.TC2.10P	Probe L=335mm with cable 10m (PBT probe)

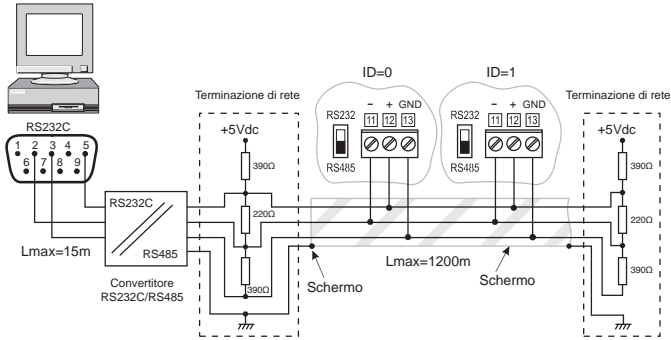
#### Probes with cable for the measurement of humidity and dew point in compressed air systems or pipes:

S.TC2.480.2	Length of the cable 2m Measuring range: -40...+60 °C, -40...+60 °C DP ¼" italian standard quick coupling. Working pressure 0 - 16 bar. Measuring chamber made of AISI304.
S.481.2	Length of the cable 2m Measuring range: -40...+60 °C, -40...+60 °C DP. Connection G ½" Working pressure from -1 > 16bar

Probes complete with SICRAM2 module for instruments HD2817TO.xx AISI 304	
S.TO1	horizontal probe L= 135mm
S.TO2	horizontal probe L= 335mm



PC connection: instrument with serial communication protocol RS232C.

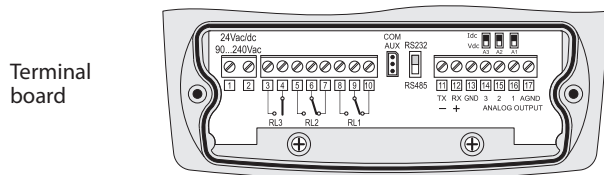


PC connection: instrument with the RS485 communication protocol for distances up to 1200 m using the RS232C/RS485 converter.

On both ends of the network, line termination have to be used. To polarize the line during periods of non transmission, resistors connected between the signal line and power line are used. If you need to connect over 32 instruments, insert a signal repeater between a group and the next one. At the beginning and at the end of each segment you should apply the line terminator. The data line should be kept separate from any power line in order to avoid interferences on the transmitted signal. The cable shield should be connected at both ends of the line. The cable should have the following characteristics:

- Impedance 120 Ohm
- Capacity <50pF/m
- Resistance <100 Ohm/km
- Section > 0.22mm<sup>2</sup>, (AVG24)

The maximum cable length depends on the data transmission velocity and on the characteristics of the cable. Typically, the maximum length is 1200m. The data line should be kept separate from any power line in order to avoid interferences on the transmitted signal.



Terminal board

Technical specifications (@ 24Vac and 20 °C)		
Inputs		
Temperature	Sensor	Pt100 class 1/3 DIN
	Working range of the sensor	-50 ... +200 °C (-58 ... +392°F)
Humidity	Relative humidity %RH	0 ... 100%RH
	Working range of the sensor in temperature	-50 ... +150 °C (Special configurations up to 180 °C available on request)
	Dew point TD	-50 ... +100 °C
	Absolute humidity	0 ... 600g/m <sup>3</sup>
	Mixing ratio	0 ... 2000g/kg of dry air
Accuracy of the measured physical quantity	Wet bulb temperature	-50...+100 °C
	Temperature Pt100	±0.25°C
	Relative humidity %RH	±1.5%RH (0...90%RH) ±2.0%RH (elsewhere) for T=15...35°C ±(1.5+1.5% of the measured value)%RH in the remaining temperature range

Accuracy of the calculated physical quantity	See table in the following chapter	Accuracy of the Dew point @ T = 20 °C ± 2°C DP (-40...-20 °C DP) ± 1,5°C DP (-20...0 °C DP) ± 1°C DP (0...+20 °C DP)
Response time		3min with grid protection (at 20 °C and 0.5m/s)

Same specifications reported above apply for S.TC2.480.2 and S.481.2 probes (for measuring humidity of the air in pipes), with the following exceptions:

S.TC2.480.2 / S.481.2		
Temperature	Measuring range	-40...+60 °C
Dew Point	Measuring range	-40...+60 °C DP
	Accuracy @ T = 20 °C	± 2 °C DP (-40...0 °C DP) ± 1 °C DP (0...+20 °C DP)

Outputs		
Communications	Type	RS232C and RS485 Multidrop
	Baud Rate	9600 baud 57600 baud non-permanent
Physical quantities	Measured	Temperature, relative humidity
	Calculated	Dew point, absolute humidity, mixing ratio, wet bulb temperature
Analog outputs	Number	3
	Output types	4...20 mA; 0...20 mA 0...10 Vdc; 2...10 Vdc
	Load resistance	Current output: 500Ω max Voltage output: 100kΩ min
	Resolution	16bit
	Accuracy analog outputs	±0.05% f.s. @20 °C
Relay	In case of measuring error (exceeding of the operating limits, faulty or not connected probe,...)	Idc = 22mA Vdc = 11V
	Control relay	2 x 3A/250Vac Load resistance, 1 change-over contact
	Alarm relay	1 x 3A/250Vac Load resistance, 1 with normally-open contact

Instrument		
Power supply	Versions	24Vdc / 24Vac 50...60Hz, ±10% 90 ... 240Vac 50...60Hz
	Average consumption	3W
Data logger	Storage capacity	9000 samples in max. 256 sessions
	Storage type	Circular memory
	Stored parameters	Dew point, temperature, relative humidity, absolute humidity, mixing ratio, wet bulb temperature, analog outputs 1, 2 and 3, relay status 1, 2, 3.
	Storage interval	1, 2, 5, 10, 20, 60 seconds, 2 and 4 minutes
Real time clock	Type	Real time with Lithium buffer battery
	Accuracy	±1min/month
Software		DeltaLog12 for Windows® operating systems
Display	Graphic backlit LCD	128x64 pixel
Ambient working conditions of the electronics	Operating temperature	-20...+60 °C
	Relative humidity	0...90%RH - No condensate
	Static working pressure of the sensors	12 bar max.
Housing	Storage temperature	-30...+80 °C
	Lenght x Width x Height	144x154x61
	Weight	600g
	Material	ABS
	Degree of protection	Electronics IP65

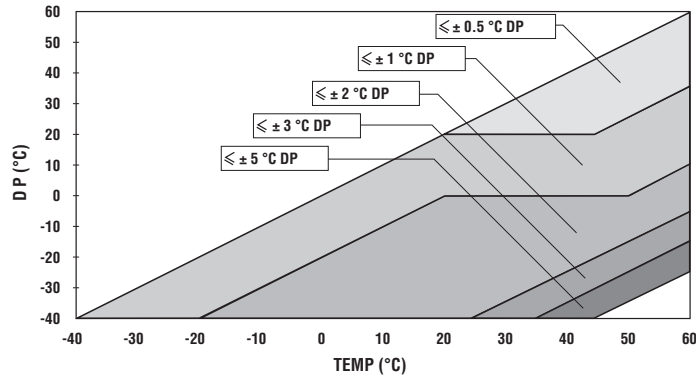
## Accuracy of the calculated physical quantities

The accuracy of the calculated physical quantities depends on the accuracy of the relative humidity and temperature calibration.

### Accuracy of the dew point measurement (DP) as a function of %RH

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.92	0.49	0.30	0.22	--	--
	0	1.05	0.56	0.35	0.25	0.20	0.18
	20	1.18	0.75	0.45	0.34	0.27	0.23
	50	1.27	0.88	0.56	0.42	0.33	0.30
	100	1.30	1.17	0.76	0.58	0.47	0.42

### Accuracy of the Dew Point Td (°C) in S.TC2.480.2 and S.481.2



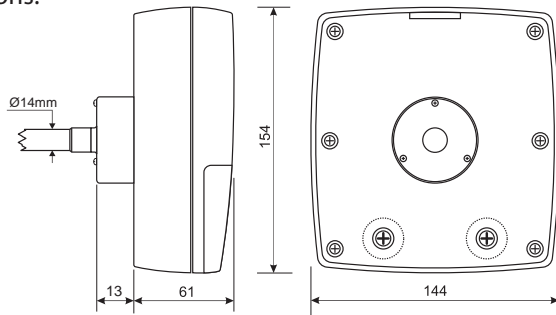
### Accuracy of the absolute humidity (g/m³)

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.015	0.020	0.025	0.030	---	---
	0	0.08	0.10	0.11	0.13	0.14	0.15
	20	0.28	0.33	0.40	0.44	0.50	0.55
	50	1.36	1.56	1.74	1.92	2.13	2.19
	100	9.37	10.2	11.3	12.3	13.2	13.5

### Accuracy of the mixing ratio (g/kg)

		Relative Humidity (%)					
		10	30	50	70	90	100
Temperature (°C)	-20	0.014	0.017	0.020	0.024	---	---
	0	0.06	0.08	0.09	0.10	0.12	0.13
	20	0.24	0.29	0.34	0.39	0.44	0.45
	50	1.28	1.54	1.85	2.20	2.53	2.66
	100	12.5	23.2	46.2	136.0	---	---

### Dimensions:

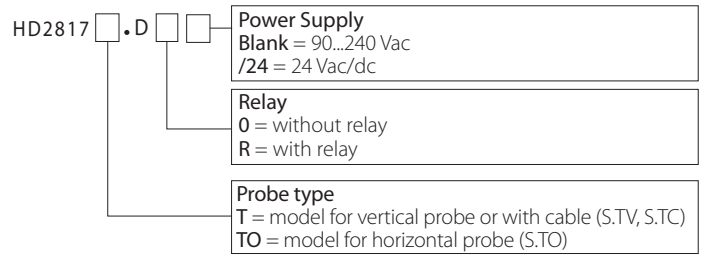


Version HD2817TO.Dx for horizontal probes

### ORDERING CODES

**HD2717T...**: Transmitter, indicator, and ON/OFF regulator for temperature and humidity, with data logging functions. Fitted with 3 analogue current outputs (0...20 mA and 4...20 mA) or voltage outputs (0...10 Vdc and 2...10 Vdc). RS232/RS485 serial ports for connection to PC. Uses interchangeable SICRAM2 probes with microprocessor for the storage of the probe's calibration data. Visualizes the data on a large graphic backlit LCD. Power supply 24Vac/dc or universal 90...240Vac. Includes DeltaLog12 software downloadable from Delta OHM website, instructions manual.

Power supply, type of probe and accessories have to be specified when placing the order.



### Interchangeable temperature and humidity probes with SICRAM 2 module, vertical version S.TV or with cable S.TC

S.TV: Vertical probe. Length of stem 130mm. Aisi 304.

### Probes with cable:

- S.TC1.2: Stem length 135 mm, cable length 2 m. AISI 304
- S.TC1.2P: Stem length 135 mm, cable length 2 m. PBT technopolymer
- S.TC1.5: Stem length 135 mm, cable length 5 m. AISI 304
- S.TC1.5P: Stem length 135 mm, cable length 5 m. PBT technopolymer
- S.TC1.10: Stem length 135 mm, cable length 10 m. AISI 304
- S.TC1.10P: Stem length 135 mm, cable length 10 m. PBT technopolymer
- S.TC2.2: Stem length 335 mm, cable length 2 m. AISI 304
- S.TC2.2P: Stem length 335 mm, cable length 2 m. PBT technopolymer
- S.TC2.5: Stem length 335 mm, cable length 5 m. AISI 304
- S.TC2.5P: Stem length 335 mm, cable length 5 m. PBT technopolymer
- S.TC2.10: Stem length 335 mm, cable length 10 m. AISI 304
- S.TC2.10P: Stem length 335 mm, cable length 10 m. PBT technopolymer.
- S.TC2.480.2: Probe for pipes. Cable length 2m. ¼" quick coupling Italian standard. AISI 304 measuring chamber.
- S.481.2: Probe for pipes. G ½" threading. Cable 2 m. 15µ sintered AISI 316 stainless steel filter.

### S.TO horizontal interchangeable temperature and humidity probes with SICRAM 2 module

- S.TO1: Horizontal probe for instrument HD2817TO.xx. Stem length 135 mm
- S.TO2: Horizontal probe for instrument HD2817TO.00. Stem length 335 mm

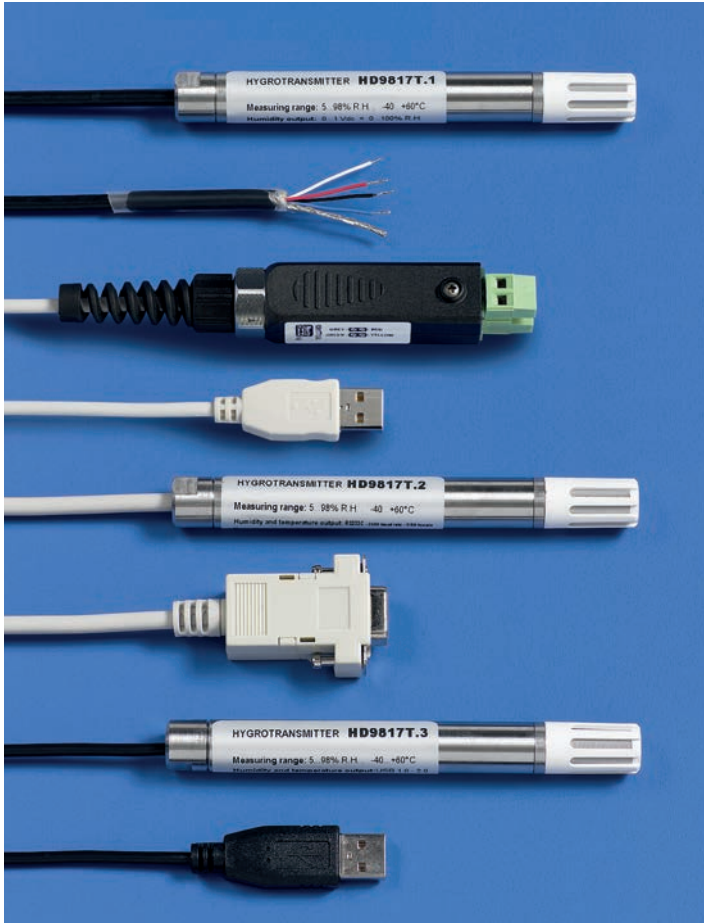
### Accessories:

- CP27: USB to COM AUX serial converter.
- HD75: 75%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm
- HD33: 33%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm.
- HD11: 11%RH saturated solution for checking the relative humidity sensor, complete with screw adaptor for probes Ø 14mm and Ø 26mm.
- HD9008.21.1: Flange with support, hole Ø 26mm for installation of S.TC probes in vertical position, distance from the wall 250mm. The adapter HD9008.26/14 from Ø 26mm to Ø 14mm is requested for S.TC series probes.
- HD9008.21.2: Flange with support, hole Ø 26mm for installation of S.TC probes in vertical position, distance from the wall 125mm. The adapter HD9008.26/14 from Ø 26mm to Ø 14mm is requested for S.TC series probes.
- HD9008.26/14: Adapter from Ø 26mm to Ø 14mm for supports HD9008.21.1 and HD9008.21.2 for S.TC series probes.
- HD9008.31: Wall flange with cable gland to fix the probes Ø 14mm.
- PG16: Cable gland made of AISI 304 PG16 for probes Ø 14mm.

### Protection for humidity probes Ø 14, thread M12x1

- P6: 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.
- P7: 20µm PTFE protection. Operating temperature: -40...150 °C.
- P8: PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.

## HD9817T1R, HD9817T2R, HD9817T3R, HD9817TVS



### HD9817T1R, HD9817T2R, HD9817T3R, HD9817TVS TEMPERATURE AND HUMIDITY TRANSMITTERS WITH ANALOG OR DIGITAL OUTPUT RS232, USB OR RS485 MODBUS-RTU

Dual relative humidity and temperature transmitter for HVAC applications, environmental monitoring, pharmaceutical storage, food transport, greenhouse automation, etc. Equipped with an IP65 stainless steel AISI 304 housing, it is suitable even for severe environments; besides, its ultra-compact dimensions (Ø14x130 mm or Ø14x155 mm depending on the models) and wide range of outputs (analogue 0...1V, digital RS232C or RS485-MODBUS RTU, USB 1.1-2.0) make it ideal for integrating into a variety of OEM applications. It is supplied with the HD9817TC software for reading measurements and calibrating the relative humidity sensor.

#### VERSIONS, OUTPUTS AND CONNECTIONS

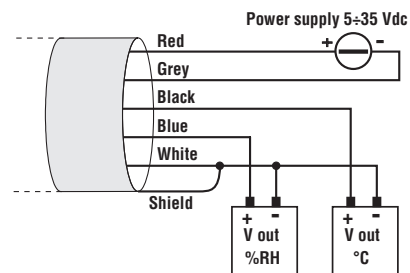
	HD9817T1R	HD9817T2R
Output	0...1V = 0...100%RH 0...1V = -40...+60 °C	RS232C non insulated, 2400 baud rate
Temperature sensor	Pt100	Pt100
Load resistance	$R_L > 10k\Omega$	
Cable Connection	L=1.5m (7 wires + shield)	L= 2m DB9 female connector

	HD9817T3R	HD9817TVS
Output	USB 1.1-2.0 non insulated	0...1V = 0...100%RH or 0...1V = -40...+60 °C DP 0.1V = -40...+60 °C RS485 Modbus RTU non insulated
Temperature sensor	Pt100	Pt100
Load resistance		$R_L > 10k\Omega$
Cable Connection	L= 2m USB connector type A	M12 8-pole connector. Provided with cable CP9817.3, L=3m

Technical specifications		
HD9817T1R - HD9817T2R - HD9817T3R - HD9817TVS		
Relative humidity	Sensor	Capacitive
	Sensor protection	P8, stainless steel grid and PTFE, 10µ
	Measuring range	0..100%RH
	Sensor working range	-40...+80 °C
	Accuracy @ 20 °C	±1.5% (0...90%RH), ±2,0% in the remaining range
	Temperature dependence	2% on the whole temperature range
	Hysteresis and repeatability	0.4%RH
	Long term stability	1%/year
Temperature	Sensor type	Pt100 1/3 DIN
	Measuring range	-40...+60 °C
	Accuracy	±0.2°C ±0.15% of the measured value
General	Long term stability	0.2°C/year
	Power voltage	5...35Vdc
	Consumption	Typically 2mA
	Max. operating temperature	-40...+80 °C (for short periods)
Housing	Operating humidity	0...100%RH
	Dimensions	Ø14x130 mm Ø14x155 mm for HD9817TVS
	Degree of protection	IP65

#### Connections

HD9817T1 models with 0...1Vdc analogue output.



The instrument is equipped with a 7 wire + shield cable.

The Yellow and Green wires are used during calibration only for PC connection through the HD9817T1CAL interface module (see the paragraph about the RH sensor calibration).

Power is supplied to the Red (+) and Grey (-) wires.

The output signal voltage is taken from:

- Black (+) and White (-) wires for temperature,
- Blue (+) and White (-) wires for relative humidity.

The shield must be connected to the White wire.

#### HD9817T2R model with RS232C output and HD9817T3R model with USB output.

The HD9817T2R cable ends in a RS232C 9-pole subD female connector, while the HD9817T3R cable ends in a USB type A connector.

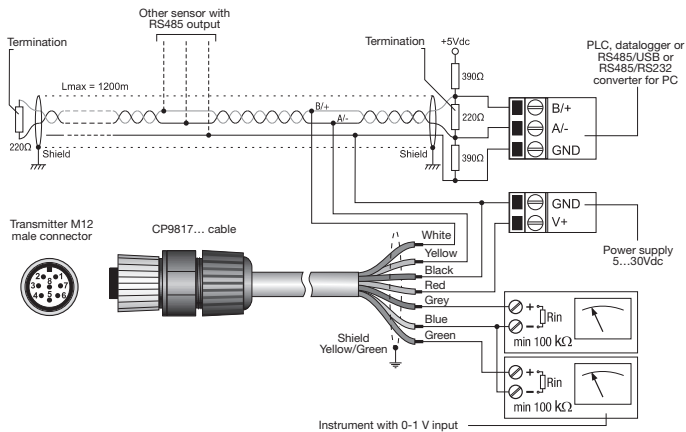
The following set of commands is available for both instruments.

Command	Response	Description
G0	HD9817T_Pt100_RH_RS232	Model
G3	Firm.Ver.=01-00	Firmware version
HAnn.n	&	75% calibration point where nn.n stands for the actual humidity value
HBnn.n	&	33% calibration point where nn.n stands for the actual humidity value
S0	0072.7   063.9	It sends the current measurement (tttt.t   hhh.h) t = temperature h = RH
U0	&	International System of units
U1	&	Imperial units

#### Note for HD9817T3R model with USB output

this model requires that you install USB drivers first in order to ensure a correct PC connection: **don't connect the instrument to your PC before installing the drivers.**

Wiring diagram of the 0...1Vdc analog outputs and of the RS485 digital output.



#### Setting parameters for RS485 communication

Before connecting the transmitter to the RS485 network you must assign an address and set the communication parameters if different those preset at the factory.

The setting of the parameters is made by connecting the transmitter to the PC by using the cable CP24 (optional) with integrated RS485/USB converter or the cable CP9817.3 supplied with the instrument and a generic RS485/USB or RS485/RS232 converter.

#### RELATIVE HUMIDITY CALIBRATION

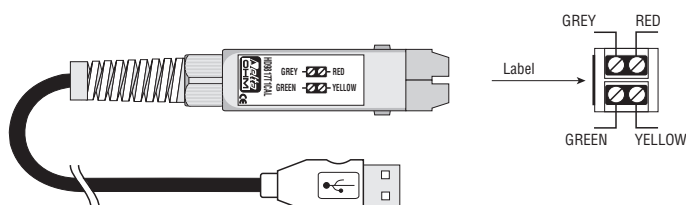
The instruments are supplied factory calibrated and ready to use.

If necessary, the user can calibrate Relative Humidity. Before performing the calibration, please note that to connect HD9817T1R models to your PC, you have to use the HD9817T1CAL interface module: **the module is equipped with a USB type A connector for your PC USB port connection as well as a 4-pole terminal board to connect the transmitter. Before connecting the module to your PC, you need to install the USB drivers: don't connect the module to your PC before installing the drivers.**

For further details, please follow the guide you can find when you download the software. Please connect the **Red** (power supply positive), **Grey** (power supply negative), **Yellow** (Tx) and **Green** (Rx) wires as shown in the figure below.

The terminal board is seen from above: in order to direct the clamps correctly, make sure that the label on the side of the module is placed as shown in the figure below.

The terminal board is seen from above: in order to direct the clamps correctly, make sure that the label on the side of the module is placed as shown in the figure below.

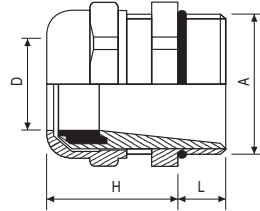


#### INSTALLATION NOTES

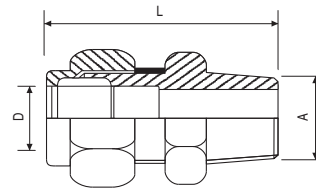
To fix the probe in a ventilation duct, pipe ,etc. you can use, for example, the HD9008.31.12 flange, a PG16 metal cable gland (Ø10...14mm) or a 3/8" universal biconical connection.



HD9008.31 Flange



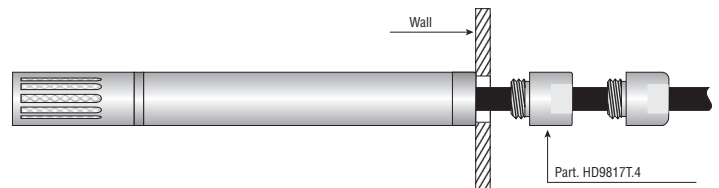
**PG16.12 Metal cable gland**  
D = 10...14mm  
L = 6.5mm  
H = 23mm  
A = PG16



**Universal biconical connector**  
L = 35mm  
D = 14mm  
A = 3/8"

For wall-mounted installation, the HD9008.21.1 (distance from wall 250mm) and HD9008.21.2 (distance from wall 125mm) supports are available. Both require the HD9008.26/14 adapter.

For direct wall mounting on a metal support, the HD9817T.4 part is available as shown in the figure below (for HD9817T1 versions only).



The wall can be 2mm thick at most while the hole in the wall can be 10.5mm.

#### Electrical connection

HD9817T1R models

#### Power supply

The power supply voltage must be as per the electrical specifications (5...35Vdc) between the wires:

**Red** = (+) power supply positive

**Grey** = (-) power supply negative.

#### Analogue output

The voltage output signals are taken from the following wires:

**Blue** = (+) %RH output positive

**Black** = (+) Temperature output positive

**White** = (-) ground. Common reference between %RH and Temperature outputs.

**Shield** = the braid is connected to the common ground (White wire).

#### HD9817T2R and HD9817T3R models

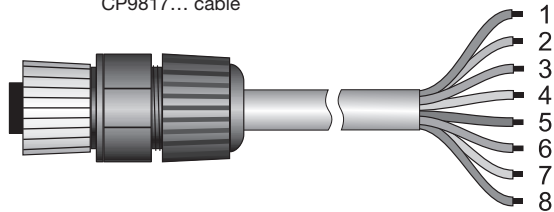
These models are powered directly from your PC port and no external power supply is required.

## Models HD9817TVS with analog outputs 0...1Vdc and RS485 MODBUS-RTU output.

They are supplied with the cable CP9817.3 equipped with the M12 connector on the one side for the connection to the instrument and loose wires on the other side.

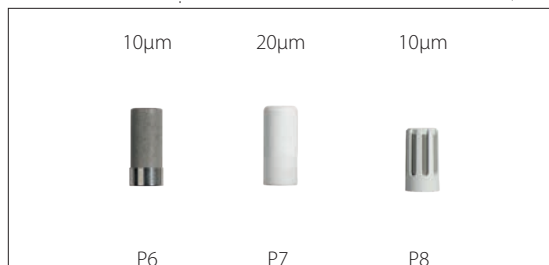
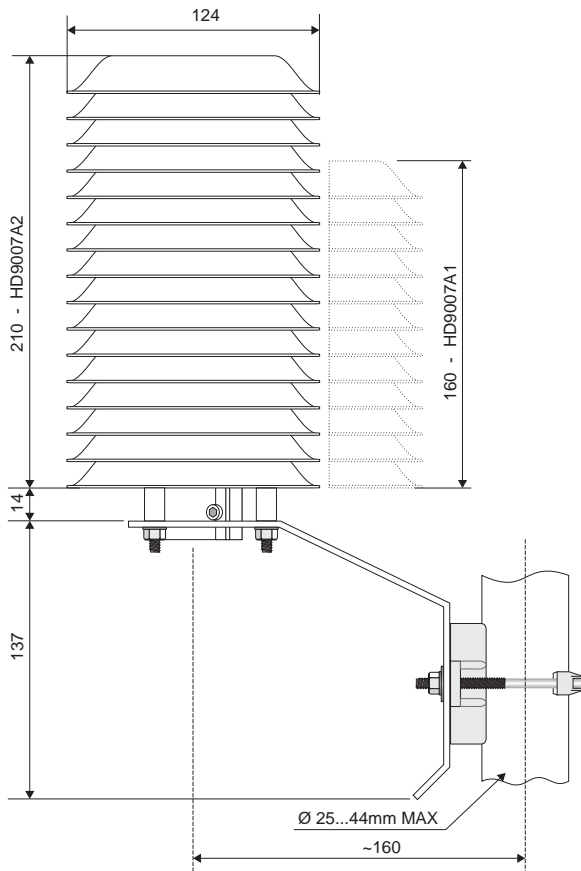
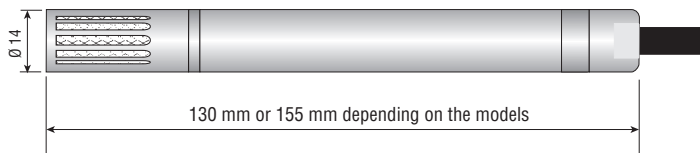
transmitter M12 male connector

CP9817... cable



Connector	Function	Color
1	Power supply negative	Black
2	Power supply positive	Red
3	Not connected	
4	RS485 A/-	Yellow
5	RS485 B/+	White
6	Analog output negative	Blue
7	Temperature analog output positive	Grey
8	Humidity analog output positive	Green
	Cable shield	Yellow/Green

## HD9817T... DIMENSIONS



## ORDERING CODES

**HD9817T1R:** Dual relative humidity and temperature transmitter, Pt100 sensor. 0...1Vdc analogue outputs. Temperature measuring range -40...+60 °C (-20...+80 °C on request). Power supply 5...35Vdc. AISI 304 housing. Probe protection class IP65. Dimensions Ø14x130mm. Output with cable L=1,5m (7 wires + shield). Max. working temperature -40°...+80 °C. Supplied with HD9817TC software downloadable from Delta OHM website.

**HD9817T2R:** Dual relative humidity and temperature transmitter, Pt100 sensor. RS232C digital output. Temperature measuring range -40...+60 °C (-20...+80 °C on request). Powered directly from your PC RS232C port. AISI 304 housing. Probe protection class IP65. Dimensions Ø14x130mm. Output with cable L=2m with DB9 female connector. Max. working temperature -40°...+80 °C. Supplied with HD9817TC software downloadable from Delta OHM website.

**HD9817T3R:** Dual relative humidity and temperature transmitter, Pt100 sensor. USB1.1-2.0 digital output. Temperature measuring range -40...+60 °C (-20...+80 °C on request). Powered directly from your PC USB port. AISI 304 housing. Probe protection class IP65. Dimensions Ø14x130mm. Output with cable L=2m with USB type A connector. Max. working temperature -40°...+80 °C. Supplied with HD9817TC software downloadable from Delta OHM website.

**HD9817TVS:** Dual relative humidity and temperature transmitter, Pt100 sensor. 0...1Vdc analogue and RS485 MODBUS-RTU output. Temperature measuring range -40...+60 °C. Power supply 5...35Vdc. AISI 304 housing. Probe protection class IP65. Dimensions Ø14x155mm. Output with cable M12 8-pole connector. Supplied with CP9817.3 cable, length 3m.

## Accessories

**CP24:** PC connecting cable for the MODBUS parameters configuration. With built-in RS485/USB converter. 8-pole M12 connector on instrument side and A-type USB connector on PC side.

**CP9817.3:** Spare cable for HD9817TVS transmitter, with 8-pole M12 female connector on one side, open wires on the other side. Length 3 m.

**HD9817T.4:** Wall-mounting adapter. Only for HD9817T1R and on request.

**HD9817T1CAL:** USB interface module for connecting HD9817T1R transmitters to your PC USB port as well as calibrating or checking the humidity sensor. USB connector type A, cable L=1.5m. Connection through 4-pole terminal board.

**HD75:** saturated salt solution 75% R.H. thread M 12x1.

**HD33:** saturated salt solution 33% R.H. thread M 12x1.

**HD9008.21.1:** holder for vertical sensor, wall distance 250mm, hole Ø 26. HD9008.26.14 adapter is required.

**HD9008.21.2:** holder for vertical sensor, wall distance 125mm, hole Ø 26. HD9008.26.14 adapter is required.

**HD9008.26/14:** holders for Ø 26 and Ø 14mm holes, for HD9008.21.1 and HD9008.21.2

**HD9008.31:** flange with sensor block Ø 14mm for duct sensors TC and TO series.

**HD9007A-1:** 12 ring protection from solar radiations for Ø 26mm probes. Complete with mounting brackets. For the transmitters HD9817T the HD9007T26.2 adapter can be provided.

**HD9007A-2:** 16 ring protection from solar radiations for Ø 26mm probes. Complete with mounting brackets. For the transmitters HD9817T the HD9007T26.2 adapter can be provided.

**HD9007T26.2:** fitting for Ø 14mm transmitters (HD9817T...) for the protections from solar radiations HD9007 A-1 and HD9007 A-2.

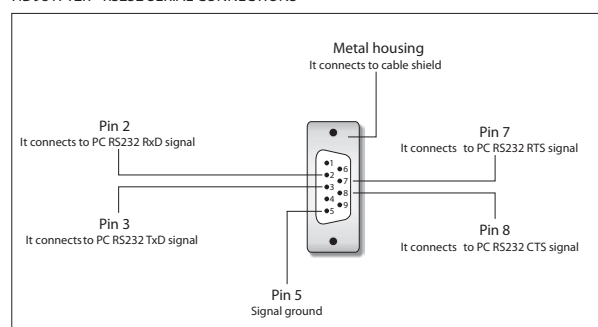
## Protection for humidity probes Ø 14, thread M12x1

**P6:** 10µm sintered stainless steel protection. Operating temperature: -40...180 °C.

**P7:** 20µm PTFE protection. Operating temperature: -40...150 °C.

**P8:** PBT and 10µm stainless steel grid protection. Operating temperature: -40...120 °C.

## HD9817T2R - RS232 SERIAL CONNECTIONS





**HD3817T... HD38V17T...**



Technical specifications		
Absolute Humidity	Type of sensor	Heat conductivity with double combined NTC.
	Sensor protection	20µm sintered bronze filter
	Measurement range	0...130 g/m <sup>3</sup> (0...100% RH @60 °C and 1013hPa) (*)
	Sensor working range	0 ... +200 °C
	Accuracy	±3g/m <sup>3</sup> at 35 g/m <sup>3</sup> and 40 °C
	Startup stabilization time	120 seconds
	Response time	60 seconds with standard filter for a 63% variation of the final value
Temperature	Repeatability	±5%
	Sensors type	4 wire Pt100
	Measurement range	0 ... +200 °C
	Accuracy	1/3 DIN
Analog outputs (according to the models)	4...20 mA (HD3817T...)	R <sub>L</sub> < 500Ω
	0...10 Vdc (HD38V17T...)	R <sub>L</sub> > 10kΩ
General Characteristics	Power supply voltage	24Vac ±10% 50...60Hz On request, 115Vac or 230Vac ±10% 50...60Hz
	Consumption	4VA typical
	Temperature / Electronic Working Humidity	-10 °C ... +70 °C / 5...90% RH without condensation
	Case size	120x80x55 mm
	Protection Degree	IP66 probe excluded
	Case material	Polycarbonate
	Probe material	Stainless steel AISI304

(\*)Note: The 0...130g/m<sup>3</sup> range is referred to a 60 °C temperature. The absolute humidity maximum value varies with environment temperature according to the following diagram.

**DIAGRAM OF THE ABSOLUTE HUMIDITY AND TEMPERATURE OUTPUTS**  
The graphs of the absolute humidity and temperature outputs are reported below.

**HD3817T..., HD38V17T...  
ABSOLUTE HUMIDITY AND TEMPERATURE ACTIVE TRANSMITTER**

The HD3817T... and HD38V17T... are double **absolute humidity and temperature active transmitters** with 4...20 mA current or 0...10 Vdc voltage outputs, respectively.

Absolute humidity is the ratio between the mass of water vapour and the measured volume of air, and is expressed in g/m<sup>3</sup>. The transmitters of the HD3817T... family may be used in materials humidity control during a drying process. When the materials are dried through heating or a hot air flow, the air absolute humidity increase is directly proportional to the quantity of water lost by the materials. A control system measuring absolute humidity, can maintain a certain humidity level by injecting vapour or water spray in the environment, if needed. Generally, these transmitters are employed in the chemical, textile, food industry, in the production and storage of paper, in the drying of wood,... even with high temperatures and wide humidity excursions. The type of sensor used is immune to most physical and chemical contaminants. The maximum working temperature is 200 °C: this makes these instruments particularly suitable to heavy industrial applications where the traditional capacitive sensor cannot be used.

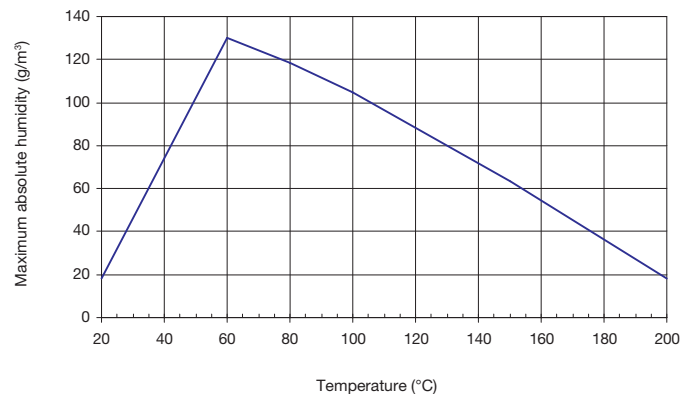
The response time is fast, as well as the recovery time from saturation.

The maximum measurement ranges are: 0...130 g/m<sup>3</sup> for absolute humidity and 0...200 °C for temperature: The instruments come out of the factory with the 0...60g/m<sup>3</sup> and 0...200 °C standard ranges. You can request, when placing the order, different ranges both for absolute humidity and temperature, but within the set limits.

The standard power supply is 24VAC. On request, 115VAC or 230VAC versions are available.

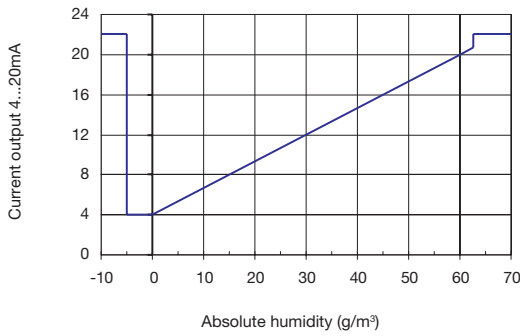
The probe is made of stainless steel and has a 20µm sintered bronze filter. The case is in polycarbonate with an IP66 protection degree.

The instruments have IP66 protection degree.



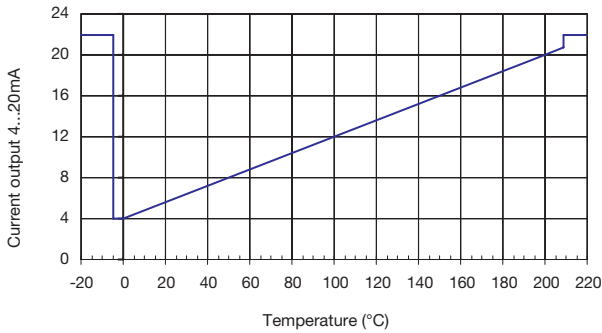
### Absolute humidity (g/m<sup>3</sup>)

4...20 mA current output according to 0...60g/m<sup>3</sup> standard range



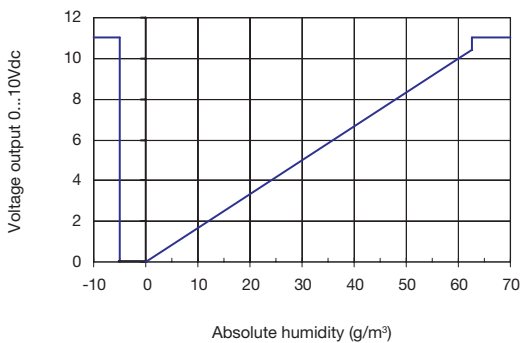
### Temperature (°C)

4...20 mA current output according to 0...200 °C standard range



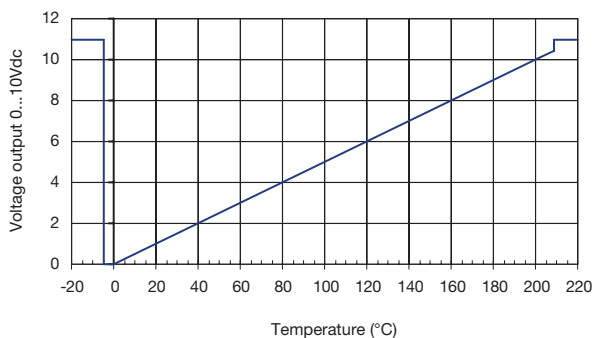
### Absolute humidity (g/m<sup>3</sup>)

0...10 Vdc voltage output according to 0...60g/m<sup>3</sup> standard range



### Temperature (°C)

0...10 Vdc voltage output according to 0...200 °C standard range

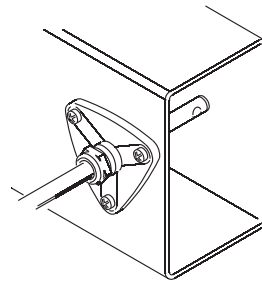


### Calibration

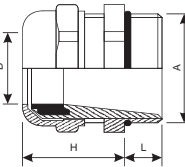
The instruments are calibrated in the factory; no calibration is required by the user.

### INSTALLATION NOTES

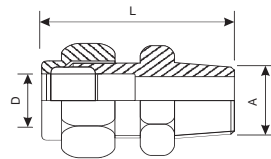
Each probe is calibrated in the factory with its transmitter: probe cannot be used onto another transmitter. The transmitter has to be installed into a position with good air circulation. The probe orientation is not important. To set the probe in a ventilation channel, into a duct, inside a dryer, etc. you can use the HD9008.31.12 flange, a PG16 (Ø10...14mm) metallic fairlead or a 3/8" biconical universal fitting.



HD9008.31.12 flange

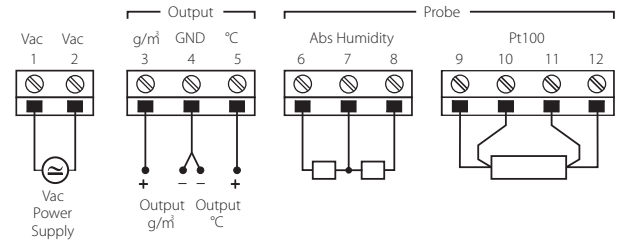


PG16.12 metallic fairlead  
D = 14 mm  
L = 6.5 mm  
H = 23 mm  
A = PG16



Biconical universal fitting  
L = 35 mm  
D = 14 mm  
A = 3/8

### ELECTRIC CONNECTION



### Power

Apply power to the instrument with the correct VAC voltage between the power supply terminals ① and ②.

### Connection of the absolute humidity and temperature probe

Connect the probe respecting the colours and the numbers in the following table:

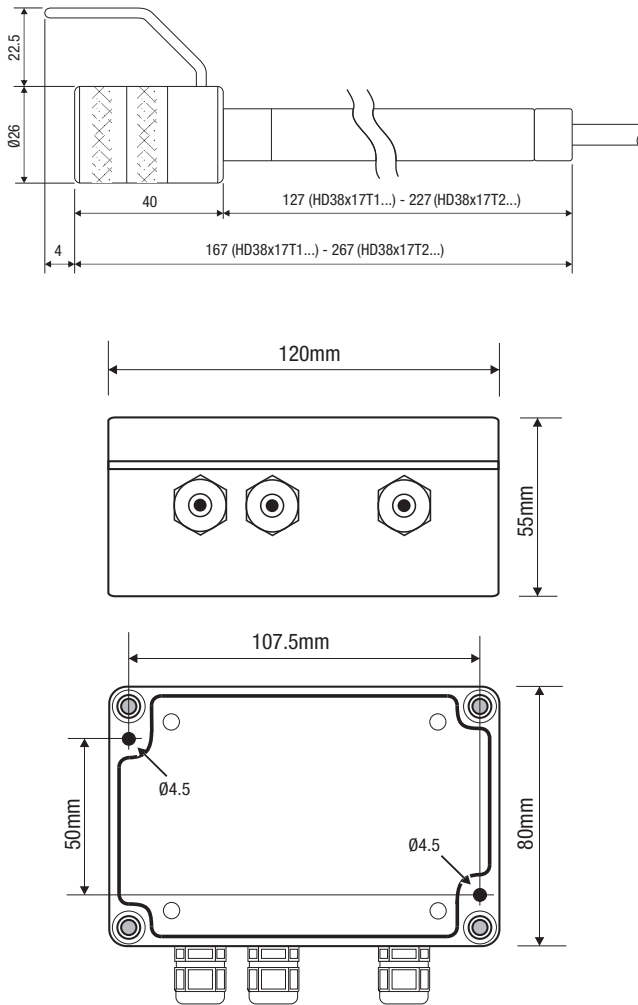
Function	Terminal Number	Cable Colour
Absolute Humidity	6	Red
	7	White
	8	Yellow
Pt100 Temperature	9	Blue
	10	Blue
	11	Black
	12	Black

### Analog outputs

The output signals are acquired between the terminals:

- ③=g/m<sup>3</sup> and ④=GND for absolute humidity,
- ⑤=°C and ⑥=GND for temperature.

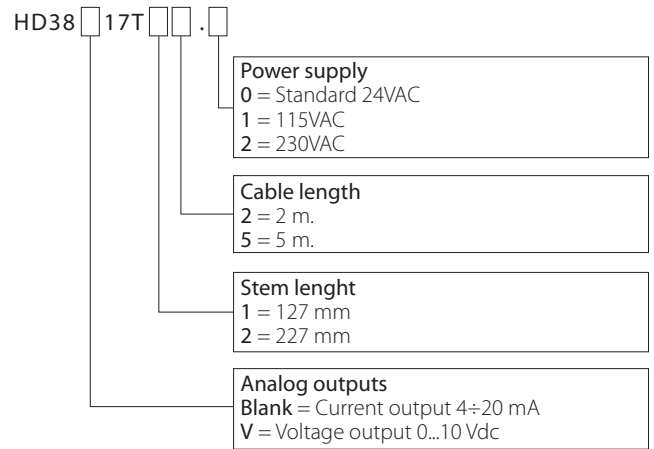
## DIMENSION



## ORDERING CODES

**HD3817T...:** Absolute humidity and Pt100 temperature double transmitter. Analog output 4...20 mA. Measurement range of absolute humidity 0...60g/m<sup>3</sup>, temperature 0...+200 °C (On request, when making the order, other outputs in the range, 0...130g/m<sup>3</sup> and 0...+200 °C). Probe with 20µm sintered bronze filter AISI304. Electronic working temperature -10...+70 °C. Probe working temperature 0...+200 °C.  
**When making the order, please specify 1) Power supply 2) Stem length 127mm o 227mm. 3) Probe's cable length 2m or 5m.**

**HD38V17T...:** Absolute humidity and Pt100 temperature double transmitter. Analog output 0...10 Vdc. Measurement range of absolute humidity 0...60g/m<sup>3</sup>, temperature 0...+200 °C (On request, when making the order, other outputs in the range, 0...130g/m<sup>3</sup> and 0...+200 °C). Probe with 20µm sintered bronze filter AISI304. Electronic working temperature -10...+70 °C. Probe working temperature 0...+200 °C.  
**When making the order, please specify 1) Power supply 2) Stem length 127mm o 227mm. 3) Probe's cable length 2m or 5m.**



## RELATION BETWEEN ABSOLUTE HUMIDITY, RELATIVE HUMIDITY E MIXING RATIO

$$\%RH = \frac{100 \cdot E}{E_s}$$

$$AH = \frac{804 \cdot E}{(1 + 0.00366 \cdot T) \cdot P_0}$$

$$MR = \frac{0.622 \cdot E}{P_0 - E}$$

%RH = % of relative humidity

AH = absolute humidity in g/m<sup>3</sup>

MR = Mixing ratio in water vapour kg per air kg

E = Current value of vapour pressure in air in Pascal

E<sub>s</sub> = Saturated vapour pressure in air in Pascal

P<sub>0</sub> = Atmospheric pressure in Pascal

T = temperature in Celsius degrees

the E<sub>s</sub> value can be obtain from a psychrometric table



## HD208



### HD208 MINIDATALOGGER TEMPERATURE – TEMPERATURE/RELATIVE HUMIDITY

The data loggers of the series **HD208** are compact instruments for monitoring temperature, relative humidity (RH) and dew point temperature. Usable in a wide spectrum of applications, are available in various models (with or without LCD display):

- with 1 channel for temperature only (depending on the model, the sensor can be internal, external fixed or external with cable).
- with 1 channel for temperature and relative humidity (combined probe fixed or with cable).
- with 2 channels for temperature only (one external sensor with cable and one internal sensor).
- with 2 channels: one for temperature and relative humidity (combined probe with cable) and one for temperature only (internal sensor).

The logging function is extremely versatile; logging can be started and stopped manually, by means of the front buttons, or the start and stop date and time of acquisition can be programmed. The delayed start capability allows starting the logging with a configurable delay time after pressing the button for the manual start.

For each quantity detected, two configurable alarm thresholds can alert the user if the measure exceeds the configured parameters.

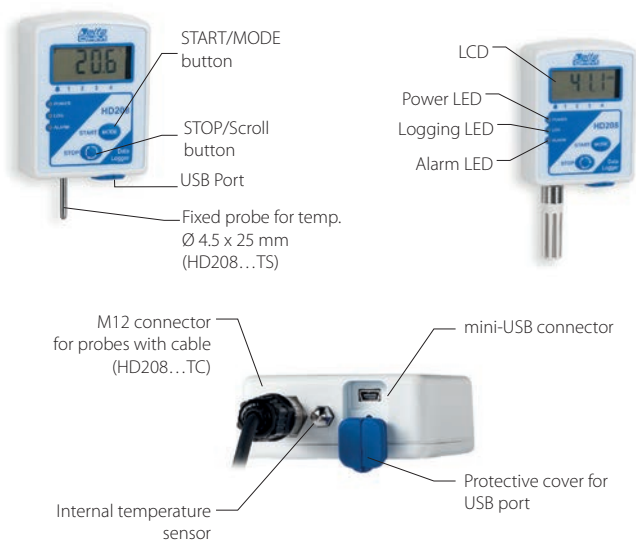
The instrument automatically generates, after logging, a PDF report with charts of the variables collected and a CSV file with all measurements logged. The PDF and CSV files can then be copied to the PC via the USB port, without any dedicated software: the instrument is recognized as a USB flash drive.

The basic application software HD35AP-S supplied with the instrument allows the configuration of the instrument, the real-time monitor of the measurements and the transfer of the acquired data into a database. The connection to the PC does not require any installation of USB drivers, thereby ensuring compatibility with all versions of the Windows® operating system.

The HD35AP-CFR21 application software option allows the use of security features of the recorded data and configuration of the instrument in response to FDA 21 CFR part 11 recommendations.

The sensors are pre-calibrated and require no further calibration by the user. If necessary, the user can perform a new calibration using the HD35AP-S application software.

Technical specifications	
<b>Relative Humidity</b>	
Sensor	Capacitive
Measuring range	0...100 %RH
Resolution	0.1%RH
Accuracy	$\pm 1.5\% \text{RH}$ (0...85 %RH) / $\pm 2.5\% \text{RH}$ (85...100 %RH) @ $T=15...35\text{ }^\circ\text{C}$ $\pm (2 + 1.5\% \text{ measure})\%$ @ $T=\text{remaining range}$
Sensor operating temperature	-40...+80 °C standard / -40...+150 °C with the probe HP3517E2... for high temperature
Response time	$T_{90} < 20\text{ s}$ (air speed 2 m/s, without filter)
Temperature drift	$\pm 2\%$ over the whole operating temperature range
Stability	1% / year
<b>Temperature</b>	
Sensor	Pt1000 or NTC10k $\Omega$ @ 25 °C depending on the model
Measuring range	NTC10k $\Omega$ : -40...+105 °C Pt1000: -50...+300 °C  The measuring range can be limited by the operating temperature of the probe used and, in the case of internal sensor or external fixed probe, by the maximum operating temperature of the instrument (+75 °C).
Resolution	0.1 °C
Accuracy	NTC10k $\Omega$ : $\pm 0.3\text{ }^\circ\text{C}$ in the range 0...+70 °C / $\pm 0.4\text{ }^\circ\text{C}$ outside Pt1000: class A, $\pm (0,15 + 0,002 t )\text{ }^\circ\text{C}$
Long term stability	0.1 °C / year
Unit of measurement	°C or °F
Logging interval	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Storable quantities	According to the model: - Temperature: internal sensor, fixed external probe or external sensor with cable; Mean Kinetic Temperature (MKT) calculated; the models with two temperature channels (internal sensor and external probe with cable) store both temperatures. - Relative Humidity. - Dew Point. - Battery Voltage.
Memory	Flash memory with circular management or stop logging when full. The PDF report is generated with the data stored in the Flash memory and the maximum number of samples (Ns) is: $N_s = \frac{921,600}{(1+0.75 \times N_g)}$ Example: > 526,000 with one quantity stored ( $N_g=1$ ) > 147,000 with seven quantities stored ( $N_g=7$ )  The maximum number of samples in the CSV files is instead limited only by the capacity of the 4 GB SD memory.
Alarms	Two alarm thresholds (configurable) for each measured quantity
Power supply	3.6 V not rechargeable lithium-thionyl chloride internal battery (Li-SOCl <sub>2</sub> ), size AA, 2-pole Molex 5264 connector.
Battery life	2 years typical, with logging interval 30 s
PC connection	USB port with mini-USB connector
Temperature/humidity of the instrument	-40...+75 °C / 0...100 %RH non condensing
Material	Plastic Tecnopolymer UV resistant
Dimensions	Case: 70 x 90 x 30 mm Size of the TV model with fixed probe: 70 x 138 x 30 mm
Precision degree	IP 64
Weight	150 g approx.
Installation	wall mount



**Power supply LED (POWER):** briefly flashes every 10 seconds to indicate that the instrument is powered. It is steady on if the instrument is connected to the PC.

**Logging LED (LOG):** briefly flashes three times when logging starts and stops, and once every 10 seconds during logging.

**Alarm LED (ALARM):** briefly flashes every 10 seconds if any of the measured quantities is in alarm.

**START/MODE button:** by pressing it briefly, you change the type of information displayed (measures, date/time, alarm thresholds, logging settings); if pressed for more than 2 seconds, manually starts logging. In models without LCD, the button performs only the START function.

**STOP/Scroll button:** by pressing it briefly, you change the parameter displayed (the parameter depends on the type of information selected with the START/MODE button); if pressed for more than 2 seconds, manually stops logging. In models without LCD, the button performs only the STOP function.

### Models with LCD

In models with LCD, MODE and SCROLL buttons allow viewing a variety of information. With the MODE button (short press) you choose the type of information: measurements, date and time of the instrument, alarm thresholds, start and stop instants of programmed logging, delay time for the manual start of logging. With the SCROLL button (short press) you navigate through the various fields of the type of information selected.

The buttons operation is cyclical.

### Logging

The start of logging can be:

- Automatic, by programming the start date and time.
- Manual, by pressing for more than 2 seconds the button START/MODE.
- Delayed: logging does not start immediately when you press the START/MODE button, but after the delay time set.

Logging stop can be automatic, by programming the stop date and time or manually, by pressing for more than 2 seconds the STOP/Scroll button.

The programmed time and the delay time are set using the software HD35AP-S.

During logging, the LOG symbol on the display and the LOG LED flash. In case of delayed start, during the delay time the DELAY symbol appears on the display, indicating that the instrument is waiting to start logging.

### PDF Report

At the end of each logging session, the data logger automatically generates a PDF report, which can then be copied to the PC via the USB port of the instrument. When generating the report, the display of the instrument shows PDF.

The report includes the graphs of the detected quantities and information about the logging session: logging start and stop time, logging interval,

number of samples acquired, alarm thresholds, minimum, average and maximum of each detected quantity.

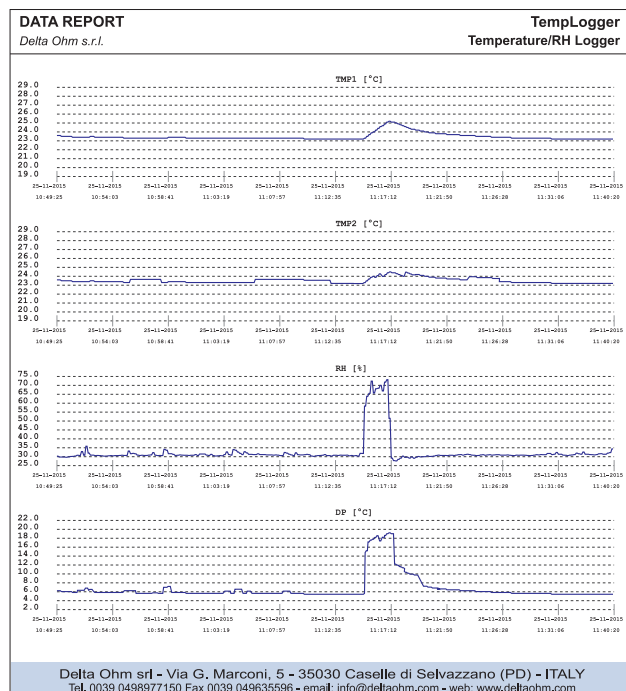
The report includes the calculation of the Mean Kinetic Temperature (MKT). The Mean Kinetic Temperature is an evaluation index of the cold chain used in the pharmaceutical field, and is calculated according to the Haynes equation as a function of all the temperature measurements acquired during the logging session. The Mean Kinetic Temperature is used to evaluate temperature fluctuations experienced by a biological substance during storage or transport, and corresponds to the storage temperature that, if maintained constant, produces on the biological substance the same effects of the actual temperature changes recorded in the time period considered (i.e. the duration of the logging). You can set the value of the activation energy, parameter necessary for the calculation of MKT.

The time required to generate the PDF file depends on the amount of data acquired, and can go from a few seconds (if the amount of data acquired is limited) up to about a minute.

Note: the PDF report is generated with the data stored in the Flash memory; the number of samples in the Flash memory may be less than the number of samples stored in the CSV file (please see the memory capacity in the specifications table).

The generation of the PDF report can be enabled/disabled by using the HD35AP-S application software or, alternatively, by holding pressed the STOP button and then pressing the reset button located on the electronic board (above the battery connector).

DATA REPORT		TempLogger	
Delta Ohm s.r.l.		Temperature/RH Logger	
<b>DATA SUMMARY</b>			
S.N.:	15037735	Session Number:	1
Recording Start:	2015-11-25 10:49:24	Recording Stop:	2015-11-25 11:40:20
Number of Samples:	3056	Sampling Interval:	1 s
Start reason:	BUTTON PRESS	Stop Reason:	BUTTON PRESS
Calibration date:	2015-11-20	Calibration used:	Factory
CFR Enabled:	NO	CFR User:	N/A
Measure:	TMP1	MKT:	MKT1
Type:	TEMPERATURE	Value:	23.5 °C
Max:	25.2 °C	High Alarm Level:	27.0 °C
Min:	23.2 °C	Low Alarm Level:	5.0 °C
Avg:	23.6 °C	High Alarm time:	0 s
High Alarm Level:	30.0 °C	Low Alarm time:	0 s
Low Alarm Level:	-10.0 °C		
High Alarm time:	0 s		
Low Alarm time:	0 s		
Measure:	TMP2	MKT:	MKT2
Type:	TEMPERATURE	Value:	23.7 °C
Max:	25.4 °C	High Alarm Level:	27.0 °C
Min:	23.1 °C	Low Alarm Level:	5.0 °C
Avg:	23.5 °C	High Alarm time:	0 s
High Alarm Level:	30.0 °C	Low Alarm time:	0 s
Low Alarm Level:	-10.0 °C		
High Alarm time:	0 s		
Low Alarm time:	0 s		
Measure:	RH	Measure:	DP
Type:	RH%	Type:	DEW POINT
Max:	74.6 %	Max:	19.9 °C
Min:	26.5 %	Min:	4.8 °C
Avg:	31.6 %	Avg:	6.2 °C
High Alarm Level:	80.0 %	High Alarm Level:	80.0 °C
Low Alarm Level:	5.0 %	Low Alarm Level:	-10.0 °C
High Alarm time:	0 s	High Alarm time:	0 s
Low Alarm time:	0 s	Low Alarm time:	0 s



## Advanced software option

The supplied PC basic software HD35AP-S, downloadable free of charge from the Delta OHM website, allows:

- configuring the devices
- viewing the real time measurements both graphically and numerically
- downloading data.

The connection to the database is multi-client: it is possible to store the data in a remote database on the local network to which the PC is connected and the data can be displayed from any PC on the local network running the software HD35AP-S.

The HD35AP-CFR21 option (working with hardware key) allows, in addition to the features of the basic software, the protection of recorded data and configuration of the system in response to FDA 21 CFR part 11 recommendations. In particular are available:

The traceability of activities (audit trail) performed with the software; for example, which users connected and what changes were possibly made to the configuration of the system.

The management of users access for the system configuration and viewing of data in the database. Each user can be assigned a different password for using the software. There are also three levels of access (Administrator, Super-user and standard User); for each level, the allowed operations can be defined.

## ORDERING CODES:

**HD208...** Temperature or temperature / relative humidity (RH) data logger. Calculates the Mean Kinetic Temperature (MKT) and the Dew Point temperature (only models measuring relative humidity). Selectable storage interval 1-2-5-10-15-30 s/min, 1 hour. Memory capacity from 147,000 to 526,000 samples depending on the number of quantities stored. Configurable alarm thresholds. USB output. IP64 protection degree. Power supply: 3.6 V not rechargeable lithium-thionyl chloride battery (Li-SOCI2). Includes HD35AP-S software downloadable from Delta OHM website. Supplied with: battery, user manual. The probes with cable and the USB cable must be ordered separately.

**HD208** [ ] [ ] [ ]

**Probe Type**

Blank = only internal temperature sensor  
 TC = only external probe with cable  
 TS = only external fixed temperature probe with stainless steel tube  
 TV = only external fixed temperature probe with PBT technopolymer protective cap and stainless steel grid  
 TCI = external probe with cable + internal temperature sensor

**Measured quantities**

N = temperature with NTC10kΩ sensor  
 6P = temperature with Pt100 sensor  
 7P = temperature with Pt1000 sensor  
 1N = temperature (NTC10kΩ sensor) and relative humidity  
 17P = temperature (Pt1000 sensor) and relative humidity  
 Options 6P (Pt100 sensor) 7P and 17P (Pt1000 sensor) are possible only with external probe with cable.

**LCD**

Blank = without LCD,  
 L = with LCD

The screenshot shows the HD35AP-S software interface with several key components labeled:

- Monitor of the measures:** Points to the real-time data display area showing Temperature (23.4°C), Relative humidity (50.6%), and Dew point (17.6°C).
- Device information:** Points to the top status bar showing device ID (HD208), SN (15023723), and other settings.
- Data base time interval selection:** Points to the 'View data from database' window where search dates and time intervals are defined.
- Selection of devices and quantities:** Points to the 'Database Collections' window where specific sensors and data points are selected for display.
- Users permissions (only with HD35AP-CFR21 option):** Points to the 'Setup user login' and 'User list' windows, which manage user access and permissions.
- Graph of measures:** Points to the line graph at the bottom of the interface showing historical data trends.
- Measures:** Points to the numerical data values displayed in the real-time monitor.
- DATABASE:** A blue arrow points to the 'Database' label at the bottom of the graph area.

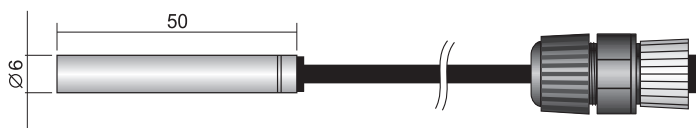
## Temperature probes with NTC10kΩ@ 25 °C sensor

**TP35N1...** Temperature probe with NTC10kΩ sensor. Operating temperature: -40...+105 °C. Accuracy: ± 0.3 °C (0...+70 °C) / ± 0.4 °C (outside). Dimensions: Ø 5 x 40 mm. AISI 316 stainless steel tube. 4-pole M12 connector.



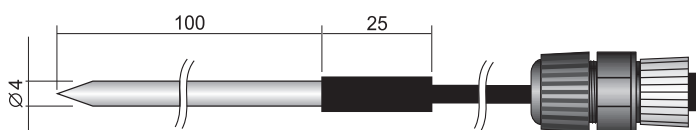
TP35N1. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m, 10 = 10 m

**TP35N2...** Temperature probe with NTC10kΩ sensor. Operating temperature: -40...+105 °C. Accuracy: ± 0.3 °C (0...+70 °C) / ± 0.4 °C (outside). Dimensions: Ø 6 x 50 mm. AISI 316 stainless steel tube. 4-pole M12 connector. Suitable for aggressive chemicals and immersion (IP68).



TP35N2. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m, 10 = 10 m

**TP35N5...** Penetration temperature probe, NTC10kΩ sensor. Operating temperature: -40...+105 °C. Accuracy: ± 0.3 °C (0...+70 °C) / ± 0.4 °C (outside). Dimensions: Ø 4 x 100 mm. AISI 316 stainless steel tube. 4-pole M12 connector.

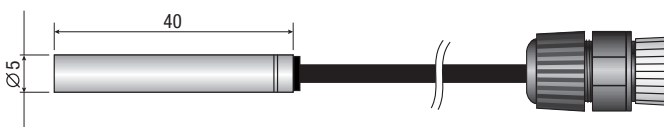


TP35N5. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m

## Temperature probes with Pt1000 sensor

Note: temperature only probes TP35... with Pt1000 sensor cannot be connected to models HD208[L]17PTC...

**TP35.1...** Temperature probe with Pt1000 1/3 DIN 4-wire sensor. Operating temperature: -50...+105 °C. Dimensions: Ø 5 x 40 mm. AISI 316 stainless steel tube. 4-pole M12 connector.



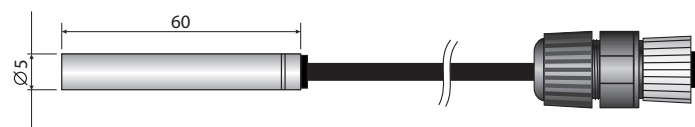
TP35.1. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m, 10 = 10 m

**TP35.2...** Temperature probe with Pt1000 1/3 DIN 3-wire sensor. Operating temperature: -40...+105 °C. Dimensions: Ø 5 x 20 mm. Thermoplastic rubber tube. 4-pole M12 connector. Cable length 3 or 5 m. Suitable for aggressive chemicals and immersion (IP68).



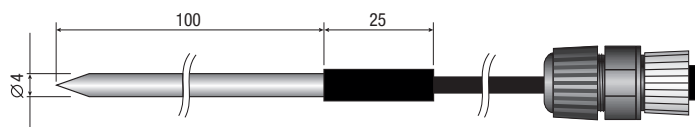
TP35.2. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m

**TP35.4...** Temperature probe with Pt100 1/3 DIN 4-wire sensor. Operating temperature: -50...+105 °C. Dimensions: Ø 6 x 50 mm. AISI 316 stainless steel tube. 4-pole M12 connector.



TP35.4. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m, 10 = 10 m

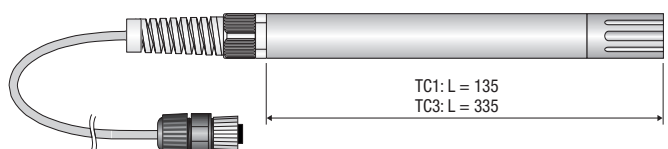
**TP35.5...** Penetration temperature probe, Pt1000 1/3 DIN 3-wire sensor. Operating temperature: -40...+300 °C. Dimensions: Ø 4 x 100 mm. AISI 316 stainless steel tube. 4-pole M12 connector.



TP35.5. /C  
CABLE LENGTH: 3 = 3 m, 5 = 5 m

## Temperature and relative humidity combined probes

**HP3517...** Temperature and relative humidity combined probe. Temperature sensor: NTC10kΩ@ 25 °C (HP3517TC...) or Pt1000 (HP3517E2TC...). Measuring range: 0...100 %RH / -40...+105 °C (NTC10kΩ) / -40...+150 °C (Pt1000). R.H. sensor operating temperature: -40...+80 °C standard, -40...+150 °C with E2 option. M12 4-pole (HD3517TC...) or 8-pole (HP3517E2TC...) connector. PBT technopolymer body.



HP3517  
Cable Length  
2 = 2 m, 5 = 5 m, 10 = 10 m  
Stem Length  
TC1 = 135 mm, TC3 = 335 mm  
Temperature Sensor  
Blank = NTC10kΩ  
E2 = Pt1000

## Accessories

**HD35AP-CFR21:** Advanced version of the HD35AP-S software for the management of the data logging system in accordance with the FDA 21 CFR part 11 recommendations. It works with USB hardware key (included).

**CP23:** Direct USB connection cable with mini-USB male connector on the instrument side and USB type A male connector on the PC side.

**HD208.13:** Aluminium flange for fixing the instrument to the wall.

**HD35-BAT3** 3.6 V non-rechargeable lithium-thionyl chloride (Li-SOCl<sub>2</sub>) battery, size AA, 2-pin Molex 5264 connector.

**HD75** 75%RH saturated solution for checking the RH sensor, with screw adaptor for probes Ø14mm, M12x1 thread.

**HD33** 33%RH saturated solution for checking the RH sensor, with screw adaptor for probes Ø14mm, M12x1 thread.

**HD11** 11%RH saturated solution for checking the RH sensor, with screw adaptor for probes Ø14mm, M12x1 thread.

# Related products

HD37AB1347

HD21ABE17

HD45...  
HD46...

HD2001T...

HD9008Txx  
HD9009Txx  
HD9007



T	✓	✓	✓	✓	✓
CO	✓	✓			
CO <sub>2</sub>	✓	✓	✓		
Atmospheric Pressure	✓	✓		✓	
Air Speed	✓			✓	
Luminance					
Logger	✓	✓	✓		
Description	Multifunction data logger for indoor air quality analysis (IAQ) and comfort conditions.	Portable measuring instrument & data logger suitable especially where indoor measurements regulations apply.	Series of transmitters, indicators and controllers. They are suitable for monitoring the air quality in indoor environments.	Series of wall mounted transmitters provided with RS232C or RS485 serial output.	The HD9008T... and HD9009T... are single block RH and temperature microprocessor transmitters.
You can find all technical details	<b>Indoor IAQ &amp; Thermal Comfort</b> Catalogue Delta OHM website	<b>Indoor IAQ &amp; Thermal Comfort</b> Catalogue Delta OHM website	<b>Indoor IAQ &amp; Thermal Comfort</b> Catalogue Delta OHM website	<b>Air Speed</b> Catalogue Delta OHM website	<b>Environmental Analysis</b> Catalogue Delta OHM website



Is it not only **humidity** that you need to measure?

In these two pages we list all the instruments with the related additional measured parameters.

Also, we indicated where to find the related technical datasheet.

HD31

DO9847

HD35

HD9022

HD40.1



T	✓	✓	✓		
CO	✓	✓	✓		
CO <sup>2</sup>	✓	✓	✓		
Atmospheric Pressure	✓	✓	✓		
Air Speed	✓	✓	✓		
Luminance	✓	✓	✓		
Logger	✓	✓	✓		
Description	Three channel multifunction data logger for probes complete with SICRAM module.	Combinations of all measurements in a 3 channel portable data logger.	Series of wireless loggers to be combined with any measurement.	The microprocessor-controlled panel instrument HD9022 is an indicator with alarm thresholds.	Lightweight, compact, portable thermal printer.
You can find all technical details	Delta OHM website	Delta OHM website	Delta OHM website <b>HD35</b> Catalogue	<b>Temperature</b> Catalogue Delta OHM website	Delta OHM website



LAT N° 124

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**Permanent Laboratory ACCREDITATION TABLE**

Quantity	Instruments to be calibrated	Measuring range	Uncertainty (*)	Note
Relative Humidity	Electrical hygrometers and thermohygrometers	From 10%RH to 92%RH (with air temperature from 0 °C to 60 °C)	From 0.5%RH to 1.8%RH	②
	Mechanical hygrometers and thermohygrometers	From 10%RH to 92%RH (with air temperature from da 0 °C to 60 °C)	From 2.0%RH to 2.6%RH	②
	Electrical psychrometers	From 10%RH to 92%RH (with air temperature from 13 °C to 33 °C)	From 0.5%RH to 1.8%RH	②
	Salt saturated solutions	From 10%RH to 90%RH (with air temperature from 20 °C to 25 °C)	1.4%RH	
Dew point*	Condensing mirror hygrometers	From -20 °C to 60 °C	0.16 °C	

(\*) The uncertainties are expressed on a confidence level of about 95%.

② Total extended uncertainty caused by propagation of the uncertainties of the reference quantities ( $t_{dew}$  e  $t_{air}$ ).







Your direct contact to us



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